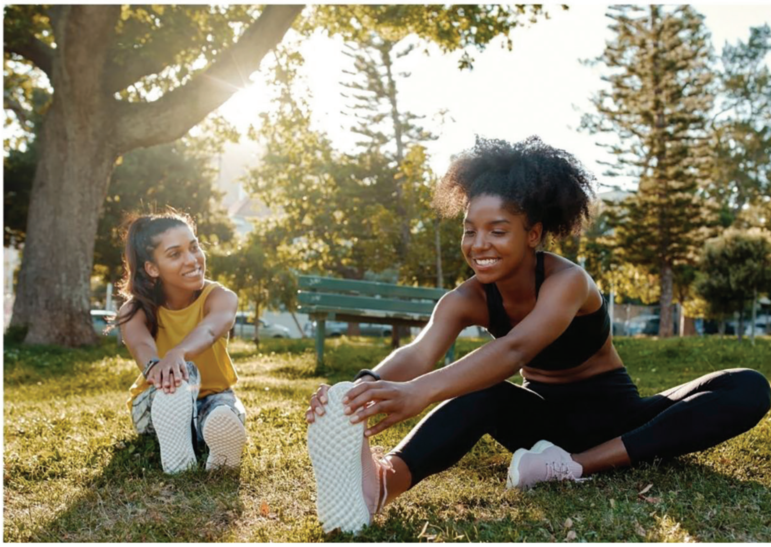
Healthy Eating and Active Lifestyles

BEST PRACTICES IN PUBLIC HEALTH



OECD

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BETTER POLICIES FOR BETTER LIVES

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Foreword

Overweight, which includes obesity, affects over half of all men and women in OECD countries. Although the causes of weight gain are multifaceted and complex, changes to what people eat and levels of physical activity are the two leading factors.

People living with overweight are at greater risk of developing non-communicable diseases such as cardiovascular diseases, type 2 diabetes and certain cancers. Such diseases are associated with greater health care use leading to higher health expenditure. Overweight also worsens workforce productivity, for example through higher rates of absenteeism. Previous OECD analyses show that gross domestic product would be 3.3% lower per year on average across OECD countries due to the combined effect of lower workforce productivity and life expectancy, see *The Heavy Burden of Obesity: The Economics of Prevention*.

This report is part of the OECD's work on promoting best practices in public health in OECD and EU27 countries. It aims to help countries improve their response to high rates of overweight by examining the potential to scale-up and transfer best practice interventions. Interventions included in the report range from those targeting individual behaviour, such as lifestyle counselling programmes, to those that change the environment in which people live, such as community-based programmes.

Examinations involved an assessment of the intervention against validated best practice criteria outlined in the *OECD Guidebook on Best Practices in Public Health*. The set of criteria includes effectiveness, efficiency, equity, the quality of the evidence-base, and the extent of coverage, as well as an assessment of the intervention's potential to be transferred to another region.

Drawing upon key findings from an examination of selected interventions, this report outlines five ways policy makers can improve their response to high rates of overweight and obesity:

- **Create comprehensive policy packages** that include interventions covering a range of settings – such as schools, primary care and the community – as well as population groups
- **Target the needs of disadvantaged groups** such as those with a lower socio-economic status, for example by adapting interventions to the needs of these groups
- **Boost participation in weight reduction programmes** using several strategies such as providing social support and asking participants to set goals targeting behaviour change
- **Adequately resource transfer and scale-up efforts** for example to develop implementation material outlining key steps and "lessons learnt" from previous implementation efforts
- **Provide incentives that strengthen evidence-based research** such as setting minimum evidence-based standards when determining which interventions to transfer or scale-up.

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A preliminary version of the structure used to examine public health interventions (Chapters 3-14) was submitted for written review at the October 2020 meeting of the OECD Expert Group on the Economics of Public Health (EGEPH). A selection of intervention case studies included in this report were submitted for written review at the April 2021 meeting of the OECD EGEPH. Finally, the draft report was submitted for written review at the December 2021 meeting of the OECD Health Committee. The authors would like to thank all countries who provided feedback following these meetings, which provided essential input into the final report.

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Acronyms and abbreviations

BMI	Body mass index
CLI	Combined Lifestyle Intervention
CVD	Cardiovascular disease
DALY	Disability adjusted life year
DE-PLAN	Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutrition
EU	European Union
G20	Group of 20 countries
GDP	Gross domestic product
HALE	Healthy life expectancy
HL	Health literacy
JA	Joint Action
LE	Life expectancy
MTI	Multimodal Training Intervention
NCD	Non-communicable disease
OECD	Organisation for Economic Co-operation and Development
PAOMC	Personalised Approach to Obesity Management in Children
PAP	Physical Activity on Prescription
PPP	Purchasing power parity
QALY	Quality adjusted life year
SES	Socio-economic status
SPHeP	Strategic Planning for Public Health
UN	United Nations
WHO	World Health Organization

Executive summary

Overweight and obesity has a significant health and economic impact in OECD countries

Overweight, which includes obesity, affects over half of all men and women living in OECD countries. While the causes underpinning the rise in overweight are multifaceted and complex, changes in lifestyles including unhealthy diets and insufficient physical activity are the two leading risk factors.

People living with overweight are at greater risk of developing non-communicable diseases (NCDs) such as type 2 diabetes, cancers and cardiovascular diseases. Frequent use of health care services and higher health care costs are associated with such diseases. Overweight also has an indirect negative economic impact by depressing workforce productivity, for example through higher rates of absenteeism.

Countries have responded to high rates of overweight with national action plans, which are the basis for different policies and interventions

Over 90% of OECD countries have action plans for unhealthy diets and physical inactivity. Interventions included in these action plans typically influence people to make healthier choices (e.g. food labelling), widen the availability of healthy choices (e.g. green spaces), change the price of goods (e.g. tax on sugary drinks) or restrict access to unhealthy products (e.g. banning unhealthy foods in certain spaces).

This report examines a selection of high-priority overweight prevention interventions implemented in OECD and EU27 countries

Twelve interventions including food-labelling schemes, lifestyle counselling programmes, community- and school-based programmes, as well as mHealth apps were selected for analysis. Interventions were selected based on submissions by countries and do not aim to be comprehensive. Rather, they represent those that are of key strategic interest, therefore, other countries are considering similar approaches.

Each intervention was examined against a common set of frameworks – specifically, an assessment of the intervention against several best practice criteria including effectiveness, efficiency and equity, and second, an assessment to determine the transferability of the intervention.

The use of validated assessment frameworks and a focus on the economic impact of interventions provides policy makers with a unique, in-depth analysis of interventions tackling overweight. The analysis also fills a knowledge gap regarding the potential to transfer interventions to other regions.

Selected interventions tackling overweight risk factors are both effective and efficient

An analysis of selected interventions using the OECD microsimulation model – Strategic Planning for Public Health NCD model – shows their potential to reduce disease incidence, in particular, musculoskeletal disorders and cardiovascular diseases.

Results from modelling exercises also reveal that the selected interventions are efficient as they reduce health expenditure and improve workforce productivity. As a result, many interventions are not only cost effective, but also cost saving. For example, Nutri-Score, a front-of-pack health food label first introduced in France, is expected to be cost saving if scaled-up and transferred to all OECD and EU27 countries.

Countries can implement five main policy recommendations to improve their response to high rates of overweight

Create comprehensive policy packages. Among the selected interventions, changes in diet and physical activity outcomes were sometimes small, not statistically significant and limited in scope when assessed from a population-wide perspective. This is not surprising given the causes of overweight are complex and multifaceted meaning there is no "silver bullet" solution. For this reason, policy makers should focus on comprehensive policy packages that include several complementary interventions. Namely, "downstream" interventions focused on changing people's behaviour as well as "upstream" interventions that change the environment in which people live, such as food reformulation, food procurement, and more green spaces.

Target the needs of disadvantaged groups. Overweight disproportionately affects people with a lower socio-economic status. Despite this, the selected interventions infrequently targeted or reported health outcomes for disadvantaged groups. Further, among interventions that did, the results were mixed, highlighting the difficulty of reducing health inequalities. Further efforts are necessary to address the needs of disadvantaged groups. Key policy actions include boosting levels of health literacy (HL), given HL is typically lower in disadvantaged groups, adapting programmes to the specific needs of certain groups (such as offering services in other languages), and utilising diverse communication and recruitment strategies to increase uptake among underrepresented groups.

Boost participation in weight reduction programmes. Changing people's behaviour is complex; particularly in relation to behaviours that affect rates of overweight given they are shaped by cultural, socio-economic and environmental factors. Therefore, it is not surprising that weight loss interventions analysed as part of this report suffered from recruitment and retention issues. Policy makers can improve uptake and retention using several strategies such as providing social support and asking participants to set goals targeting behaviour change. Such strategies will increase the likelihood of the intervention being effective in the long term.

Adequately resource transfer and scale-up efforts. Over half of all selected interventions were transferred from their original country (i.e. the owner) to another country (i.e. the target). An analysis of the transfer process revealed successful transfers are complex and require a thorough understanding of both the owner and target setting. To assist the spread of best practice interventions, policy makers should dedicate resources to support the transfer or scale-up process. Additional resources can be spent on building close ties between key personnel in the owner and target country (e.g. through regular in-person meetings), developing practical implementation guides, as well as further research to understand differences between the owner and target country and how this may affect the transfer process.

Provide incentives that strengthen evidence-based research. Randomised controlled trials (RCTs) are the "gold standard" in establishing causal effects given their potential to reduce bias. Among selected interventions, nearly half were evaluated using an RCT with the remainder relying on observational study designs, which are practical and often desirable in public health. To enhance the quality of evidence supporting overweight interventions, policy makers can set minimum evidence-based standards when determining which interventions to scale-up or transfer; require researchers to submit an evaluation study design when applying for funding; promote collaborative research between academics and public health bodies; and dedicate a proportion of funds to monitoring and evaluation.

1 Key findings and recommendations

Changes in lifestyle behaviours have led to a rise in rates of overweight and obesity, which has both a significant health and economic impact. In this context, this chapter summarises key findings and policy recommendations following a review of 12 interventions targeting overweight and obesity risk factors – i.e. unhealthy diets and physical inactivity.

Overweight is a major public health issue requiring effective policy action

Overweight, which includes obesity,[1] is a key public health issue facing countries across the world. Advances in technology, globalisation, urbanisation and the expansion of food retail have changed the way people eat. Consequently, diets today are increasingly comprised of foods associated with weight gain (e.g. added fats and sugar) at the expense of those with healthy dietary elements (e.g. fruit and vegetables). Concurrently, people today have fewer reasons to be physically active with the rising use of less active modes of transport and sedentary jobs. Given changes in body weight are primarily due to imbalances between energy intake from diet and energy output through physical activity, it is not surprising that rates of overweight, which includes obesity, are high: as of 2019, 64% of men and 56% of women in the OECD live with overweight (OECD, 2019[1]). For further details on overweight risk factors and trends, see Chapter 2.

Overweight places both a health and economic toll on countries. Adults who live with overweight are at greater risk of developing certain non-communicable diseases (NCDs) such as type 2 diabetes and several cancers. High NCD rates, in turn, lead to a greater number of premature deaths: over the period 2020-50, overweight is estimated to reduce average life expectancy in the OECD by 2.7 years, with this figure increasing to 3.2 years when considering healthy life years (OECD, 2019[2]). Given people living with overweight are more likely have one or multiple NCDs, demand and costs for health care are also likely to be higher among this group of people. For example, OECD estimates the cost of treating overweight and its related conditions at USD PPP (purchasing power parity) 209 per year, per person, which translates into 8.4% of total health expenditure.

OECD countries have responded to the obesity epidemic with a mixture of policy interventions. Across the OECD, over 90% of countries have implemented a national action plan to address unhealthy diets and physical inactivity (WHO, 2019[3]; WHO, 2019[4]). Action plans at the national level complement and align with those developed by the international community such as WHO's Global Action Plan on Physical Activity, which aims to reduce the global prevalence of physical inactivity by 15% by 2030. Action plans typically include a range of interventions such as those that aim to widen the availability of healthy choices (see Chapter 2 for further details).

To assist policy makers address rising rates of overweight, this report examines a selection of strategically important prevention interventions implemented within OECD and EU27 countries. Given the significant health and economic impact of overweight, policy makers have implemented a range of interventions targeting key risk factors – i.e. unhealthy diets and physical inactivity. To assist policy makers select and transfer interventions considered "best practice", this report details key findings and aligning policy recommendations following a review of 12 interventions submitted by OECD policy makers or selected from the EU's Public Health Best Practice Portal (see Table 1.1 for a high-level overview of each intervention) (European Commission, 2021[5]). Due to this process, selected interventions typically target individual lifestyle behaviours. In reality, tackling overweight requires a multifaceted approach, including policies to change economic, social and physical environments. Further, the chosen interventions do not cover all overweight risk factors, but instead focus on the two predominant risk factors – diet and physical activity. Despite these limitations, selected interventions represent some of those that are of key strategic interest, therefore, countries are considering transferring them to their local context.

Each intervention was assessed against a standard methodology – namely an assessment of the intervention against five best practice criteria including effectiveness, efficiency and equity, as well as an assessment of the intervention's transferability potential. For further methodological details, see Annex A.

Table 1.1. Overview of selected case study interventions

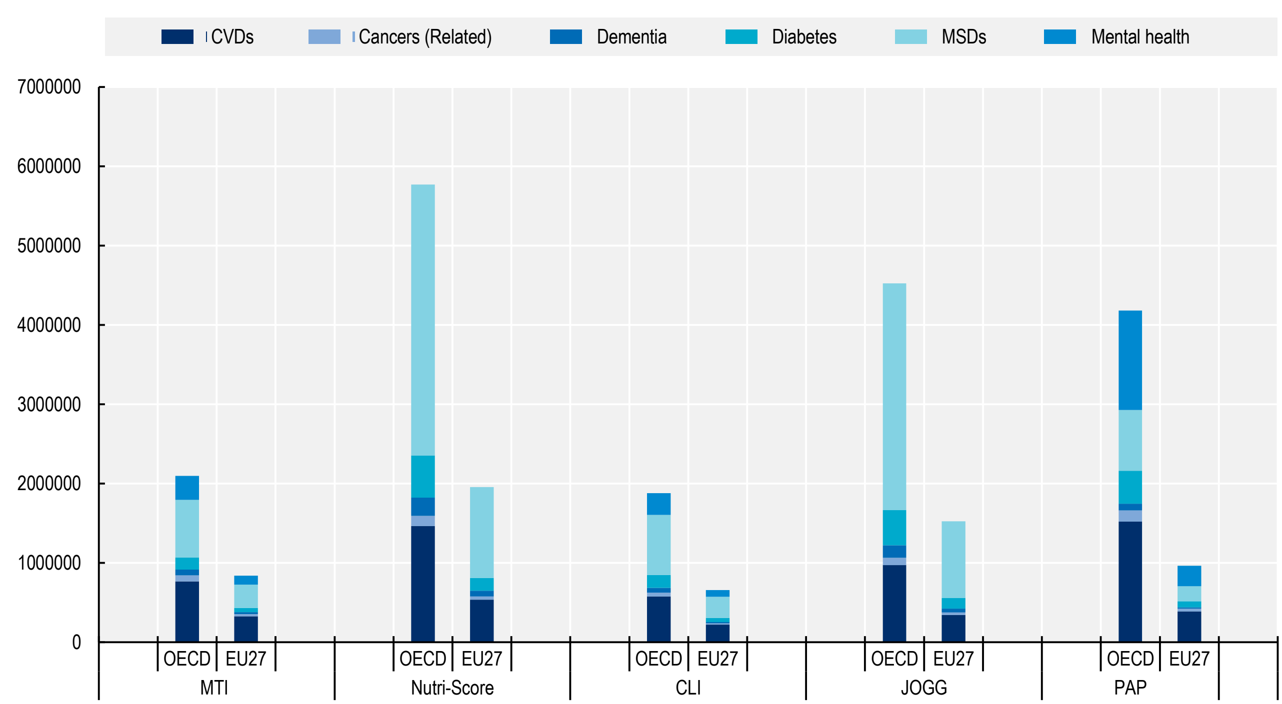
Name	Case study theme	Description	Country*	Case study write-up available in
Nutri-Score	Food labelling	Front-of-pack labelling intervention to address unhealthy eating	Various European countries	Chapter 3
Physical Activity on Prescription (PAP)	Lifestyle counselling	Intervention to prescribe patients physical activity in a primary care setting	Sweden	Chapter 4
Combined Lifestyle Intervention (CLI)	Lifestyle counselling	Intervention offered to those who are overweight or obese. Patients are guided on how to improve diet, exercise and overall health.	Netherlands	Chapter 5
Multimodal Training Intervention (MTI)	Lifestyle counselling	Physical activity and healthy eating programme targeting those aged 65 years and older.	Iceland, Spain and Lithuania	Chapter 6
Young People at a Healthy Weight (JOGG)	Community-based programme	Community-based intervention designed to improve diets and boost physical activity among those aged 0-19 years	Netherlands	Chapter 7
ToyBox	School-based programme	Kindergarten intervention to improve healthy eating and physical activity	Various European countries	Chapter 8
The Danish Whole Grain Partnership	Food labelling	A front-of-pack labelling intervention to boost wholegrain consumption	Denmark	Chapter 9
StopDia Pilot	Lifestyle counselling	Lifestyle intervention for the Somali population who are at-risk of developing type 2 diabetes (adapted from the nation-wide StopDia intervention)	Finland	Chapter 10
SI! intervention	School-based programme	Multidimensional school-based obesity prevention intervention, which targets lifestyle behaviour change in 3-5 year-olds	Spain	Chapter 11
Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutrition (DE-PLAN)	Lifestyle counselling	Type 2 diabetes prevention intervention aimed at improving diet and physical activity levels through a lifestyle, community-based intervention	Various European countries	Chapter 12
Personalised Approach to Obesity Management in Children (PAOMC)	Lifestyle counselling	Clinical, family-based and personalised childhood obesity programme targeting children aged 7 to 17 years	Estonia	Chapter 13
Let Food Be Your Medicine	mHealth	Personalised nutrition mHealth app	Romania	Chapter 14

* The case study may operate across the country or in specific regions within that country.

Modelling estimates indicate selected interventions targeting overweight risk factors are both effective and efficient

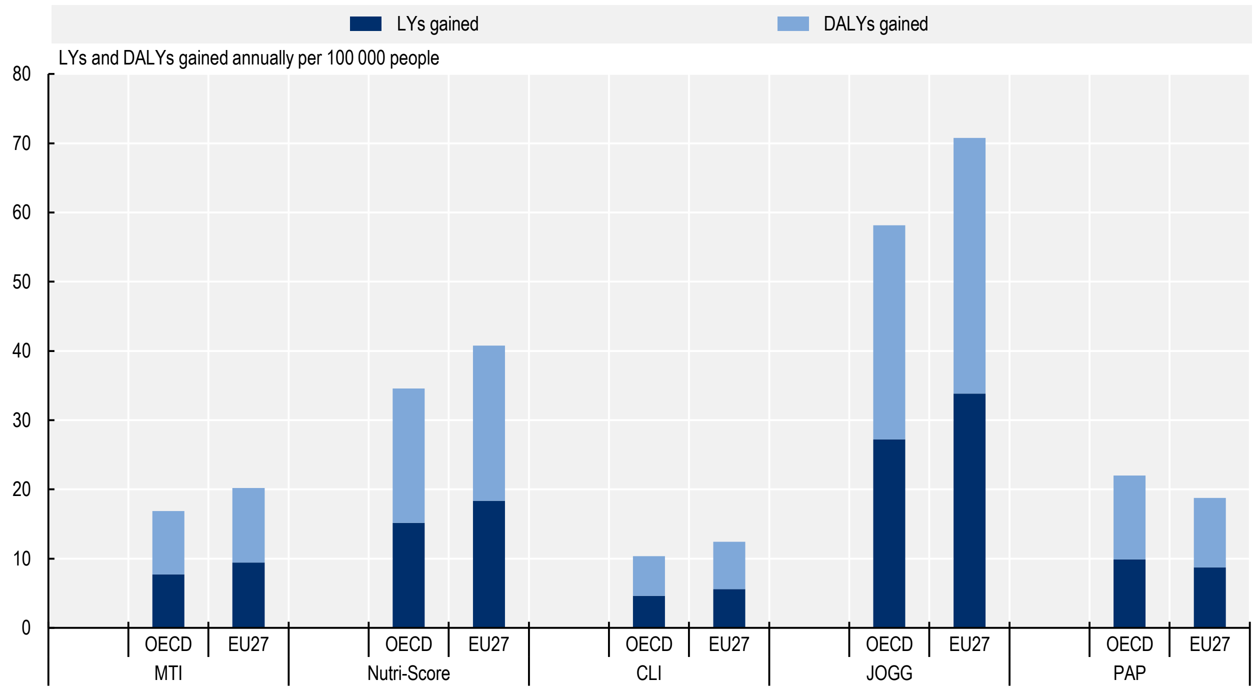
Selected interventions evaluated using OECD's microsimulation model estimate large declines in disease incidence. OECD's Strategic Public Health Planning for non-communicable diseases (SPHeP-NCD) model estimated changes in disease incidence for five of the twelve interventions following an improvement in overweight risk factors: the Multimodal Training Intervention, Nutri-Score, the Combined Lifestyle Intervention, Young People at a Healthy Weight (JOGG) and Physical Activity on Prescription (see Table 1.1 for a high-level overview of interventions). Results from the model estimate that if all interventions were to be scaled-up simultaneously by 2050, 18.4 and 5.9 million cases of disease would be avoided across analysed OECD and EU27 countries, respectively. The majority of these disease cases are either musculoskeletal disorders (MSDs) or cardiovascular diseases (CVDs) (Figure 1.1).[2] To put these figures into perspective, in the EU each year there are approximately CVD 6 million cases (Institute for Health Metrics and Evaluation, 2019[6]). Nutri-Score – a healthy food labelling scheme first established in France – is estimated to have the greatest impact, which is largely due its wide reach (covering everyone aged 1 year and over). Conversely, the Multimodal Training Intervention – a healthy living programme in Iceland – despite having a large health impact at the individual level, would have a relatively low impact across the population as it targets those aged 65+. A reduction in disease incidence has a subsequent positive impact on life years (LYs) and disability adjusted life years (DALYs) gained as summarised in Figure 1.2.

Figure 1.1. Disease cases avoided between 2021-50, OECD and EU27 countries



Note: MTI = Multimodal Training Intervention, CLI = Combined Lifestyle Intervention, JOGG = Young People at a Healthy Weight, PAP = Physical Activity on Prescription.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

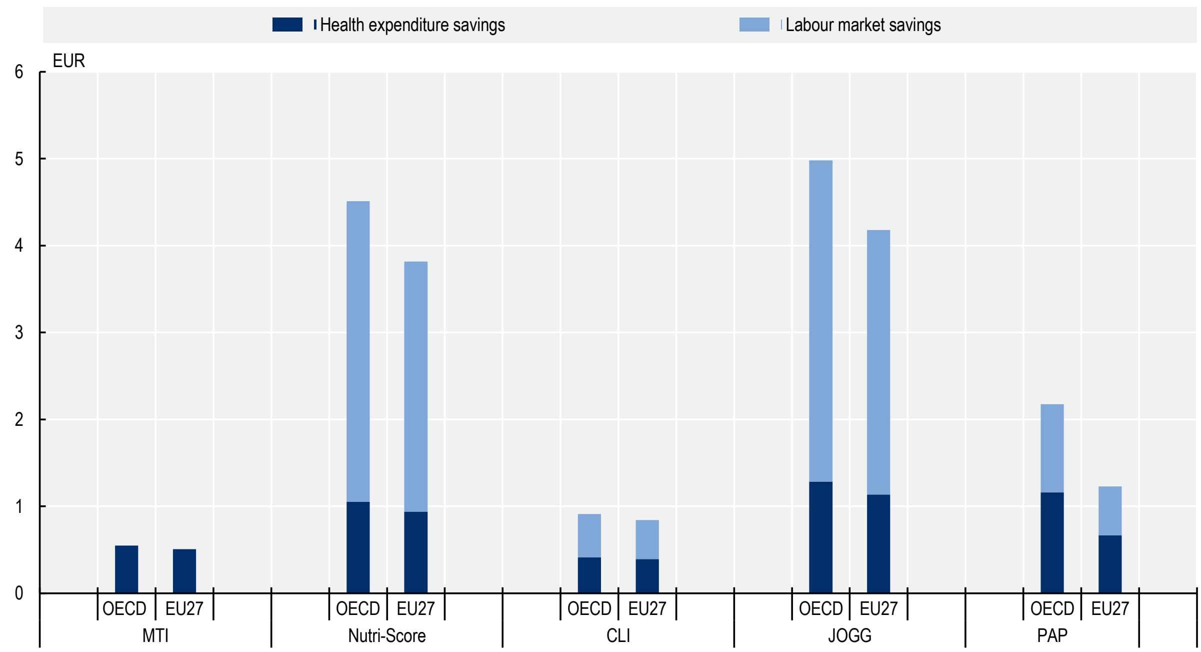
Figure 1.2. LYs and DALYs gained annually per 100 000 people, 2021-50



Note: MTI = Multimodal Training Intervention, CLI = Combined Lifestyle Intervention, JOGG = Young People at a Healthy Weight, PAP = Physical Activity on Prescription.

Interventions result in both health expenditure savings and improvements in workforce productivity. The impact of the same five interventions on efficiency was also measured using OECD's SPHeP-NCD model. Results from the analysis indicate savings ranging from 0.02% (Combined Lifestyle Intervention) to 0.06% (Young People at Healthy Weight) of total health expenditure per year over the period 2021-50. On a per capita basis, this translates into annual savings of EUR 0.41 to EUR 1.28 across OECD countries (see Figure 1.3). Interventions accrue additional savings as a result of improvements to workforce productivity – i.e. a reduction in absenteeism, presenteeism and early retirement as well as a higher employment rate. Gains in workforce productivity are also shown in Figure 1.3, which covers all interventions except the Multimodal Training Intervention given it targets those aged 65 and over and who are presumed to have already left the workforce.

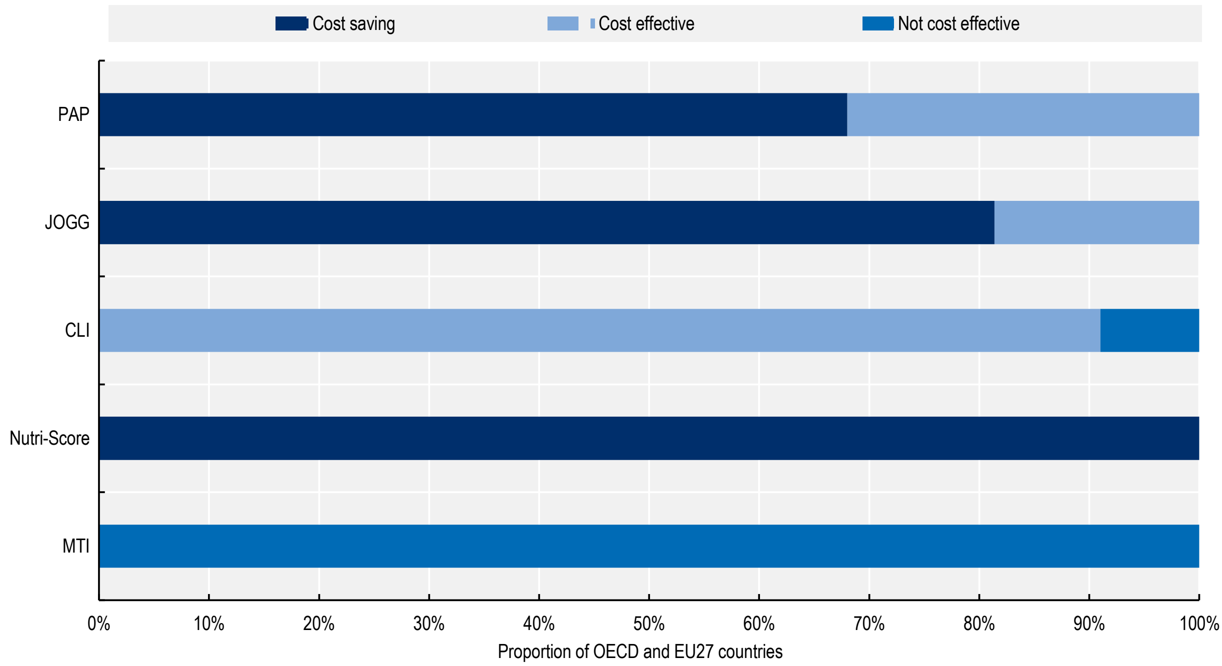
Figure 1.3. Health expenditure savings and workforce gains, EUR per capita, per year, 2021-50



Note: MTI = Multimodal Training Intervention, CLI = Combined Lifestyle Intervention, JOGG = Young People at a Healthy Weight, PAP = Physical Activity on Prescription.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Many interventions are cost-effective, and for several countries, even cost-saving. For each of the selected case studies, the cost per DALY gained (over the period 2021-50) revealed interventions were in many instances not only cost-effective but also cost-saving (see Figure 1.4).[3] Nutri-Score, in particular, is viewed as a good financial investment as it is cost-saving across all OECD and EU27 countries. More intensive interventions such as the Multimodal Training Intervention, which offers participants access to fitness classes under the supervision of a qualified personal trainer, are more expensive and therefore, although highly effective, may not being cost-effective against standard thresholds. It is important to note that the Multimodal Training Intervention and the Combined Lifestyle Intervention (CLI) have a relatively low extent of coverage, indicating there is room to improve economies of scale and therefore possibly reduce the cost per targeted individual. For example, previous analyses by OECD (2019[2]) found physical activity prescription programmes similar to CLI are cost-effective when scaled-up to the whole population. In addition, the Multimodal Training Intervention targets older people, therefore, compared to interventions that target young people or the general population, there is limited time to see an improvement in health outcomes.

Figure 1.4. Efficiency of interventions across OECD and EU27 countries



Note: Cost per DALY gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50. Costs and benefits have been discounted at a rate of 3%. MTI = Multimodal Training Intervention, CLI = Combined Lifestyle Intervention, JOGG = Young People at a Healthy Weight, PAP = Physical Activity on Prescription. For the purpose of this analysis, an intervention is cost-effective if the cost per DALY gained is less than or equal to EUR 50 000 (mid-way point between estimates outlined in Vallejo-Torres et al. (2016[7])).
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Comprehensive policy packages are needed given interventions have a greater than additive impact when combined

Overweight is a complex health issue for which there is no "silver bullet" solution. Changes in modifiable overweight risk factors such as diet, physical activity, sleep and stress are complex and multifaceted. Therefore, it is not surprising that individual interventions, alone, are limited in their ability to markedly reverse trends in overweight and obesity. This aligns with findings among selected interventions, which often recorded small changes to key health outcomes. For instance, the StopDia Pilot – a diabetes prevention programme targeting Finland's Somali population – recorded a statistically significant improvement in vegetable consumption and non-significant changes among remaining indicators (e.g. step count). Similarly, another diabetes prevention programme in Europe (DE-PLAN) led to a statistically significant drop in consumption of sugars and sweets but no significant change in fruit and vegetable consumption or physical activity levels. One notable exception was the Multimodal Training Intervention, a healthy living programme in Iceland for the elderly, which reported statistically significant, favourable changes across all outcome measures (see Box 1.1).

Box 1.1. The impact of Iceland’s Multimodal Training intervention on outcome measures

The Multimodal Training Intervention is designed to improve the overall health of older individuals through exercise classes and nutritional education information sessions. To assess the impact of the intervention, data was collected from the same patients every six months over a period of two years, namely:

- **Adiposity measures**: BMI, waist-to-hip ratio, body fat percentage, muscle mass, body fat mass
- **Physical activity measures**: 30-second chair stand, short physical performance battery score, hand grip, six minute walking test, minutes of exercise per week
- **Quality of life**: measured using the widely used tool – EQ-5D-5L. The tool measures health across five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression. Participants provide self-reported data for each dimension.
- **Other**: resting heart rate and systolic blood pressure.

An analysis of changes in outcome measures using panel data revealed statistically significant improvements in all outcome measures over the two-year period. It is important to note the data did not include a control group. However, these findings are supported by previous evaluations of the Multimodal Training Intervention which used randomised controlled trials (RCTs) (Guðlaugsson, 2014[8]).

Note: See Chapter 6 for further details.

Countries must address the obesity epidemic using a mixture of interventions targeting both the individual and society. Policy packages comprised of several interventions can address the multiple causes of overweight. This report outlines several interventions policy makers can draw upon to create a comprehensive policy package targeting overweight. Selected interventions cover a range of settings (e.g. schools, primary care, and community facilities) and populations (e.g. younger children all the way up to the older population). However, due to the selection process based on submissions by countries (see Annex A), the majority are “downstream” interventions that focus on changing the behaviour of individuals. “Upstream” structural interventions that aim to change the environment in which people live should complement downstream ones (see Box 1.2 for information on how Australia incorporates both down and upstream policies). For example, food reformulation, food procurement, restrictions on unhealthy food purchases, changes in the urban environment, and increases in green spaces and bike/walking paths (these types of interventions will be reviewed in future best practice reports). Structural interventions are important for deconstructing the obesogenic environment by “making the healthy choice the easy choice”. Strategies to tackle overweight should also cover lesser-known risk factors such as sleep and stress.

Box 1.2. Australia's National Preventive Health Strategy – desired policy achievements for healthy diets and physical activity by 2030

In December 2021, the Australian Government released its National Preventive Health Strategy covering years 2021-30. The aim of the strategy is to "improve health and well-being of all Australians at all stages of life, through a systems-based approach to prevention that addresses the wider determinants of health, reduces health inequities and decreases the overall burden of disease".

The strategy includes a number of action areas and aligning policy goals for 2030 including improving access to a healthy diet and increasing physical activity. A review of the listed policy goals highlights Australia's multifaceted and comprehensive approach to tackling key risk factors for overweight. Several policy goals, although not all, are outlined below.

Physical activity

- Mass media campaigns that link to actionable behaviour change in order to create healthier social norms and physical activity
- Prioritise urban design, land use and infrastructure to support physical activity (e.g. public open spaces and active transport networks)
- Increased physical activity and reduced sedentary behaviour is promoted in the workplace
- Incorporate sleep and screen time recommendations for all age groups into national guidelines
- Provide health care professionals with appropriate training to providing advice and support to patients regarding physical activity

Healthy diet

- Healthy eating is promoted through widespread multi-media education campaigns
- Ongoing access to adequate and affordable healthy food options available to all Australians
- Reduced sugar, saturated fat and sodium content of relevant packaged and processed foods through reformulation and a reduction in serving sizes
- Consumer choice is guided by the Health Star Rating system, which is displayed on all multi-ingredient packaged food products
- Further reduce children's exposure to unhealthy food and drink marketing, branding and sponsorships.

Source: Australian Government Department of Health (2021[9]), "National Preventive Health Strategy 2021-30", https://www.health.gov.au/sites/default/files/documents/2021/12/national-preventive-health-strategy-2021-2030.pdf.

Interventions that target children are of particular importance when designing policy packages to tackle overweight. Tackling overweight in children is of critical importance given its link to obesity in adulthood, which is associated with more complex health issues. In addition, overweight is connected with high levels of stigma among children leading to poor mental health and well-being (see Box 1.3 for further details). Despite the well-established link between overweight in childhood and poor physical and mental health, some interventions targeting children may be overlooked given the lack of evidence on their long-term impact. For example, compared to interventions targeting adults, those based in schools may look unfavourable given diseases associated with overweight (e.g. cardiovascular diseases) do not usually appear until middle adulthood, and are therefore not captured within usual evaluation timelines (OECD, 2022[10]). This is supported by previous OECD analyses which showed school-based overweight interventions are effective once a sufficient number of children exposed to the intervention are adults who are susceptible to developing chronic diseases (OECD, 2019[2]). The importance of evaluating prevention interventions targeting children and teenagers is highlighted in Switzerland, where it is a top priority within the Federal Office of Public Health.

Box 1.3. The health and well-being impact of overweight in childhood

Overweight in childhood is associated with various health and well-being issues, as highlighted in this box. Therefore investing now in children will lead to significant benefits in the future.

- **Health**: overweight in childhood is a key determinant of obesity in adulthood, which is associated with a range of NCDs. Children living with overweight may also experience health issues at an early age including breathing difficulties, insulin resistance and hypertension. (See Chapter 2 for further details.)
- **Bullying**: children who live with overweight are at greater risk of being bullied at school. According to the Rudd Centre for Food Policy and Obesity, school-aged children living with overweight or obesity are 63% more likely to be bullied by their peers, friends, and even family (WHO, 2017[11]). Girls are particularly vulnerable to bullying if overweight or obese (OECD, 2019[2]).
- **Educational outcomes**: compared to their peers with a healthy weight, children who live with overweight perform worse at school. An analysis of Health Behaviour in School-aged Children (HBSC) survey data by OECD found healthy-weight children are 13% more likely to report good performance at school than children living with obesity (OECD, 2019[2]). There are various reasons for this relationship such as poor health and mental well-being, which makes children less likely to engage in class.

Policy packages covering individual and structural overweight prevention interventions can have a greater than additive effect on health outcomes and be cost saving. As outlined above, policy packages are necessary for addressing the multiple causes of overweight and for ensuring the whole population is reached. Policy packages are also attractive given their potential to have a more than additive effect on health outcomes. As an example, interventions to boost physical activity, such as through lifestyle programmes, will be more effective among people living in environments that promote exercise, such as those with green spaces and walking paths. Similarly, interventions to improve health literacy regarding nutrition will be more effective if people have better access to healthy food that is affordable.

Interventions had limited impact on reducing health inequalities; therefore, policy makers should focus on interventions that target the needs of disadvantaged groups

Only two of the twelve selected interventions targeted a disadvantaged group in an effort to reduce health inequalities – the StopDia Pilot and SI!. The StopDia Pilot is an adaption of the nationwide Finnish diabetes prevention programme, StopDia. Specifically, StopDia was adapted to suit the needs of Finland's Somali population who are at greater risk of developing diabetes. For example, participants were recruited from their local mosque and group education sessions were run by a health professional with a Somali background. Regarding SI! – a school-based obesity prevention intervention – the process for recruiting schools ensured children with an immigrant background and/or in a low-income area were included.

In addition to the StopDia Pilot, four interventions reported outcomes specific to a disadvantaged group, which found mixed results:

- **StopDia Pilot**: initial evidence from a before-and-after evaluation of the StopDia Pilot indicate the intervention achieved small improvements in lifestyle-related diabetes risk factors such as increased vegetable consumption and physical activity, as well as weight loss (Hussein et al., 2020[12]).
- **Young People at a Healthy Weight (JOGG):** a review of JOGG, a community-based intervention for those aged 0-19, found the intervention had a greater impact on reducing overweight prevalence in low-SES municipalities compared to middle- to high-SES municipalities. Further, the results were only significant for low-SES municipalities (Kobes, Kretschmer and Timmerman, 2021[13]).
- **Nutri-Score**: a study of Nutri-Score, a healthy food labelling scheme, found people with a lower education level were more likely than higher educated people to change purchasing behaviours (Sarda, Ducrot and Serry, 2020[14]). The same study, however, found Nutri-Score was more likely to change the behaviour of middle-income people relative to those on low-incomes.
- **ToyBox**: an evaluation of ToyBox, a kindergarten based overweight prevention intervention, found it had a greater impact on reducing sedentary behaviour among children attending kindergartens in high-SES areas (De Craemer et al., 2014[15]).
- **SI!**: a randomised control trial (RCT) of SI!, another kindergarten based overweight prevention intervention, found larger observed effects among children whose parents had at least a high school education and a relatively high income – specifically, in terms of changes in knowledge, attitude and habits in relation to diet and physical activity (Peñalvo et al., 2015[16]).

Literature reviews of similar interventions were the basis for assessing equity among those that neither targeted nor reported outcomes for disadvantaged population groups. Findings are summarised in Box 1.4.

Box 1.4. The impact of different overweight interventions on reducing health inequalities

Not all intervention evaluations analysed in this report included information on equity. In these instances, evidence from the wider literature pertaining to similar interventions was used. These interventions are grouped into one of three overweight prevention themes – primary care, food labelling and digital.

Primary care

Personalised Approach to Obesity Management in Children, DE-PLAN, Physical Activity on Prescription and the Combined Lifestyle Intervention

Obesity interventions delivered in a primary care setting risk widening existing health inequalities given low-income children and adults are less likely to visit their general practitioner (GP). For example, after adjusting for needs, 70% of people living in the poorest quintile across OECD countries visited their GP in the past year compared to 73% in the richest quintile (OECD, 2019[17]). The difference isn't large, however, these figures represent the OECD average with the gap markedly wider for certain countries. For example, in Greece, which operates the primary-care diabetes prevention intervention, DE-PLAN, 55% of those in the poorest quintile accessed a GP compared to 66% in the richest quintile.

Food labelling

Danish Whole Grain Partnership

Food labelling can both widen and reduce health inequalities. Evidence has shown that products with a healthy food label are often more expensive, which may reflect a higher willingness-to-pay among consumers for "healthier products" and/or greater production costs (Sumanac, Mendelson and Tarasuk, 2013[18]). For example, Romania, a country in the process of transferring the Whole Grain Partnership, found products high in whole grain would be more expensive than refined grain products. However, this is not the case in Denmark, where the intervention was originally implemented. Conversely, easy-to-understand food labels can promote health equity as they are easily understood by all people.

Digital

Let Food Be Your Medicine

Mhealth apps, such as Let Food Be Your Medicine, have the potential to widen existing health inequalities given they are more popular among younger, higher educated populations (Bol, Helberger and Weert, 2018[19]; Azzopardi-Muscat and Sørensen, 2019[20]; Baragwanath, 2021[21]). Conversely, they may promote health equity by making care more accessible, in particular, for those who living in regional/rural areas.

The limited impact of selected interventions on health equity aligns with the broader literature. For example, Brown and colleagues' (2019[22]) systematic review of overweight prevention interventions for children found studies "rarely" reported on outcomes by factors that affect equity (e.g. by socio-economic or migrant status). Further, for studies that did report by different population groups, results were mixed and often found more favourable outcomes among privileged populations.

Policy makers should prioritise and support overweight interventions that promote healthy equity. Specifically, interventions that target disadvantaged population groups or have processes in places to ensure the needs of these groups are addressed, for example by:

- Adapting the intervention to the needs of the disadvantaged, employing a diversified recruitment and communication strategy, as well as stratifying evaluation indicators by different population groups (see Box 1.5 for further details).
- Making funding conditional on proving how the intervention promotes health equity and/or prioritise scaling-up/transfer efforts for interventions with a proven impact on reducing health inequalities.
- Providing additional financial resources given the difficulties in accessing, engaging and retaining disadvantaged population groups in public health interventions. For example, extra funding may be necessary to recruit a sufficiently large number of participants, which is important for rigorous evaluations (Bonevski et al., 2014[23]). Similarly, additional funding may be necessary to ensure participants with a low SES have equal access to interventions, in particular among those that require participants to pay a proportion of fees out-of-pocket (such as the Multimodal Training Interventions and Physical Activity on Prescription).
- Improving levels of health literacy (HL), which refers to an individual's knowledge, motivation and skills to access, understand, evaluate and apply health information (Stormacq, Wosinski and Van den Broucke, 2016[24]). Levels of HL are low in the population (HLS-EU Consortium, 2012[25]; Moreira, 2018[26]), in particular among disadvantaged population groups. For example, a nation-wide study of HL in Denmark found immigrants and individuals with a basic education and below average income had lower levels of HL (Svendsen et al., 2020[27]). Higher levels of HL among disadvantaged groups will ultimately improve population health and reduce inequalities. See Box 1.6 for an overview of policy options to boost HL rates.

Box 1.5. Policies to promote health equity among overweight interventions

This box sets out example policy options to improve the performance of overweight interventions in reducing health inequalities. It is important to note that this list is non-exhaustive.

Adapt the intervention to the needs of disadvantaged population groups

Before designing an intervention, it is important to undertake a situational analysis and needs assessment involving local community members. Findings from this research should subsequently inform the design of the intervention to increase salience, acceptability and uptake among disadvantaged groups. Public Health England's National Health Inequalities Team, for example, have developed a Health Equity Assessment Tool (HEAT) to help public health professionals "systematically address health inequalities" and "identify what action can be taken to reduce health inequalities". See the following citation to see how HEAT was applied to a local weight loss management service (Public Health England, 2020[28]).

The design of the intervention should also be adapted if results from a process and/or outcome evaluation reveal the intervention is not having the desired impact among disadvantaged population groups.

Employ a diversified recruitment and communication strategy

Disadvantaged population groups typically have worse access to health care. This is problematic particularly if eligible participants are identified within a health care setting – e.g. a GP's office.

To increase participation among disadvantaged groups, various strategies can be employed such as:

- Partnering with community organisations that have close ties with disadvantaged population groups to promote the intervention (e.g. social services and charities)
- Involving trusted community members during the recruitment stage
- Expanding recruitment opportunities beyond a primary care setting, for example, to faith-based and other community events.

It is also important to be wary that promotional material delivered by government may reduce uptake among disadvantaged groups who are typically more anxious and suspicious of prevention messaging from public health authorities (Peretti-Watel and Constance, 2009[29]).

Stratify evaluation indicators according to disadvantaged population groups

When studying the impact of overweight prevention interventions, it is important to look at their effect on inequalities. Therefore, pertinent factors for inequalities among the implementation population should be identified and included in the data collection process. Results can subsequently be analysed across different population groups to see whether the intervention increased or decreased inequalities.

Researchers can use the PROGRESS framework, which outlines factors contributing to health inequity, when choosing how to stratify data: **P**lace of residence; **R**ace/ethnicity/culture/language; **O**ccupation; **G**ender; **R**eligion; **E**ducation; **S**ocio-economic status; **S**ocial capital (O'Neill et al., 2014[30]).

Box 1.6. Boosting health literacy to reduce health inequalities

Improving levels of health literacy (HL) will ultimately improve population health. Taking selected interventions in this report as examples, higher levels of HL can enhance their effectiveness by:

- **Engaging parents in school-based interventions:** school-based diet and physical activity interventions, such as ToyBox and SI!, require parental engagement. Parents who are health literate are more likely to engage in school-based interventions as well ensure good behaviours learnt in schools are transferred to the home environment.
- **Increasing access to preventative care services**: people who are health literate are more likely to use preventative care services, such as regular visits to their GP. At-risk patients are often recruited to prevention interventions via their GP. For example, in the Netherlands, patients who are identified as living with overweight, obesity or with certain risk factors by their GP are referred to the Combined Lifestyle Intervention, which offers patients healthy eating and physical activity advice as part of the country's basic health insurance package. Similarly, in Sweden, GPs offer eligible patients prescriptions for physical activity based on their individual circumstance.
- **Improving understanding of health information***:* higher levels of HL helps people better understand and therefore act on health nutrition labels such as Nutri-Score and the Danish Whole Grain Partnership logo (Campos, Doxey and Hammond, 2011[31]).

To address low rates of HL, OECD have outlined a four-pronged policy approach (Moreira, 2018[26]), as outlined below. In addition, countries could consider actions directly targeting individuals, for example, encouraging HL at schools, and providing HL counselling and training in community and workplace settings.

- **Strengthen the health system role**: establish national strategies and frameworks designed to address HL
- **Acknowledge the importance of HL through research**: measure and monitor the progress of HL interventions to better understand what policies work
- **Improve data infrastructure***:* improve international comparisons of HL as well as monitoring HL levels over time
- **Strengthen international collaboration**: share best practice interventions to boost HL across countries.

Levels of uptake and retention are low among selected interventions indicating further strategies to boost participation are needed to ensure their long-term effectiveness

Uptake and retention issues limit the effectiveness of overweight prevention interventions. Changing people's behaviour is complex, particularly in relation to behaviours that affect rates of overweight given they are shaped by cultural, socio-economic and environmental factors (Rogers et al., 2016[32]). Therefore, it is not surprising that weight loss interventions suffer from recruitment and retention issues (Lam, Partridge and Allman-Farinelli, 2015[33]), including interventions in this report. For example, the Combined Lifestyle Intervention in the Netherlands, which offers participants advice on diet and physical activity, has a GP referral rate of 1.03% (it is important to note that this intervention is in its infancy). Further, only half of all people prescribed physical activity as part of Sweden's Physical Activity on Prescription intervention followed-up after six months.

There are various reasons explaining low rates of uptake and retention. These include, but are not limited to: issues with making initial contact, particularly for certain groups such as ethnic minorities, a lack of interest and time among eligible participants, poor intervention design, and limited confidence in the intervention (Lam, Partridge and Allman-Farinelli, 2015[33]). Failing to improve uptake and retention ultimately has a negative impact on an intervention's long-term effectiveness.

To improve uptake and retention in overweight prevention interventions, policy makers should use a multi-pronged evidence-based approach. Several strategies are available to policy makers to increase uptake and retention in overweight prevention interventions, including those outlined in Box 1.7.

Box 1.7. Strategies to improve uptake and retention in overweight prevention interventions

This box includes a non-exhaustive list of strategies to increase uptake and retention in overweight prevention interventions:

- **Provide social support for participants.** Interventions can improve social support by offering "buddies" or peer coaches as well as involving family and friends in activities (Public Health England, 2018[34]).
- **Set goals targeting behaviours.** Higher retention has been show in interventions that encourage participants to set goals targeting behaviours (e.g. amount of physical activity), not just outcomes (e.g. weight loss) (Public Health England, 2018[34]).
- **Supervise and monitor adherence.** A review by Rogers et al. (2016[32]) found weight loss interventions that supervise and monitor attendance have adherence rates 65% higher than those that do not.
- **Design interventions that are convenient and enjoyable**. For people to participate in overweight prevention interventions they must be convenient (e.g. easy-to-access location) and be perceived as fun and interesting (e.g. by offering group activities).
- **Explore the use of financial incentives.** There is evidence indicating financial incentives increase uptake and retention thereby improving the overall effectiveness of overweight prevention interventions – e.g. cash payments, discounts from participating brands (Ananthapavan, Peterson and Sacks, 2017[35]). However, the impact of incentives typically only lasts for the duration of the incentive.
- **Raise awareness of this public health issue**: not only can this help increase uptake in overweight prevention interventions, it can also help reduce social stigma, which may in turn improve retention rates. Raising awareness is currently a top priority for the Swiss Federal office of Public Health.

The following strategies aim to increase uptake and retention in overweight prevention interventions by targeting health care professionals, and were developed as part of the Physical Activity on Prescription intervention in Sweden (Gustavsson et al., 2018[36]).

- **Increase knowledge and affirmative attitude among the health care professionals**. This includes knowledge on how to talk about health behaviours in patient consultations, and knowledge of and belief in overweight prevention interventions. Ireland for example is in the process of implementing training programmes for health professionals as well as developing an overarching Model of Care for the treatment of overweight.
- **Provide clear, supportive management.** Policies and clinical guidelines need to be developed, shared and approved at all levels, central management of health care organisations need to show clear support as well as earmark time and resources for the intervention.

- **Provide supporting structures**. This includes a centralised or local support function, such as a central co-ordinator, tailored written routines at health care centres on when and how to do referrals, and the availability of an up-to-date list of intervention providers in the area.

Any attempt to transfer or scale-up a best practice intervention should be adequately resourced given the complexity of this task

Several countries transferred selected interventions to their local setting. Over half of all selected interventions have been transferred from their original "owner" country to another "target" country (Table 1.2). The majority of transfers took place among European countries. Of these interventions, only two reported changes in outcomes in the target country, which is largely due to the infancy of several transfer projects, many of which were delayed due to COVID-19. One further intervention – StopDia, a diabetes prevention intervention in Finland – was adapted and transferred to the country's Somali population. The remaining four interventions exist only in the owner country.

Table 1.2. Transfer status of selected interventions

	Transferred to another country	Transferred to a different population within the same country	No transfer to date
Nutri-Score	✓		
Physical Activity on Prescription	✓		
Multimodal Training Intervention*	✓		
ToyBox*	✓		
DE-PLAN	✓		
Whole Grain Partnership	✓		
Young People at a Healthy Weight (JOGG)	✓		
StopDia		✓	
Combined Lifestyle Intervention			✓
Personalised Approach to Obesity Management in Children			✓
SI!			✓
Let Food be Your Medicine			✓

*Case study interventions reported the impact on outcomes in countries in which the intervention was transferred.

Transferring interventions is a complex task that requires an in-depth understanding of contextual factors. Public health interventions, such as those targeting overweight risk factors, are complex given they involve several interacting components and multiple stakeholders in areas such as health, education, community and environment. They also target heterogeneous populations and have outcomes influenced by various direct and indirect factors (Craig et al., 2008[37]; Norris et al., 2019[38]). Transferring validated interventions is therefore complex as it requires an in-depth understanding of the owner and target setting. This information is often missing leading to a "significant gap between research, practice and transfer" (Barnfield, Savolainen and Lounamaa, 2020[39]). For example, transferring the kindergarten based healthy living intervention, ToyBox, to Malta was "much harder to implement in practice than it look[ed] on paper" for various reasons including a resistance from teachers to "excessively regulate" the school environment as well as an unwillingness among teachers and parents "to act as role models" (Stegeman et al., 2020[40])

Policy makers are providing increasing support to assist the spread of best practice interventions. Policy makers are eager to transfer interventions supported by a strong evidence base. Given the complexity of transferring an intervention, it is increasingly common for policy makers to implement multi-year projects designed to assist the transfer process. For example, as part of the Joint Action (JA) CHRODIS-PLUS (a European JA on Chronic Diseases), the following interventions were transferred to other European countries over a period of three years (2017-20): the Multimodal Training Intervention, ToyBox and Young People at a Healthy Weight (JOGG). Further details on JA CHRODIS-PLUS and other European JAs and projects related to intervention transfers are in Box 1.8. In general, these JAs and projects promote extensive mapping of contextual factors as well as building close ties between individuals responsible for implementation in the owner and target setting.

Box 1.8. European JAs and projects that support the transfer of best practice interventions

Several European JAs and projects supported the transfer of best practice interventions across EU Member States.

A European Action on Whole Grain Partnerships (WholEUGrain)

The European Action on Whole Grain Partnerships' (WholEUGrain) will run between 2019-22. The project is designed to assist countries transfer and adapt the Danish Whole Grain Partnership to their local setting. Three countries are involved in WholEUGrain – Romania, Slovenia, and Bosnia and Herzegovina (European Commission, 2019[41]).

As part of WholeEUGrain, a "Toolbox" to guide countries through the implementation process was developed. In addition, representatives from the Danish Whole Grain Partnership run a three-day spring or summer school each year. Each event consists of several webinars providing answers to questions such as "what are the pre-requisites for a well-functioning Partnership"?

A European Physical Activity on Prescription Model (EUPAP)

A transfer of the Swedish Physical Activity on Prescription intervention to other European countries has begun under the EU-funded European Physical Activity on Prescription Model project (EUPAP). This three-year project (2019-22), co-ordinated by the Public Health Agency of Sweden, will transfer the Swedish intervention to a further nine countries: Portugal, Romania, Lithuania, Spain, Germany, Denmark, Belgium, Italy and Malta.

EUPAP will provide education and training initiatives according to the needs of different partner countries, targeting both health care professionals responsible for prescribing as well as trainers or educators. In addition, several tools will be developed in English, which countries can translate into their local language.

Another important part of the EUPAP project is the feasibility study (EUPAP, 2020[42]). Each of the target countries was analysed to understand the context in which Physical Activity on Prescription would operate and how this compares to the Swedish situation. At the macro level, the feasibility study looked at the political context, past experiences with Physical Activity on Prescription schemes, relevant regulations and budget. At the micro level, the study assessed the preparedness for implementation among four groups: stakeholders, health care settings, prescribers and end-users/patients.

JA CHRODIS-PLUS (Joint Action for Chronic Diseases) (2017-20)

JA CHRODIS-PLUS (2017-20) was designed to promote the transfer and implementation of interventions covering a range of areas including health promotion and primary prevention, and multimorbidity. As part of this JA, chosen interventions developed an implementation strategy to support the transfer process. In addition, implementers from the target setting were required to participate in site visits to gain an in-depth understanding of the intervention as well as develop ties with administrators from the owner setting (Stegeman et al., 2020[40]).

OECD's transferability analysis revealed several good transfer candidate countries for selected interventions. OECD developed a methodology to cluster countries based on their potential to transfer selected interventions to their own countries. High-level methodological details are in Annex A, with further details available in an upcoming Health Working Paper. The points below, as well as Box 1.9, summarise key findings from an analysis of transferability results for all 12 interventions:

- Several countries have population, sector specific, political and economic arrangements in place that are likely to increase the transferability potential of selected interventions including Austria, Finland, Belgium, Germany, the United Kingdom and Ireland. Details on good transfer candidate countries according to the type of intervention are provided in Table 1.3, which covers school-based, primary care based and nutrition labelling interventions.
- Countries such as Hungary and Greece should consider undertaking further analysis to ensure interventions align with overarching political priorities, which is a key transfer facilitator. For example, these countries do not have a national plan to address unhealthy diets, which is a key overweight risk factor.
- Prior to transferral, several countries should ensure whether selected interventions are affordable in the long term, in particular, for interventions that require participants to pay out-of-pocket (i.e. Iceland's Multimodal Training Intervention and Sweden's Physical Activity on Prescription).

It is important to note that there are limitations with this analysis, most importantly:

- It should not be assumed that selected interventions will fail in countries where it is recommended that the political and/or economic feasibility be ensured. Instead, the results indicate areas these countries should pay particular attention to, but are not necessarily pre-requisites for transferral.
- The analysis relied on publically available data that covered a large number of OECD and EU27 countries. Therefore, the data is high level and does not capture all relevant indicators for assessing transferability. Further, the data covers information at the national level, and therefore does not take into account regional differences.

Table 1.3. Findings from OECD's transferability clustering analysis for selected interventions

Countries with high transfer potential	Countries that should ensure political feasibility of interventions	Countries that should ensure economic affordability of interventions
Belgium	Australia	Bulgaria
Bulgaria	Austria	Chile
Denmark	Costa Rica	Colombia
Finland	Croatia	Costa Rica
France	Cyprus	Croatia
Germany	Greece	Czech Republic
Ireland	Hungary	Estonia
Lithuania	New Zealand	Hungary
Norway	Portugal	Israel
Poland	Sweden	Latvia
United Kingdom		Lithuania
		Mexico
		Poland
		Portugal
		Romania
		Slovak Republic
		Slovenia
		Turkey

Note: As a result of the methodology, not all countries are represented in the table above (e.g. countries which were neither considered to have high transfer potential nor fell into a cluster of countries were further considerations should be taken into account before transferral). Further, countries can appear more than once in the table indicating there is more than one area to consider before transferring interventions.

Box 1.9. Transferability clustering analysis – key findings for specific interventions

Given the breadth of selected interventions, this report also summarises key findings from the transferability assessment according to type of intervention, namely school based, primary care based and nutrition labelling.

School based interventions

- Half of all OECD and non-OECD European countries are considered candidates with high transfer potential for interventions addressing overweight and obesity in schools – such as ToyBox and SI! Good transfer countries covered all parts of Europe, Latin America and the Middle East indicating school-based interventions can operate successfully across the world.

Primary care interventions

- Countries such as Italy, France, Belgium, Germany, the United Kingdom and Ireland show high transfer potential for overweight interventions implemented in a primary care setting – such as the Combined Lifestyle Intervention and Physical Activity on Prescription. Most of the aforementioned countries have a healthy lifestyle curriculum for health professionals, a national physical inactivity strategy, and a population who regularly see their GP.

Nutrition labelling

- Half of all OECD and non-OECD European countries have a high transfer potential for food labelling interventions such as Nutri-Score and the Danish Whole Grain Partnership. These countries already have front-of-pack labelling arrangements (either voluntary or mandatory) indicating regulatory and legal arrangements are in place to support these interventions, as well as a national strategy for addressing unhealthy diets.

Policy makers can help spread best practice interventions targeting overweight by dedicating resources to the transfer and/or scaling-up process. Given the effort needed to transfer an intervention, policy makers should provide dedicated support to this process. In Europe, this is increasingly common with the European Commission funding multi-year projects dedicated to transferring one or multiple public health interventions to several countries (see Box 1.8 for example projects). Projects that support the transfer process should ultimately depend on factors such as the size, significance and complexity of the intervention, as well as the number of countries adopting the intervention. However, for any transfer project, it is important to promote the following transfer "facilitators":

- *Close ties between implementers in the owner and target setting.* A review of health promotion and disease prevention intervention transfers as part of JA CHRODIS-PLUS found building a "strong relationship between the good practice owner and implementer" was a key transfer facilitator (Stegeman et al., 2020[40]). For example, by organising visits to the owner setting to understand the "ins and outs" of the intervention and meeting with stakeholders face-to-face.
- *An understanding of the context in the owner and target setting, and how the two differ*. The owner and target setting will differ, in particular for cross-country transfers – e.g. differences in cultural diversity, regulations, and workforce skills. It is important to understand these differences at the outset and adapt the intervention accordingly. OECD's Transferability Framework (see Annex A) provides guidance on what types of contextual factors to consider when undertaking this assessment. Further information is in OECD's *Guidebook on Best Practices in Public Health* (OECD, 2022[10]), including publically available indicators and databases to assess differences in contexts. It is unlikely publically available data can fully describe the two contexts, which reinforces

the importance of establishing close ties between the owner and target setting to fill in any knowledge gaps.

- *Practical materials and guides that assist transfers across multiple settings*. Such information will help spread the intervention to multiple settings in an efficient manner. For example, as part of WholEUGrain – a project to transfer the Danish Whole Grain Partnership to several European countries – administrators of the Partnership developed a systematic implementation guide (i.e. the "Toolbox"). See Box 1.10 for further details and for other publically available transfer material.
- *Provide evidence supporting the impact of the intervention in a different setting*. Securing buy in from policy makers and stakeholders is necessary when transferring best practice interventions to other countries. One way to secure buy in is to show evidence of the intervention's estimated impact in the target setting. Such an analysis was carried out for a selection of interventions in this report using OECD's SPHeP-NCD model (see Box 1.11). Where such information is not available, it is possible to draw upon evidence from previous transfers to similar countries.

Box 1.10. Resources for transferring and scaling-up best practice interventions targeting overweight

This box provides a list of publically available resources to help policy makers transfer best practice public health interventions.

- **OECD's Guidebook on Best Practices in Public Health**. Step 1b of the Guidebook outlines a process for assessing the transferability of an intervention (OECD, 2022[10]).
- **JA CHRODIS-PLUS: Building on what works – transferring and implementing good practice to strengthen health promotion and disease prevention in Europe**. This document summarises the experience of transferring several best practice interventions, and includes recommendations to help future intervention transfers (Stegeman et al., 2020[40]).
- **WholEUGrain – A European Action on Whole Grain Partnerships**. The WholEUGrain project has created a website dedicated to the transfer of the Whole Grain Partnership across Europe. The website provides a good example of materials and activities developed to assist the transfer process. See: https://www.gzs.si/wholeugrain/.
- **EU Physical Activity on Prescription (EUPAP).** Similarly, EUPAP developed a website including materials and activities to help countries implement Physical Activity on Prescription, which was first developed in Sweden. See: https://www.eupap.org/.

Box 1.11. Estimated impact of scaling-up and transferring interventions using OECD's SPHeP-NCD model

Coverage – as defined as the proportion of eligible participants who participate in the intervention – was low for certain interventions. For example, the Multimodal Training Intervention operates in just 5 of Iceland's 72 municipalities.

A key way to encourage policy makers and stakeholders scale-up an intervention is to provide evidence of the intervention's estimated impact in the target setting. Such an analysis was carried out for the following interventions using OECD's SPHeP-NCD model – Nutri-Score, Combined Lifestyle

Intervention, Prescription on Physical Activity, JOGG (Young People at a Healthy Weight) and the Multimodal Training Intervention (Chapters 3 to 7).

For each of the aforementioned interventions, OECD estimated the health and economic impact of scaling-up the intervention across the entire owner setting (i.e. where the intervention currently operates) and to all other OECD and non-OECD European countries.

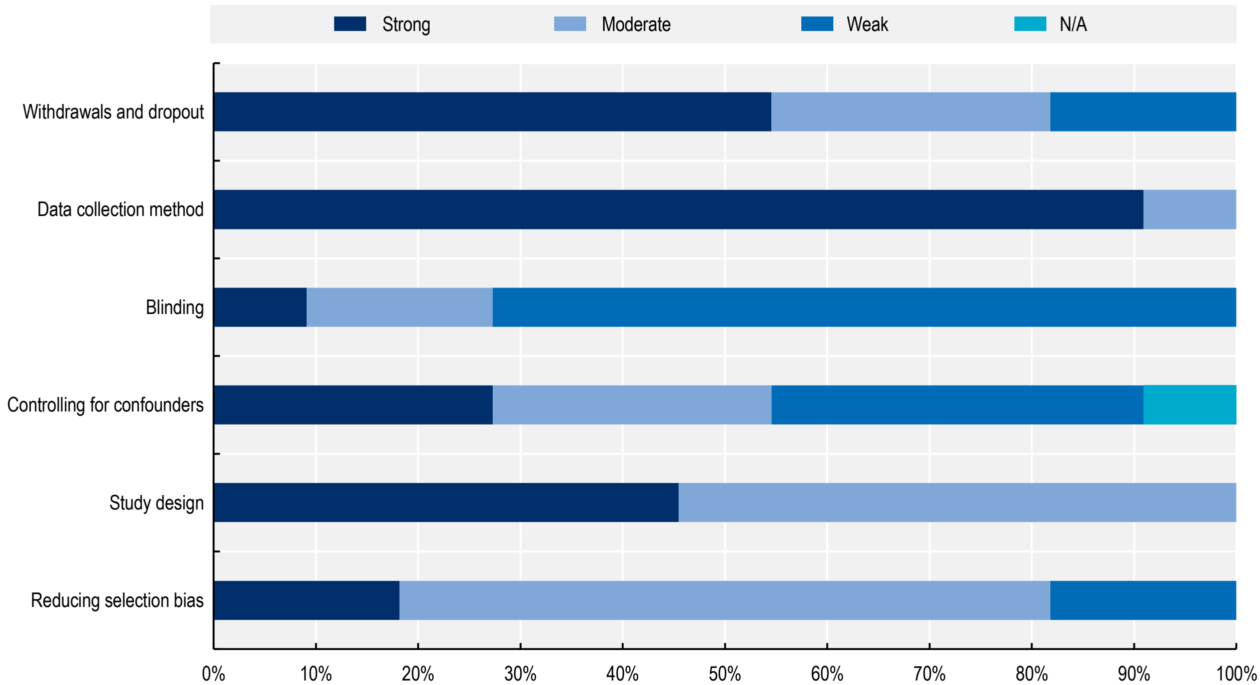
Such analyses can encourage policy makers to invest in cost-effective interventions that address the obesity epidemic.

Incentives that strengthen the evidence-base concerning intervention effectiveness and efficiency are needed to support the transfer and scale-up process

Several selected interventions employed gold standard evaluation designs, which are not commonplace in public health. In various fields, randomised control trials (RCTs) are the gold standard in evaluation given their potential to reduce many sources of bias (Deconinck et al., 2021[43]). RCTs, however, are not always appropriate when evaluating public health interventions such as those targeting overweight risk factors. For example, it may not be ethical or possible to exclude certain groups from accessing an intervention, further, given the high cost associated with RCTs, they are not always affordable. For these reasons, overweight prevention interventions are frequently evaluated using other study designs such as observational studies (Barnish and Turner, 2017[44]). Among selected interventions, 55% relied on findings from prospective or retrospective cohort studies (observational studies), while the remaining 45% employed a RCT.

Other factors used to assess the quality of evidence show selected interventions performed well in several areas. Evaluations that use the same study design aren't necessarily of the same quality. For this reason, the quality of evidence supporting selected interventions was assessed against the *Quality Assessment Tool for Quantitative Studies* (Effective Public Health Practice Project, 1998[45]). This tool evaluates the internal validity of studies using six criteria: selection bias; study design; controlling for confounders; blinding; data collection methods; and withdrawals and dropouts. For each criterion, a study is awarded either a "strong", "moderate" or "weak" score. Results across the 12 interventions are summarised in Figure 1.5, which show positive results in several areas. In particular, the majority of studies used strong data collection methods to measure outcomes and recorded low levels of withdrawal and dropout, thereby reducing bias. Conversely, studies infrequently controlled for all confounding factors or blinded participants and researchers. This is not surprising given overweight is a complex issue influenced by many factors for which there is not always readily available data (e.g. socio-economic status), further, participants must often be made aware of the intervention in order to participate.

Figure 1.5. Selected interventions – quality of evidence summary



Note: Results reflect findings from the selected case study interventions. "N/A" = not applicable.
Source: Effective Public Health Practice Project (1998[45]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Despite the use of relatively strong evaluation methods, there is room to improve the quality of evidence base supporting the effectiveness and efficiency of overweight prevention interventions, as outlined below. Ultimately, a strong evidence base helps policy makers make better decisions on which interventions to support.

Effectiveness evidence base

Incentives to encourage rigorous evaluations will improve the quality of evidence supporting overweight prevention interventions. Types of incentives may include:

- *Requiring applicants to submit an evaluation study when applying for funding*. At a minimum, the evaluation study should include a logic model, proposed evaluation indicators, chosen study design and data collection methods. Developing an evaluation study is an important first step for any new intervention.
- *Setting minimum evidence standards when deciding which interventions to scale-up and transfer*. For example, the Irish Physical Activity Research Collaboration developed a standardised evaluation framework to help funders and policy makers make evidence-based decisions on whether to continue or discontinue publically funded interventions. It is important to note that it is not plausible to rigorously evaluate all public health interventions, further, it is not always ethically feasible to apply gold standard evaluation designs, such as RCTs. For this reason, minimum evidence standards should depend on intervention characteristics such as their overall priority, risk and evidence to date. See Box 1.12 for an example of where this principle is applied.

Box 1.12. Evidence standards framework for digital health technologies – England

It is not possible to apply rigorous "gold standard" evaluation designs to all public health interventions. Therefore, it is necessary to assign evaluation resources based on intervention characteristics such as:

- **Priority:** the overall strategic importance of the intervention in achieving high level objectives as well as the intervention's importance against competing priority areas
- **Funding**: the overall funding the intervention receives
- **Risk**: risk associated with the intervention, such as difficulty in assessing intervention outcomes
- **Impact**: how likely the intervention will affect population health
- **Evidence**: the existing evidence-base for the intervention to date.

The National Institute for Health and Care Excellence (NICE), England, takes such an approach having set out a three-tiered evidence standards framework for digital health technologies (DHTs). DHTs are allocated into tiers based on their potential risk to users – specifically:

- **Tier A – system impact:** refers to DHTs that have no measurable impact on patient outcomes, but which help the health and social care system perform.
- **Tier B – understanding and communicating**: refers to DHTs that provide information to the public, patients and clinicians, general health monitoring, and communication between patients and professionals.
- **Tier C – interventions:** refers to DHTs offering services such as preventative behaviour change, self-management of diseases, treatment guidelines, active monitoring of patients, and diagnosis.

The minimum evidence standard differs across tiers, with standards more rigorous for DHTs that fall under Tier C (e.g. a requirement showing the DHT showed improvements in relevant patient outcomes using experimental or quasi-experimental study designs).

Source: NICE (2021[46]), "Evidence standards framework for digital health technologies", https://www.nice.org.uk/corporate/ecd7/chapter/section-a-evidence-for-effectiveness-standards.

Providing technical and financial support will also help strengthen the evidence base. Evaluating public health interventions, such as those targeting overweight, is a complex task that may require the development of a long-term assessment strategy. Therefore, it is necessary to involve people with experience in programme evaluations as well as ensure sufficient funding to undertake an evaluation. Some examples of how this can be achieved include:

- *Continuing to build workforce skills and competencies* for example by offering short courses to workers involved in the evaluation who do not have prior experience in this area (Pettman et al., 2012[47]), as well as promoting existing material outlining the steps involved in undertaking an evaluation (Box 1.13).

Box 1.13. Publically available resources to support evaluations of public health interventions

This box outlines publically available materials to assist those undertaking intervention evaluations:

- **OECD's Guidebook on Best Practices in Public Health**. Step 3 of the Guidebook outlines a step-by-step process for undertaking rigorous evaluations (OECD, 2022[10]).
- **CDC's Introduction to Program Evaluation for Public Health Programs: A Self-Study Guide** (Centers for Disease Control and Prevention, 2012[48]).
- **Developing a logic model:** Logic Model Workbook from Innovation Network (Innovation Network, n.d.[49]).
- **Stakeholder engagement** and other steps in programme evaluation: CDC's Introduction to Program Evaluation for Public Health Programs: A Self-Study Guide (Centers for Disease Control and Prevention, 2012[48]).
- **Data collection methods** and other steps in programme evaluation: Public Health Ontario's Evaluating Health Promotion Programmes: introductory workbook (Public Health Ontario, 2016[50])
- **Developing an interview protocol**: "Preparing for Interview Research: The Interview Protocol Refinement Framework" by Milagros Castillo-Montoya (2016[51])
- **Collecting and analysing data**: Collecting and analysing evaluation data – Planning and Evaluating Health Information Outreach Projects Booklet 3, by Olney and Barnes (2013[52])
- **Acting on the results** and other elements of community project evaluation: The Community Tool Box from the Center for Community Health and Development at the University of Kansas (Center for Community Health and Development, n.d.[53]).

- *Bridging the gap between academic and public health practice and policies by encouraging collaborative research*. In Quebec, Canada, for example, a 4P Training Programme – Prevention, Promotion and Public Policies – was implemented, which partners doctoral and post-doctoral students with public health organisations to undertake applied public health research (Box 1.14) (Hamelin and Paradis, 2018[54]). Similarly, the United States promotes alliances between academic associations and the Centers for Disease Control and Prevention (CDC) via the "Academic Partnerships to Improve Health" initiative.

Box 1.14. The 4P Programme in Quebec, Canada

In 2003, Quebec, Canada, developed the Transdisciplinary Research Training Programme in Public Health Interventions: Promotion, Prevention and Public Policy – i.e. the 4P Programme.

The primary objective of the 4P Programme is to prepare doctoral and post-doctoral students from universities in Quebec undertake research regarding population and public health interventions within a public health organisation (PHO).

Under the Programme, each student is assigned a public health mentor within a PHO. Depending on whether the student is doctoral or post-doctoral, they will spend between 60-80% of their time over a two-to-three year period at that PHO.

A review of the 4P Programme in 2017 found it successfully "enhanced the research skills" and the "abilities of [students] to navigate the complex interactions between research and public health practice".

Source: Paradis et al. (2017[55]), "The University – Public Health Partnership for Public Health Research Training in Quebec, Canada", https://doi.org/10.2105/AJPH.2016.303529.

- *Encouraging funding agencies to dedicate a specific proportion of funds to monitor and evaluate the intervention* – for example, public health agencies often set aside 15% of total funding for this purpose (Pettman et al., 2012[47]).
- *Providing funding for long-term research projects*. At present, much of the research on overweight interventions focuses on short-term impacts, including those in this report. This is problematic given the benefits of overweight interventions can take years or even decades to be realised, particularly those targeting children. For this reason, policy makers are encouraged to prioritise long-term research projects. The Dutch Public Health Institute, RIVM, for example, are in the process of developing a data registry for participants of the Combined Lifestyle Intervention, which provides participants with advice on diet and physical activity. The registry is designed to assess the long-term impact of this intervention (Box 1.15).

Box 1.15. Monitoring of the Combined Lifestyle Intervention in the Netherlands

The Combined Lifestyle Intervention is a Dutch programme designed to help people living with overweight or other risk factors improve their lifestyle. GPs refer eligible patients to a local Combined Lifestyle Intervention programme where they receive advice on diet, physical activity training, and counselling on behavioural change over a period of two years. The country's basic health insurance coverage covers the cost of the intervention.

To monitor the long-term effectiveness of this intervention, the country's public health institute, RIVM, are in the process of developing a data registry covering past and present participants. The registry will collect long-term outcome measures including BMI, waist circumference and quality of life, as well as demographic and socio-economic data. Data from the registry will be linked to claims data from health insurers, which includes information on costs and health care utilisation.

RIVM is working with a data storage provider and the government to set up the necessary infrastructure and data sharing agreements for the registry.

Note: See Chapter 5 for further details.

Efficiency evidence base

Demonstrating efficiency is increasingly important in public health. Governments today face tight budgetary constraints concurrent with growing demand for services to meet population needs. Consequently, the health sector "competes" with itself and other sectors for funding (World Health Organization and ExpandNet, 2009[56]). Demonstrating efficiency is therefore increasingly important, particularly among prevention interventions given the low proportion of funding dedicated to this area of health – as of 2019, less than 3% of total health care expenditure in the OECD is spent on prevention (OECD, 2021[57]).

Despite the importance of demonstrating efficiency, studies related to overweight prevention interventions are limited. Economic evaluations to assess efficiency among selected interventions were rare. This finding aligns with the broader literature where the cost-effectiveness of overweight prevention interventions are "infrequently studied" (Wang et al., 2015[58]), particularly among children (Brown et al., 2019[22]). The dearth of efficiency studies is not surprising given the difficulty in choosing which costs to include, particularly for interventions targeting society as a whole.

Policies to promote efficiency studies will further enhance the evidence base for overweight prevention interventions. Similar incentives and support mechanisms to promote high-quality effectiveness evaluations can be applied to economic evaluations to demonstrate efficiency. Compared to outcome evaluations, economic evaluations typically require a greater level of expertise, therefore, it is of particular importance to bridge the gap between academia (e.g. health economists) and intervention administrators in order to promote collaborative research. For example, Australia established the ACE Obesity Policy, a priority-setting study led by academics and obesity experts to evaluate the "economic credentials" of several obesity prevention policies (Box 1.16).

Box 1.16. Australia's Assessing Cost-Effectiveness (ACE)-Obesity Policy

The National Health and Medical Research Council (NHMRC) is Australia's leading health and medical research body. Between 2012-18, NHMRC funded the Centre of Research Excellence (CRE) in Obesity Policy and Food Systems, which comprised a multidisciplinary team of researchers with backgrounds in epidemiology, nutrition, health economics, food policy, health services research and advocacy.

As part of the CRE, researchers undertook the ACE-Obesity Policy study to find the "most effective, cost effective, affordable and implementable policy options to prevent obesity across a range of settings". This involved undertaking full economic evaluations of 16 obesity interventions such as food labelling, media campaigns on sugar-sweetened beverages, reformulation and advertising regulations.

Source: Ananthapavan et al. (2018[59]), "Assessing Cost-effectiveness of Obesity Prevention Policies in Australia", https://secureservercdn.net/192.169.221.188/y97.516.myftpupload.com/wp-content/uploads/2018/12/ACE-Obesity-Report_Final.pdf.

References

Ananthapavan, J., A. Peterson and G. Sacks (2017), "Paying people to lose weight: the effectiveness of financial incentives provided by health insurers for the prevention and management of overweight and obesity - a systematic review", *Obesity Reviews*, Vol. 19/5, pp. 605-613, https://doi.org/10.1111/obr.12657. [35]

Ananthapavan, J. et al. (2018), *Assessing Cost-effectiveness of Obesity Prevention Policies in Australia*, Deakin University, Melbourne, Australia, https://secureservercdn.net/192.169.221.188/y97.516.myftpupload.com/wp-content/uploads/2018/12/ACE-Obesity-Report_Final.pdf. [59]

Australian Government Department of Health (2021), *National Preventive Health Strategy*, https://www.health.gov.au/sites/default/files/documents/2021/12/national-preventive-health-strategy-2021-2030.pdf. [9]

Azzopardi-Muscat, N. and K. Sørensen (2019), “Towards an equitable digital public health era: promoting equity through a health literacy perspective”, *European journal of public health*, Vol. 29/3, pp. 13-17, https://doi.org/10.1093/eurpub/ckz166. [20]

Baragwanath, T. (2021), “Digital opportunities for demand-side policies to improve consumer health and the sustainability of food systems”, *OECD Food, Agriculture and Fisheries Papers*, No. 148, OECD Publishing, Paris, https://doi.org/10.1787/bec87135-en. [21]

Barnfield, A., N. Savolainen and A. Lounamaa (2020), “Health Promotion Interventions: Lessons from the Transfer of Good Practices in CHRODIS-PLUS”, *International Journal of Environmental Research and Public Health*, Vol. 17/4, p. 1281, https://doi.org/10.3390/ijerph17041281. [39]

Barnish, M. and S. Turner (2017), “The value of pragmatic and observational studies in health care and public health”, *Pragmatic and Observational Research*, Vol. Volume 8, pp. 49-55, https://doi.org/10.2147/por.s137701. [44]

Bol, N., N. Helberger and J. Weert (2018), “Differences in mobile health app use: A source of new digital inequalities?”, *The Information Society*, Vol. 34/3, pp. 183-193, https://doi.org/10.1080/01972243.2018.1438550. [19]

Bonevski, B. et al. (2014), “Reaching the hard-to-reach: a systematic review of strategies for improving health and medical research with socially disadvantaged groups”, *BMC Medical Research Methodology*, Vol. 14/1, https://doi.org/10.1186/1471-2288-14-42. [23]

Brown, T. et al. (2019), “Interventions for preventing obesity in children”, *Cochrane Database of Systematic Reviews*, https://doi.org/10.1002/14651858.cd001871.pub4. [22]

Campos, S., J. Doxey and D. Hammond (2011), “Nutrition labels on pre-packaged foods: a systematic review”, *Public Health Nutrition*, Vol. 14/8, pp. 1496-1506, https://doi.org/10.1017/s1368980010003290. [31]

Castillo-Montoya, M. (2016), “The Qualitative Report Preparing for Interview Research: The Interview Protocol Refinement Framework”, *The Qualitative Report*, Vol. 21/5, pp. 811-831, https://nsuworks.nova.edu/tqr/vol21/iss5/2 (accessed on 3 April 2020). [51]

Center for Community Health and Development (n.d.), *Community Tool Box: Chapter 39. Using Evaluation to Understand and Improve the Initiative. Section 3. Refining the Program or Intervention Based on Evaluation Research*, https://ctb.ku.edu/en/table-of-contents/evaluate/evaluate-community-interventions/refine-intervention/main (accessed on 28 May 2020). [53]

Centers for Disease Control and Prevention (2012), *Introduction to Program Evaluation for Public Health Programs: A Self-Study Guide*, https://www.cdc.gov/eval/guide/index.htm (accessed on 8 May 2021). [48]

Craig, P. et al. (2008), “Developing and evaluating complex interventions: the new Medical Research Council guidance.”, *BMJ (Clinical research ed.)*, Vol. 337, p. a1655, https://doi.org/10.1136/bmj.a1655. [37]

De Craemer, M. et al. (2014), “The effect of a kindergarten-based, family-involved intervention on objectively measured physical activity in Belgian preschool boys and girls of high and low SES: The ToyBox-study”, *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 11/1, https://doi.org/10.1186/1479-5868-11-38. [15]

Deconinck, K. et al. (2021), "Overcoming evidence gaps on food systems", *OECD Food, Agriculture and Fisheries Papers*, No. 163, OECD Publishing, Paris, https://doi.org/10.1787/44ba7574-en. [43]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [45]

EUPAP (2020), *EUPAP Feasibility Study - Final Report*, https://www.eupap.org/storage/app/media/WP4%20Feasibility%20Study.pdf (accessed on 4 February 2021). [42]

European Commission (2021), *Public Health Best Practice Portal*, https://webgate.ec.europa.eu/dyna/bp-portal/ (accessed on 4 October 2021). [5]

European Commission (2019), *WholEUGrain – A European action on Whole Grain partnerships [WholEUGrain] [874482] - project*, https://webgate.ec.europa.eu/chafea_pdb/health/projects/874482/summary (accessed on 14 December 2020). [41]

Guðlaugsson, J. (2014), *Multimodal Training Intervention: An Approach to Successful Aging*, University of Iceland, https://www.janusheilsuefling.is/wp-content/uploads/2019/06/Doktorsritger%C3%B0-Janusar-Gu%C3%B0laugssonar-12-9-14-III.pdf. [8]

Gustavsson, C. et al. (2018), "What is required to facilitate implementation of Swedish physical activity on prescription? - Interview study with primary healthcare staff and management", *BMC Health Services Research*, Vol. 18/1, https://doi.org/10.1186/s12913-018-3021-1. [36]

Hamelin, A. and G. Paradis (2018), "Population health intervention research training: the value of public health internships and mentorship", *Public Health Reviews*, Vol. 39/1, https://doi.org/10.1186/s40985-018-0084-9. [54]

HLS-EU Consortium (2012), *Comparative Report of health literacy in eight EU member states: The European health literacy survey*. [25]

Hussein, I. et al. (2020), *WP7 - Finland Individual pilot action report*. [12]

Innovation Network (n.d.), *Logic Model Workbook*, http://www.pointk.org/client_docs/File/logic_model_workbook.pdf (accessed on 19 August 2019). [49]

Institute for Health Metrics and Evaluation (2019), *GBD Results Tool | GHDx*, http://ghdx.healthdata.org/gbd-results-tool (accessed on 19 September 2019). [6]

Kobes, A., T. Kretschmer and G. Timmerman (2021), *Prevalence of overweight among Dutch primary school children living in JOGG and non-JOGG areas*, Center for Open Science, https://doi.org/10.31219/osf.io/u7b9q. [13]

Lam, E., S. Partridge and M. Allman-Farinelli (2015), "Strategies for successful recruitment of young adults to healthy lifestyle programmes for the prevention of weight gain: a systematic review", *Obesity Reviews*, Vol. 17/2, pp. 178-200, https://doi.org/10.1111/obr.12350. [33]

Moreira, L. (2018), “Health literacy for people-centred care: Where do OECD countries stand?”, *OECD Health Working Papers*, No. 107, OECD Publishing, Paris, https://doi.org/10.1787/d8494d3a-en. [26]

NICE (2021), *Evidence standards framework for digital health technologies*, https://www.nice.org.uk/corporate/ecd7/chapter/section-a-evidence-for-effectiveness-standards. [46]

Norris, S. et al. (2019), “Complex health interventions in complex systems: improving the process and methods for evidence-informed health decisions”, *BMJ Global Health*, Vol. 4/Suppl 1, p. e000963, https://doi.org/10.1136/bmjgh-2018-000963. [38]

OECD (2022), *Guidebook on Best Practices in Public Health*, OECD Publishing, Paris, https://doi.org/10.1787/4f4913dd-en. [10]

OECD (2021), *OECD Health Statistics: Health expenditure and financing*, OECD Publishing, Paris, https://doi.org/10.1787/health-data-en. [57]

OECD (2019), *Health at a Glance 2019: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/4dd50c09-en. [1]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [17]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [2]

Olney, C. and S. Barnes (2013), *Collecting and analyzing evaluation data - Planning and Evaluating Health Information Outreach Projects Booklet 3*, National Network of Libraries of Medicine. [52]

O’Neill, J. et al. (2014), “Applying an equity lens to interventions: using PROGRESS ensures consideration of socially stratifying factors to illuminate inequities in health”, *Journal of Clinical Epidemiology*, Vol. 67/1, pp. 56-64, https://doi.org/10.1016/j.jclinepi.2013.08.005. [30]

Paradis, G. et al. (2017), “The University–Public Health Partnership for Public Health Research Training in Quebec, Canada”, *American Journal of Public Health*, Vol. 107/1, pp. 100-104, https://doi.org/10.2105/ajph.2016.303529. [55]

Peñalvo, J. et al. (2015), “The SI! Program for Cardiovascular Health Promotion in Early Childhood”, *Journal of the American College of Cardiology*, Vol. 66/14, pp. 1525-1534, https://doi.org/10.1016/j.jacc.2015.08.014. [16]

Peretti-Watel, P. and J. Constance (2009), “Comment les fumeurs pauvres justifient-ils leur pratique et jugent-ils la prévention ?”, *Déviance et Société*, Vol. 33/2, p. 205, https://doi.org/10.3917/ds.332.0205. [29]

Pettman, T. et al. (2012), “Strengthening evaluation to capture the breadth of public health practice: ideal vs. real”, *Journal of Public Health*, Vol. 34/1, pp. 151-155, https://doi.org/10.1093/pubmed/fds014. [47]

Public Health England (2020), *Health Equity Assessment Tool (HEAT): practice example*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/920031/Weight_Loss_Management_Services_HEAT_case_study.pdf. [28]

Public Health England (2018), *Uptake and retention in group-based weight-management services: Literature review and behavioural analysis*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725927/Uptake_and_retention_in_group_based_weight_management_services.pdf. [34]

Public Health Ontario (2016), *Evaluating health promotion programs: introductory workbook*, https://www.publichealthontario.ca/-/media/documents/E/2016/evaluating-hp-programs-workbook.pdf?la=en. [50]

Rogers, M. et al. (2016), "Weight-loss intervention adherence and factors promoting adherence: a meta-analysis", *Patient Preference and Adherence*, Vol. Volume 10, pp. 1547-1559, https://doi.org/10.2147/ppa.s103649. [32]

Sarda, B., P. Ducrot and A. Serry (2020), *Nutri-Score : Évolution de sa notoriété, sa perception et son impact sur les comportements d'achat déclarés entre 2018 et 2020*, Santé Publique France, Saint-Maurice, https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/documents/enquetes-etudes/nutri-score-evolution-de-sa-notoriete-sa-perception-et-son-impact-sur-les-comportements-d-achat-declares-entre-2018-et-2020 (accessed on 9 March 2021). [14]

Stegeman, I. et al. (2020), *D5.3 Recommendations for the implementation of health promotion good practices: Building on what works: transferring and implementing good practice to strengthen health promotion and disease prevention in Europe*, EuroHealthNet & Finnish Institute for Health and Welfare. [40]

Stormacq, C., J. Wosinski and S. Van den Broucke (2016), "The effectiveness of health literacy interventions on health-related outcomes among socioeconomically disadvantaged adults living in the community: a systematic review protocol", *JBI Database of Systematic Reviews and Implementation Reports*, Vol. 14/2, pp. 49-63, https://doi.org/10.11124/jbisrir-2016-2501. [24]

Sumanac, D., R. Mendelson and V. Tarasuk (2013), "Marketing whole grain breads in Canada via food labels", *Appetite*, Vol. 62, pp. 1-6, https://doi.org/10.1016/j.appet.2012.11.010. [18]

Svendsen, M. et al. (2020), "Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults", *BMC Public Health*, Vol. 20/1, https://doi.org/10.1186/s12889-020-08498-8. [27]

Vallejo-Torres, L. et al. (2016), "On the Estimation of the Cost-Effectiveness Threshold: Why, What, How?", *Value in Health*, Vol. 19/5, pp. 558-566, https://doi.org/10.1016/j.jval.2016.02.020. [7]

Wang, Y. et al. (2015), "What childhood obesity prevention programmes work? A systematic review and meta-analysis", *Obesity Reviews*, Vol. 16/7, pp. 547-565, https://doi.org/10.1111/obr.12277. [58]

WHO (2019), *Body mass index - BMI*, https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi. [60]

WHO (2019), "Existence of operational policy/strategy/action plan to reduce physical inactivity". [3]

WHO (2019), *Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)*, https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en. [4]

WHO (2017), *Weight bias and obesity stigma: considerations for the WHO European Region*, https://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/publications/2017/weight-bias-and-obesity-stigma-considerations-for-the-who-european-region-2017 (accessed on 9 August 2021). [11]

WHO Press (ed.) (2009), *Practical guidance for scaling up health service innovations*, https://expandnet.net/PDFs/WHO_ExpandNet_Practical_Guide_published.pdf. [56]

Notes

[1] For adults, WHO define overweight and obesity as having a BMI >=25Kg/m^2 and 30Kg/m^2, respectively. BMI is the most widely used proxy for body adiposity to assess population-level rates of overweight, as it is easily derived from a person's weight and height (i.e. weight (kg) divided by height in metres squared) (WHO, 2019[60]).

[2] These figures assume interventions have a purely additive effect, which has not been verified.

[3] An intervention is cost-effective if the cost per DALY gained falls below international thresholds used to define a country's willingness to pay for one year of life in good health (this threshold typically ranges between EUR 22 000-80 000 (Vallejo-Torres et al., 2016[7]). An intervention is cost saving if the cost per DALY gained is negative.

2 Overweight and its threat to public health

This chapter describes changes in lifestyle behaviours and their impact on key risk factors associated with weight gain – i.e. unhealthy diets and physical inactivity. Trends in overweight and obesity and their subsequent impact on health and economic outcomes are also discussed. The chapter concludes with a summary of policies taken at both the national and international level to address this major public health issue.

Key messages

Changing environmental factors that dictate lifestyle behaviours have fuelled overweight, which disproportionality affects poorer populations

- Factors such as advances in technology, globalisation, urbanisation and the expansion of food retail have changed the way people eat. Consequently, diets are increasingly comprised of foods associated with weight gain (e.g. added fats and sugar) at the expense of foods with healthy dietary elements (e.g. fruits and vegetables).
- People today also have fewer reasons to be physically active (PA) with approximately one in three adults in OECD and the EU27 insufficiently active. In addition, levels of sedentary behaviour are high due to a variety of reasons such as the proliferation of labour-saving technologies: in the EU, nearly four in ten adults complete their work sitting down.
- It is widely recognised that an imbalance between energy intake from food and energy expenditure from PA drives individual weight loss/gain. Therefore, it is not surprising that today more than half of all adults in the OECD live with overweight, with rates higher among those with a low socio-economic status.

Overweight has a heavy toll on both health and economic outcomes

- Those living with overweight are at greater risk of developing certain NCDs in adulthood such as type 2 diabetes, however, health effects also occur at an early age such as difficulties breathing. Overweight also depresses workforce productivity due to increases in absenteeism and presenteeism. Modelling work by OECD estimates that member countries spend 8.4% of their health budget to provide treatment for overweight-related diseases.

Overweight is associated with worse health outcomes from COVID-19, despite this, overweight risk factors increased during the pandemic

- Policies to restrict movement during the COVID-19 pandemic worsened overweight risk factors, in particular, levels of PA declined while sedentary behaviour increased. As a result, the proportion of people reporting weight gain during the pandemic was greater than those who reported weight loss.

OECD countries have responded to the obesity epidemic with a mixture of policy interventions

- All OECD and EU27 countries have in place multiple national strategies to address key overweight risk factors including national dietary and physical activity guidelines. Strategies at the national level draw upon and complement action plans developed by the international community, such as WHO's *Global Action Plan on Physical Activity*, which aims to reduce the global prevalence of physical inactivity by 15% by 2030.

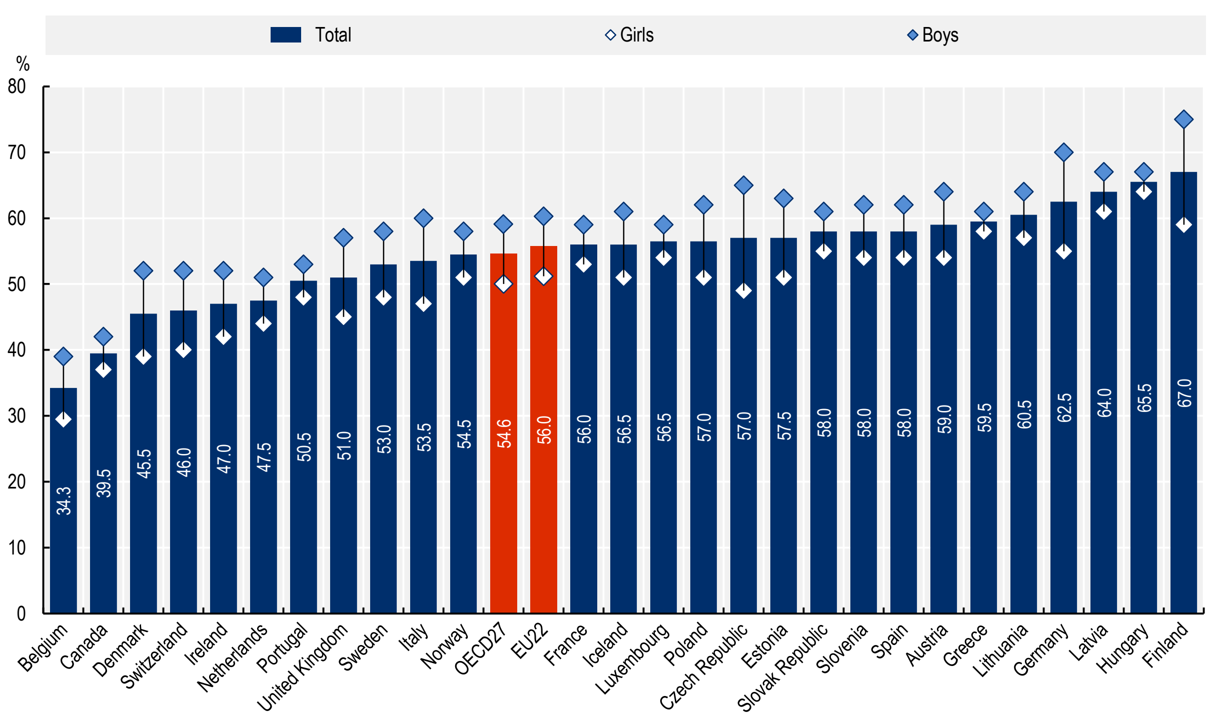
Changing environmental factors that dictate lifestyle behaviours have fuelled overweight, which disproportionality affects poorer populations

While multiple factors contribute to a person's weight, it is widely recognised that changes in body-mass index (BMI) are due to an imbalance between energy intake from diet and energy output through physical activity. For reasons discussed below, environments in which people live are increasingly considered "obesogenic" given they encourage people to eat more and move less (Swinburn, Egger and Raza, 1999[1]).

A multitude of factors has altered what and how much people eat. Advances in technology, globalisation, the expansion of food retail, rising incomes and urbanisation have changed the quantity and quality of calories consumed (Etilé and Oberlander, 2019[2]; Baker et al., 2020[3]). For example, today, mass-produced, ultra-processed foods (UPFs) are both cheap and readily accessible in countries across the world. As a result, among high-income countries, UPFs now make up “30-60% of total dietary energy consumed”. Further, these aforementioned factors have contributed to the rise of “food swamps” characterised by areas with a high number of fast food outlets (OECD, 2021[4]).

Among OECD countries, the quantity of calories has increased, while the nutritional quality has worsened. Between 1961 and 2013, total food supply grew by 10% among OECD countries – or from 3 000 to 3 300 calories per capita, per day. EU27 countries recorded similar levels of growth (OECD, 2019[5]). Examining changes in calories alone is insufficient, given the quality of calories plays a key role in weight gain/loss. Today, consumption of nutrients associated with weight gain such as added fats and sugars, as well as saturated fat intake, primarily from animal sources, play a larger role in diets among OECD countries (WHO and FAO, 2003[6]). This comes at the expense of foods with healthy dietary elements such as fruit and vegetables and whole grain products, whose consumption is associated with weight loss. For example, over half of all adolescents do not consume fruit or vegetables each day (Figure 2.1), with similar figures recorded for adults. Further, UPFs, which are linked to higher calorie intake and worse health outcomes (Hall et al., 2019[7]) comprise over 50% of total energy intake in countries such as the United States and the United Kingdom (Marino et al., 2021[8]).

Figure 2.1. Share of 15-year-olds not consuming any fruit or vegetable each day, 2017-18



Source: Inchley et al. (2020[9]), “Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings”, https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf.

Physical activity is another key determinant of overweight.[1] There are four areas where people are physically active throughout the day – at work or school, at home, during leisure time and when travelling (see Table 2.1). When combined, these four types of physical activity become the second largest contributor to total energy expenditure behind resting metabolic heart rate, (the rate at which your body burns energy when at complete rest) and before the thermic effect of feeding (energy used to digest and process food) (FAO, 2003[10]). Of the three contributors to energy expenditure, physical activity is the most modifiable and therefore a key policy area for promoting weight loss.

Table 2.1. Physical activity domains

Physical activity domain	Example activities
Leisure time	Hobbies, sports and exercise
Household	Household chores such as gardening, shopping, child care, and incidental physical activity
Occupation and schools	Work-related physical activity (e.g. walking across a shop floor)
Transportation	Walking or cycling to work or public transport

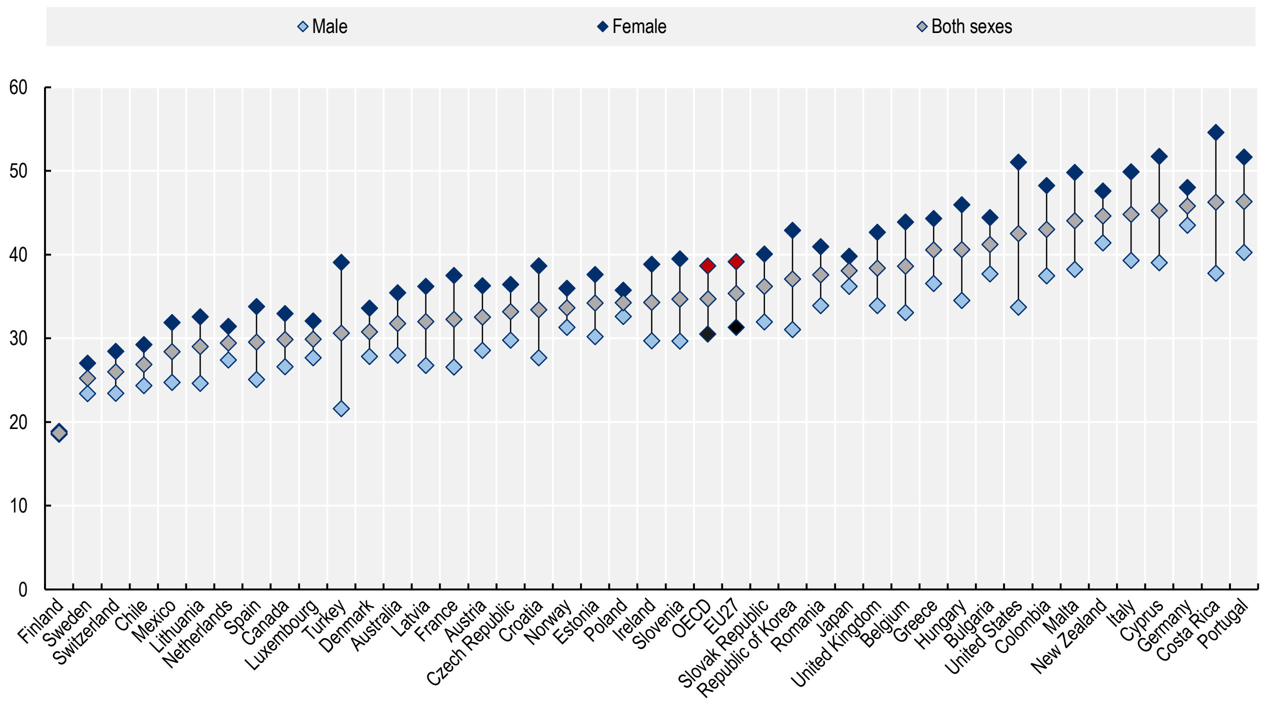
Source: Sallis et al. (2012[11]), "Role of Built Environments in Physical Activity, Obesity, and Cardiovascular Disease", https://doi.org/10.1161/CIRCULATIONAHA.110.969022.

The benefits of physical activity extend beyond weight loss and management. Key benefits include an improvement in mental health, strengthening of bones, muscles and joints, as well as lowering the risk of illness (e.g. cardiovascular diseases, some commonly occurring cancers, Alzheimer's disease, dementia, high blood pressure, and type 2 diabetes).

People today have fewer reasons to be physically active. Approximately a third of all adults in the OECD and EU are insufficiently active with figures ranging from just under 20% in Finland to up to 46% in Portugal. For all countries, levels of insufficient physical activity are higher for women than men (Figure 2.2). Low levels of physical activity reflect factors such as advances in technologies and changes to the built environment, which have given people fewer reasons to be physically active. For example, between 1990 and 2019, the number of passenger cars per 1 000 people – also known as the motorisation rate – grew by 88% among EU27 countries (Eurostat, 2019[12]). Further, as of 2019, cars are the predominant form of urban transport in the EU, which may in part reflect higher levels of car ownership (Eurostat, 2021[13]). Conversely, there is scientific consensus that people who live in "walkable" environments are more likely to have higher levels of physical activity (Mackett and Brown, 2011[14]). (Further details on physical activity trends and patterns are available in an upcoming joint OECD and WHO publication (forthcoming[15])).

Figure 2.2. Prevalence of insufficient physical activity

Prevalence of insufficient physical activity among adults aged 18+ years, crude estimate (%), 2016



Source: WHO (2021[16]), "Prevalence of insufficient physical activity among adults aged 18+ years (crude estimate) (%)", https://apps.who.int/gho/data/view.main.2463.

Levels of sedentary behaviour are also high. Similar to physical activity, sedentary behaviour is another key determinant of total energy expenditure and is therefore important to examine when discussing trends in overweight and obesity. Sedentary behaviour is defined as any behaviour when awake, which involves low energy expenditure (i.e. 1.5 metabolic equivalent of task (MET)[2] or lower) such as sitting, reclining or in a lying posture (van der Ploeg and Hillsdon, 2017[17]). Levels of sedentary behaviour are high among OECD countries for a variety of reasons including the proliferation of labour-saving technologies, such as laptops (see Box 2.1). For example, nearly four in ten adults across the EU complete their work while sitting down, with figures as high as 54% in the Netherlands (Eurostat, 2017[18]). Further, in the United States, the average civilian worker sits for 43% of the workday (U.S. Bureau of Labor Statistics, 2020[19]). During the COVID-19 pandemic, there is consensus among published papers that levels of sedentary behaviour worsened, for example due to an increase in daily screen time (OECD and WHO, forthcoming[15]).

Box 2.1. Sedentary behaviour is prevalent among OECD countries

A number of surveys have investigated levels of sedentary behaviour recorded across several OECD member countries:

- **Australia:** the most recent data on levels of sedentary behaviour in Australia comes from the National Nutrition and Physical Activity Survey undertaken in 2011-12. Results from this survey found just one in four children aged 2-5 met sedentary screen-based behaviour guidelines, with this figure decreasing to one in five among those aged 13-17 years (AIHW, 2018[20]).
- **EU**: a Eurobarometer Survey undertaken in 2017 revealed 12% of the EU population spend over eight and a half hours a day sitting, ranging from 7% in Spain to 32% in the Netherlands (European Commission, 2017[21]).
- **Japan**: a cross-sectional study covering nearly 2 000 Japanese adults aged 40 years and over found half of participant's waking time was spent being sedentary, of which nearly a third was accumulated over long periods of time (i.e. >=30 minutes) (Chen et al., 2018[22]).
- **United States**: a cross-sectional study in the United States covering 50 000 children aged five years and over found 62% of children spent at least two hours a day sitting watching television or videos with this figure increasing to 65% among adults (Yang et al., 2019[23]).

There is growing recognition that changes to the food and physical environment are not solely responsible for rising rates of overweight. Other modifiable risk factors that contribute to a person's weight gain/loss include stress levels, sleep and the gut microbiota:

- *Sleep*: sleep deprivation can affect a person's energy intake/output through several channels including increasing hunger, allowing people more time to eat and decreasing levels of physical activity due to fatigue. Several studies are now available measuring the link between sleep and weight in both children and adults. Among young people, a meta-analysis suggest there is an association between poor sleep quality and overweight and obesity (e.g. young adults who experience inadequate sleep are 27% more likely to live with overweight) (Fatima, Doi and Mamun, 2016[24]). Similarly for adults, a recent systematic review and meta-analysis concluded there is a significant association between short sleep duration and risk of future obesity (Bacaro et al., 2020[25]).
- *Stress*: stress due to work, personal or financial strain can negatively impact a person's energy intake/output leading to weight gain, for example, due to "euroendocrine and inflammatory pathways that directly increase abdominal adiposity" as well as a preference for high energy foods (Harding et al., 2013[26]). A longitudinal study of over 5 000 Australian adults found those with perceived high levels of stress experienced a 0.20kg/m^2 greater gain in BMI compared to those with low stress levels (Harding et al., 2013[26]).
- *Gut microbiota*: microbiota plays a key function within the human body, for example, by regulating the immune system, food digestion and production of key vitamins. A diverse gut microbiota consisting of different types of microorganisms (e.g. bacteria and fungi) is considered healthy and is largely influenced by a person's diet. For example, there is emerging evidence indicating an association between a gut microbiota with reduced diversity[3] and obesity (Kim et al., 2020[27]). People can create more diverse gut microbiota by consuming a diet rich in a variety of fruits, vegetables, legumes, nuts, seeds and whole grains. Further, there is evidence to show that a plant-based diet is also good for the environment (see Box 2.2).

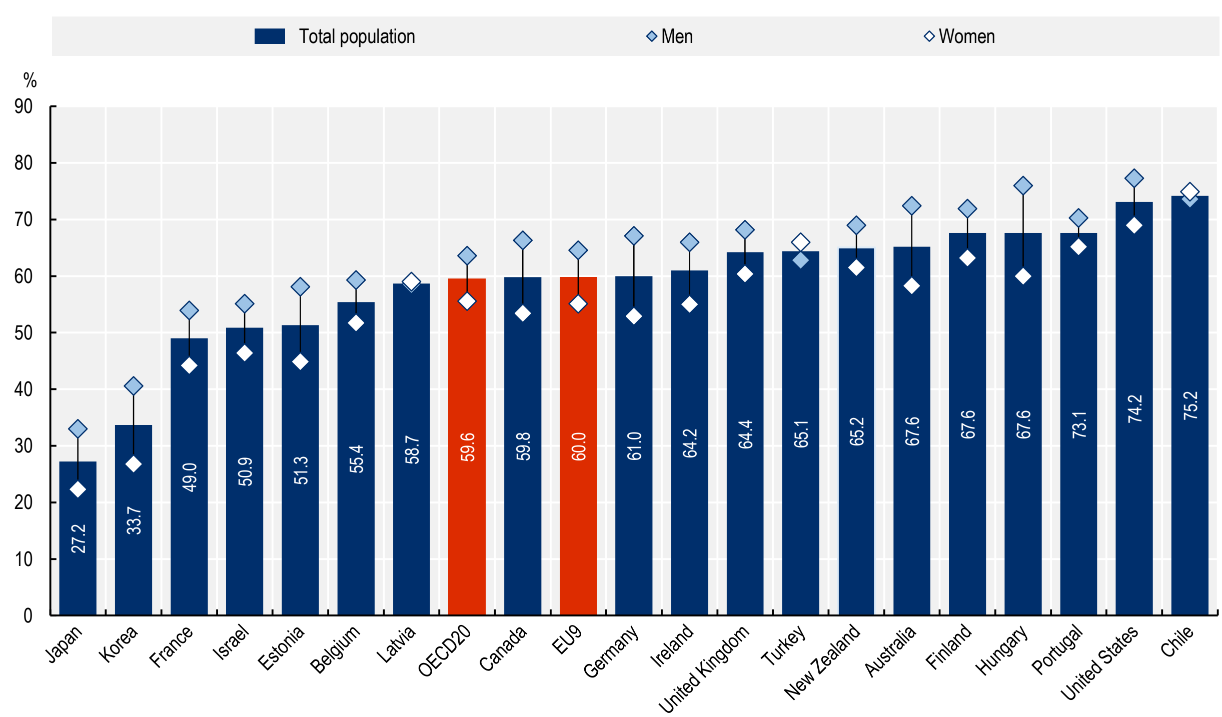
Box 2.2. Diets and climate change

Changes in human activities including the burning of fossil fuels, deforestation and farming of livestock have drastically increased the level of greenhouse gas emissions emitted into the atmosphere. Consequently, the global temperature has risen rapidly and without action will continue to increase leading to more extreme weather events and rising sea levels.

One way to reduce levels of greenhouse gas emissions is to change what people eat. Specifically, away from meats and towards a more plant-based diet (The EAT-Lancet Commission, 2022[28]). This is because meat, in particular red meats, has a markedly higher carbon footprint when compared to plant-based foods due to land use, methane emissions and crop production to feed animals. For example, beef emits 60kg CO_2-equivalents per kilogram compared to 6kg for poultry meat and 1.4kg for wheat and rye (Poore and Nemecek, 2018[29]).

Rates of overweight and obesity for both adults and adolescents have been rising and are higher for men. Between 1996 and 2016, the proportion of men and women in the OECD living with obesity increased by 10 and 7 percentage points, respectively (WHO, 2016[30]). Consequently, as of 2016, nearly one in four adults in the OECD live with obesity. Over the same period (1996-2016), the proportion of children aged between five and nine considered overweight increased from 21% to 31% (OECD, 2019[31]). More recent estimates (2019) from a smaller number of countries that report measured data suggest rates of overweight, which includes obesity, are even higher at around 64% and 56% of men and women in the OECD, respectively (see Figure 2.3).

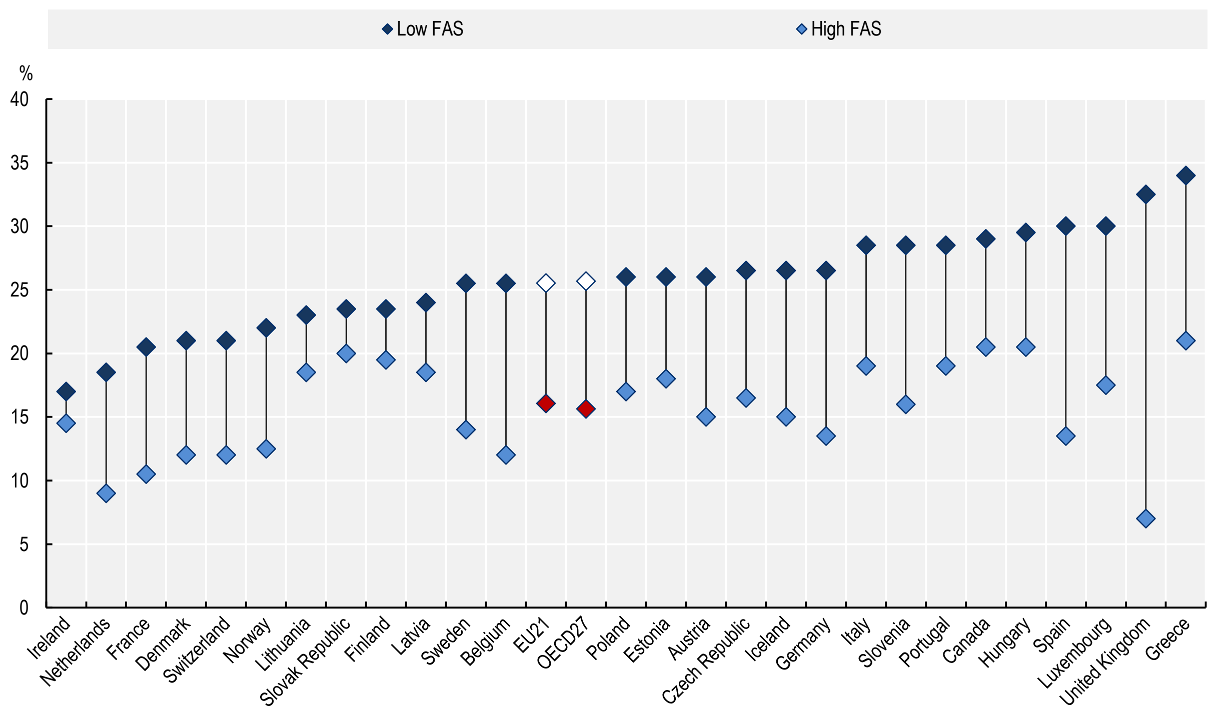
Figure 2.3. Measured overweight (including obesity) rates among adults, 2019 (or nearest year)



Note: The OECD average is unweighted.
Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en.

Overweight is more prevalent among lower socio-economic groups. As previously discussed, people increasingly live in obesogenic environments. Individuals with a higher socio-economic status (SES) are better equipped to live in such an environment – for example, higher educated individuals may have a better understanding of what constitutes a healthy lifestyle and the resources to pursue this way of life (Devaux et al., 2011[32]; Placzek, 2021[33]). Data from the Health Behaviour in School-aged Children (HBSC) survey 2017/18 reflect this theory with 26% of 15-year-olds with a low family affluence status (FAS) report being overweight compared to 16% among those with a high FAS (Figure 2.4) (Inchley et al., 2020[9]).

Figure 2.4. Self-reported overweight (including obese) in 15-year-olds, by family affluence, 2017-18

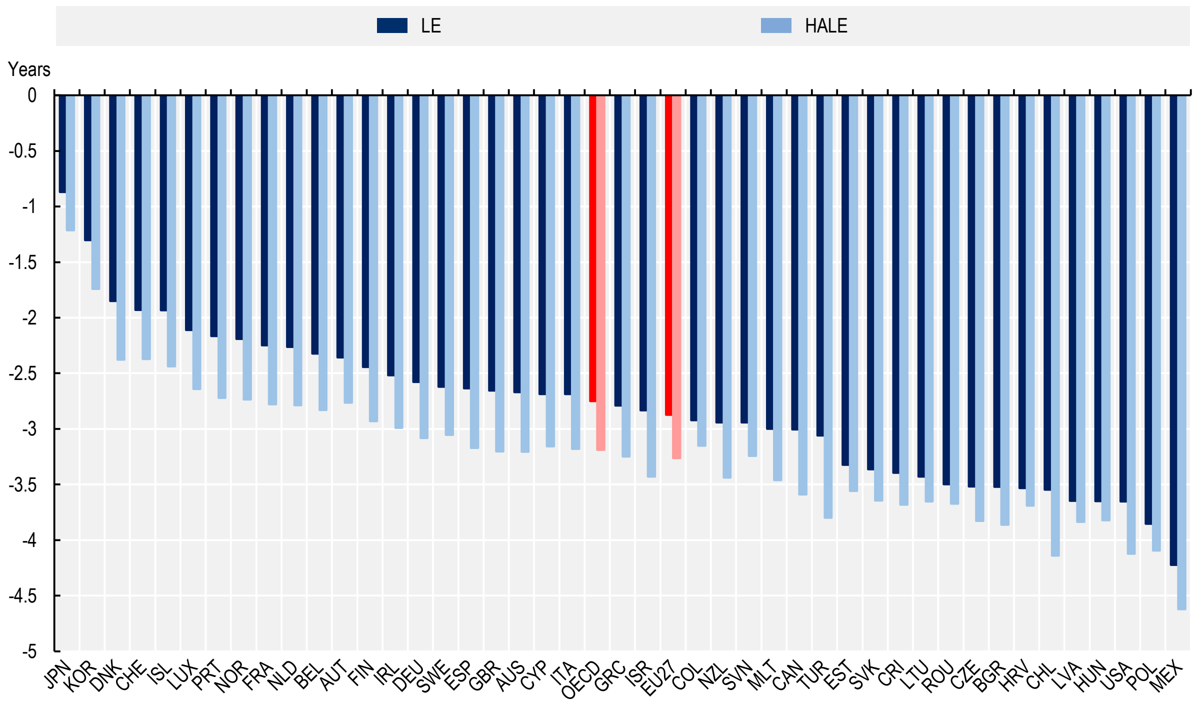


Note: FAS = Family affluence status.
Source: Inchley et al. (2020[9]), "Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings", https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf.

Overweight has a heavy toll on both health and economic outcomes

Overweight in adults worsens health outcomes and shortens life expectancy. Adults who live with overweight are at greater risk of developing non-communicable diseases (NCDs) including type 2 diabetes, several cancers, stroke, and asthma (Nyberg et al., 2018[34]). Modelling work undertaken by OECD across 52 countries[4] estimates that between years 2020 and 2050, overweight and obesity will cause an additional 462 million cases of cardiovascular disease (CVD) and 212 million new cases of diabetes. Respectively, these figures represent 18% and 58% of all new cases (OECD, 2019[5]). In turn, higher incidence of NCDs causes premature mortality and therefore a decline in overall life expectancy (LE): over the same period (2020-50), overweight and obesity is estimated to reduce average LE in the OECD by 2.7 years, with this figure increasing to 3.2 years when considering healthy life years (HALE) (OECD, 2019[5]) (Figure 2.5).

Figure 2.5. The impact of overweight and obesity on life expectancy and healthy life expectancy in years, average for 2020-50



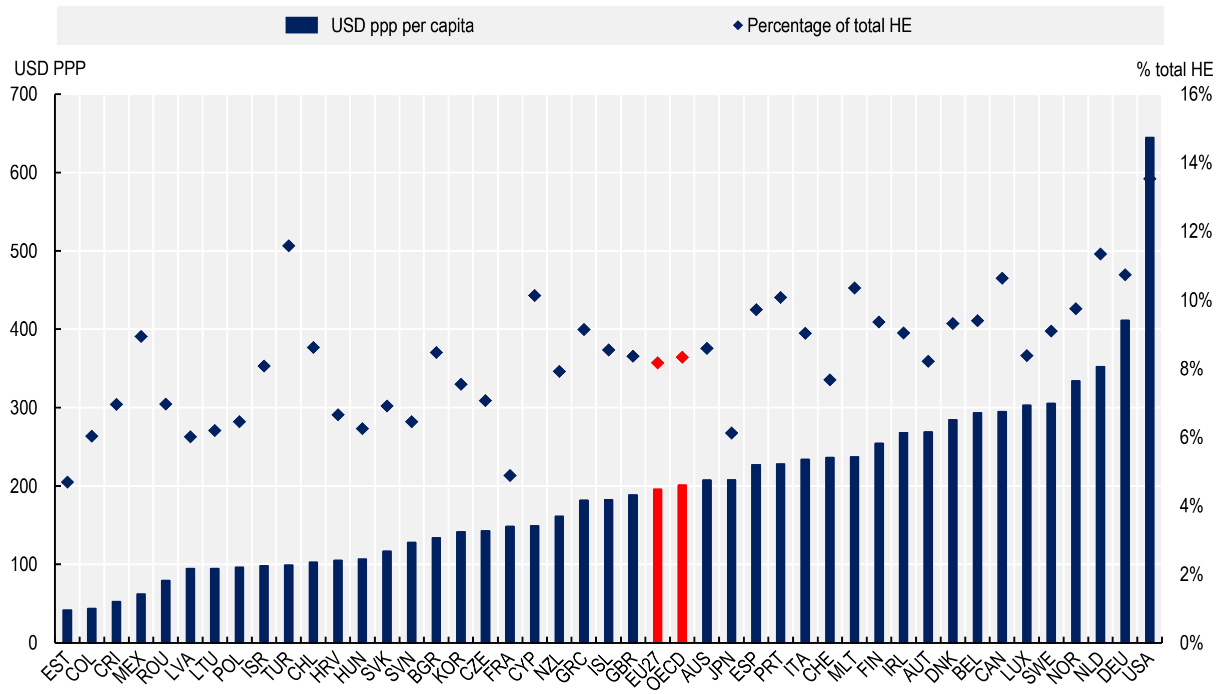
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

Negative health effects associated with excessive weight also occur during early years of life. Overweight in childhood is a key determinant of obesity in adulthood, which, as previously mentioned, is associated with a range of NCDs. Children living with overweight may also experience health issues at an early age including breathing difficulties, insulin resistance and hypertension. Overweight at a young age can also cause higher levels of mental distress, for example, due to bullying: OECD analysis found boys aged 11-15 living with obesity are nearly twice as likely to be bullied when compared to their normal weight peers, with this figure increasing to three times as likely for girls (OECD, 2019[5]).

Overweight has a direct impact on health expenditure by increasing demand for health care services. People with overweight are more likely to develop one or multiple NCDs. Consequently demand for health care services that treat and manage NCDs rises. Not only does overweight increase the frequency of contact with the health care system, it also increases the cost per contact as treatment is often more complex (Bertakis and Azari, 2005[35]). OECD analysis estimates that treating overweight and its related conditions cost countries, on average, an additional USD PPP (purchasing power parity) 209 annually per capita, which translates into 8.4% of total health expenditure (Figure 2.6).

Figure 2.6. Estimated health expenditure associated with overweight

Health expenditure due to overweight per year, in USD PPP per capita and as a percentage of total health expenditure, average 2020-50



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2019.

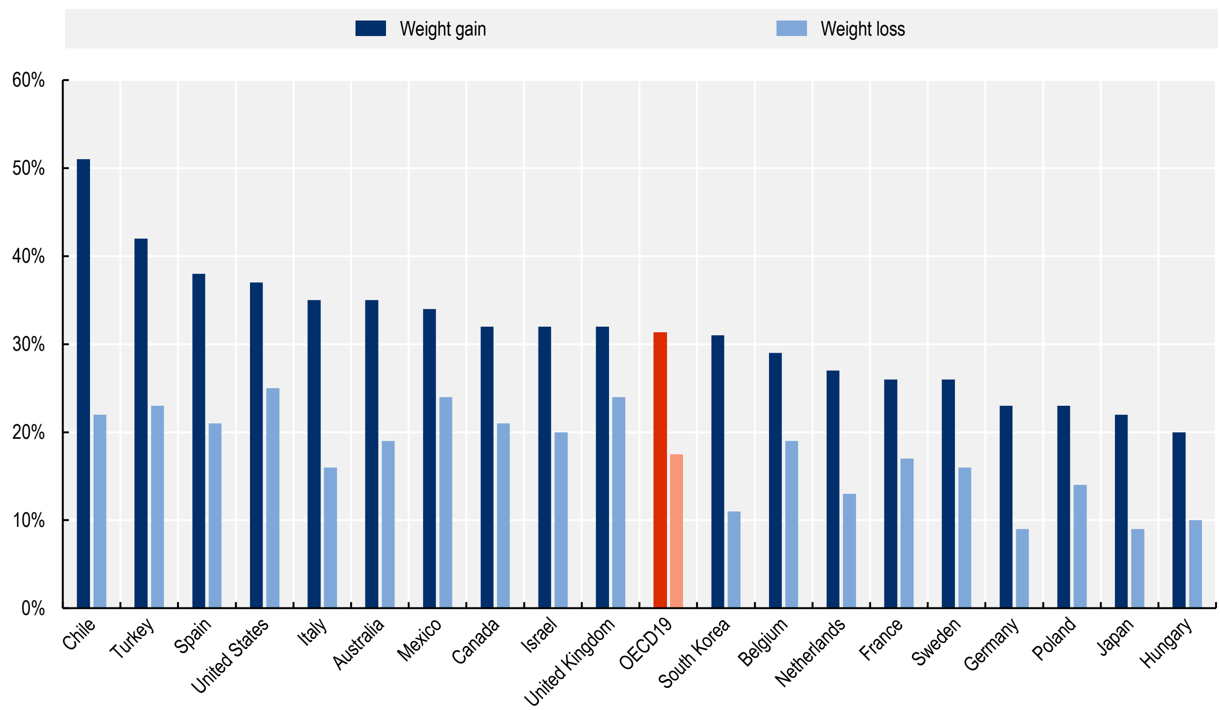
Overweight has an indirect negative impact on economic outcomes by depressing workforce productivity. Overweight and its related health issues reduce productivity among working-age adults, for example, through absenteeism and early retirement. Across OECD countries, overweight is estimated to reduce workforce productivity, on average, by -1.66% per capita, per year. When combining the impact on the workforce and life expectancy, overweight is estimated to reduce GDP by 3.3% per year on average across OECD countries.

Overweight is associated with worse health outcomes from COVID-19, despite this, overweight risk factors increased during the pandemic

People living with overweight, and obesity in particular, are at greater risk of developing severe symptoms and dying from COVID-19. For example, a study by Tartof et al. (2020[36]) using data from a United States integrated health care organisation, found compared to patients with a "normal weight" (BMI between 18.5-24 kg/m^2), morbidly obese patients are between 2.68 (BMI 40-44 kg/m^2) and 4.18 (BMI > 45 kg/m^2) times more likely to die from COVID-19. Similarly, several studies show that obesity increases the risk of developing severe COVID-19 symptoms as measured by hospitalisations, including intensive care unit admissions (CDC, n.d.[37]; Public Health England, 2020[38]; Yang, Hu and Zhu, 2020[39]; the LICORN and the Lille COVID-19 and Obesity study group, 2020[40]; Popkin et al., 2020[41]; World Obesity Federation, 2021[42]).

The COVID-19 pandemic had a negative impact on lifestyle behaviours resulting in weight gain. OECD countries responded to the COVID-19 pandemic by introducing "lockdowns" as a way to reduce disease transmission. This significantly altered people's daily lives including how they eat and exercise. It is too soon to conclude what long-term impact the pandemic had on peoples weight, however, studies on short-term weight gain/loss as well as overweight risk factors are available. For example, results from an Ipsos survey covering 19 OECD countries found that in all countries, the proportion of the population who reported gaining weight during the pandemic was greater than those reporting losing weight (Figure 2.7) (Bailey et al., 2021[43]). A summary of studies looking at the impact of COVID-19 on overweight risk factors is available in Box 2.3.

Figure 2.7. Proportion of the population reporting weight gain/loss during the COVID-19 pandemic



Source: Bailey et al. (2021[43]), "Diet & Health under COVID-19", https://www.ipsos.com/sites/default/files/ct/news/documents/2021-01/diet-and-health-under-covid-19.pdf.

Box 2.3. The impact of COVID-19 on overweight risk factors

Provided below is summary of key findings from studies analysing the impact of the COVID-19 pandemic on eating habits and physical activity:

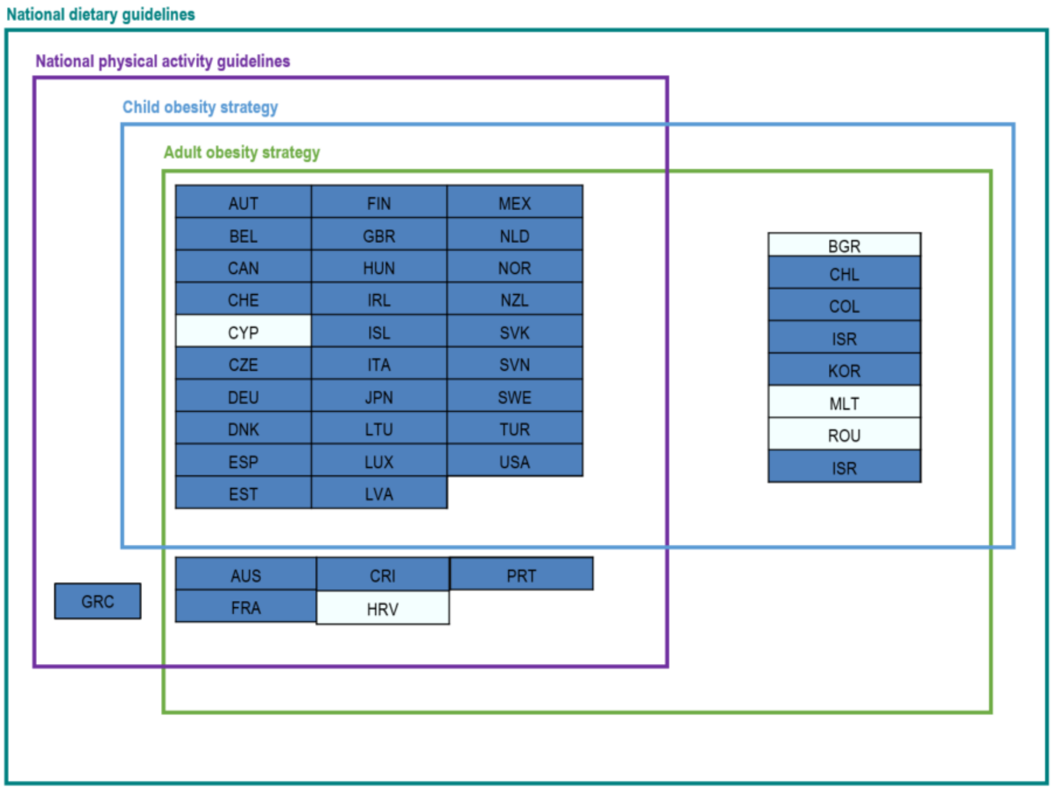
- A survey by Bailey et al. (2021[43]) found that, on average, 22% of people living in OECD19 countries increased the amount they exercised compared to 25% who decreased the amount they exercised.
- Stockwell et al. (2021[44]) undertook a systematic review to understand the impact of the pandemic on physical activity and sedentary behaviour. The review included 66 studies covering nearly 90 000 people aged between 13 and 86 years. The majority of studies included in the review found a decline in physical activity and an increase in sedentary behaviour despite guidance on how to stay active in lockdown.
- Stavridou et al. (2021[45]) focused their literature review on the impact of the pandemic on overweight among children and adolescents. Their review, which covered nearly 40 000 subjects, found an increase in the number of meals eaten as well as intake of potatoes, meat and sugary drinks. Further, due to a restriction in movement, levels of physical activity declined while sedentary behaviour increased.
- Findings from a multinational survey covering 14 countries (10 of which were OECD members) found self-reported levels of moderate-vigorous physical activity as well as vigorous physical activity declined during COVID-19 restrictions. No significant differences were found between men and women, however, those with high levels of physical activity prior to the pandemic reported greater decreases than those who were less active (Wilke et al., 2021[46]).

OECD countries have responded to the obesity epidemic with a mixture of policy interventions

Overweight is a top political priority in the OECD given its detrimental impact on health and economic outcomes. Overweight causes health expenditure to rise and productivity in the workforce to lower. Given the wide-reaching impact of overweight, governments in the OECD have responded by developing overarching national action plans addressing the determinants of overweight. These include, but are not limited to, policies to guide national dietary and physical activity guidelines, as well as adult and childhood overweight specific strategies. As shown in Figure 2.8, all OECD and EU27 countries have in place multiple national strategies to address high rates of overweight. The data in Figure 2.8 is supported by more recent information collected by WHO which found that, as of 2019, 92% of OECD and 89% of EU27 countries have a national action plan for unhealthy diets and physical inactivity (WHO, 2019[47]; WHO, 2019[48]). A few examples of strategies to tackle the determinants of obesity at the country level are listed below:

- **United States**:
  - *Active People, Healthy Nation*SM is led by the Centers for Disease Control and Prevention (CDC) to encourage young people and adults to be more active by 2027
  - *Healthy People 2030* sets out data-driven objectives to improve overall health and well-being, including a reduction in the proportion of children, adolescents and adults living with obesity.
- **Australia:**
  - The *National Preventive Health Strategy 2021-30* (further details are available in Box 1.2).

Figure 2.8. National action plans to address overweight and obesity – OECD and EU27 countries



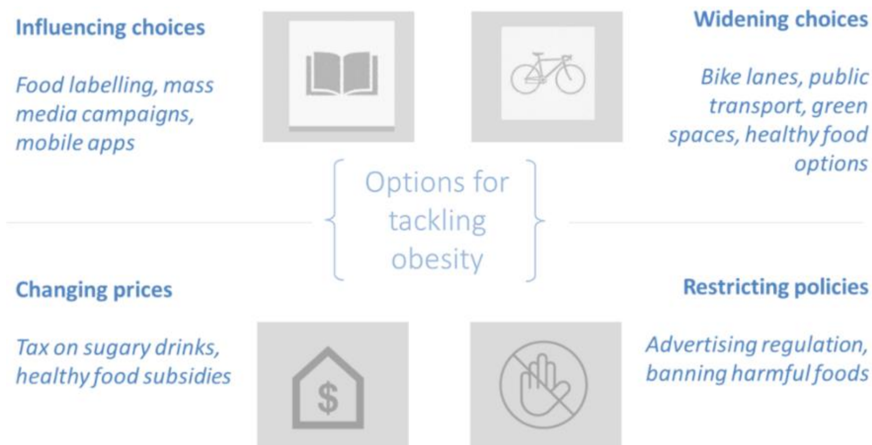
Note: OECD countries are in dark blue and non-OECD EU27 countries in light blue.
Source: WCRFI (2016[49]), "Nourishing framework", http://www.wcrf.org/int/policy/nourishing-framework; Development Initiatives (2018[50]), "2018 Global Nutrition Report: Shining a light to spur action on nutrition", https://globalnutritionreport.org/d7447a; WHO (2012[51]), "Global database on the Implementation of Nutrition Action (GINA)", https://www.who.int/nutrition/gina/en/; WHO Regional Office for Europe (2021[52]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf.

Plans at the national level align with international policies to tackle overweight. Overweight is global issue affecting both developing and developed countries. In response, the international community has responded by developing overarching goals and strategies to address this growing public health issue. Prominent examples include:

- The United Nation's (UN) *Sustainable Development Goals*, which has a target to reduce premature mortality from NCDs by one-third through prevention and treatment by 2030
- WHO's *Global Action Plan on Physical Activity*, which aims to reduce the global prevalence of physical inactivity by 15%, also by 2030
- WHO's *Physical Activity Strategy* for the WHO European Region 2016-25, which provides a blueprint to incentivise Member States to act (WHO, 2013[53]; Breda et al., 2018[54])
- *Europe's Beating Cancer Plan* recognises that obesity is a key risk factor for cancer and therefore must be addressed (European Commission, 2021[55])
- The EU's *Farm to Fork Strategy,* which among other things, aims to ensure people have access to nutritious foods (European Commission, 2019[56])
- The two-year campaign, *HealthyLifestyle4All* (EC, 2021[57]), which is a follow-up of the Tartu Call for a Healthy Lifestyle, was launched in September 2021 to showcase the European Commission's continuous commitment to promoting a healthy lifestyle across generations and social groups.

Comprehensive policy packages that draw upon international best practice are necessary to tackle the determinants of overweight. Overweight is a complex issue that affects people from all different backgrounds and ages. For this reason, no single policy can tackle this health issue, rather, a suite of complementary policies that create an environment supportive of healthy eating and physical activity is needed. At a high-level, OECD has grouped policies to tackle overweight into four broad domains (Figure 2.9). These domains align with frameworks and policy advice from the WHO, including "Best Buy" interventions for preventing and controlling NCDs, as well as the Global Action Plan on Physical Activity (2018-30) (WHO, 2018[58]).

Figure 2.9. OECD's policy framework for tackling overweight



Source: Taken from OECD (2019[5]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Subsequent chapters to this report analyse 12 interventions targeting overweight risk factors – i.e. unhealthy diets and/or physical inactivity. Table 2.2 lists each analysed intervention accompanied by a high-level description. The vast majority of interventions analysed in this report reflect policies that aim to influence people's choices (see Figure 2.9) – for example, by providing education on how to eat more nutritious foods and be more active, as well as labelling foods to highlight those associated with a healthy diet and weight loss.

Table 2.2. Case study interventions

Intervention	Description	Type of obesity policy
Nutri-Score	Front-of-pack labelling intervention to address unhealthy eating	Influencing choices
Physical Activity on Prescription (PAP)	Intervention to prescribe patients physical activity in a primary care setting	Influencing choices
Combined Lifestyle Intervention (CLI)	Primary care intervention offered to those who are overweight or obese. Patients are guided on how to improve diet, exercise and overall health.	Influencing choices
Multimodal Training Intervention (MTI)	Physical activity and healthy eating programme targeting those aged 65 years and older.	Influencing and widening choices
Young People at a Healthy Weight (JOGG)	Community-based intervention designed to improve diets and boost physical activity among those aged 0-19 years	Influencing and widening choices
ToyBox	Kindergarten intervention to improve healthy eating and physical activity	Influencing choices

Intervention	Description	Type of obesity policy
Danish Whole Grain Partnership	A front-of-pack labelling intervention to boost wholegrain consumption	Influencing choices
StopDia Pilot for the Somali population	Lifestyle intervention for the Somali population who are at-risk of developing type 2 diabetes (adapted from the nation-wide StopDia intervention)	Influencing choices
SI! intervention	Multidimensional school-based obesity prevention intervention, which targets lifestyle behaviour changes in 3-5 year-olds	Influencing choices
Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutrition (DE-PLAN)	Type 2 diabetes prevention intervention aimed at improving diet and physical activity levels through a lifestyle, community-based intervention	Influencing choices
Personalised Approach to Obesity Management in Children (PAOMC)	Clinical, family-based and personalised childhood obesity programme targeting children aged 7 to 17 years	Influencing choices
Let Food Be Your Medicine	Personalised nutrition mHealth app	Influencing choices

References

AIHW (2018), *Physical activity across the life stages*, https://www.aihw.gov.au/reports/physical-activity/physical-activity-across-the-life-stages/contents/table-of-contents. [20]

Bacaro, V. et al. (2020), “Sleep duration and obesity in adulthood: An updated systematic review and meta-analysis”, *Obesity Research & Clinical Practice*, Vol. 14/4, pp. 301-309, https://doi.org/10.1016/j.orcp.2020.03.004. [25]

Bailey, P. et al. (2021), *Diet & Health under COVID-19*, Ipsos, https://www.ipsos.com/sites/default/files/ct/news/documents/2021-01/diet-and-health-under-covid-19.pdf (accessed on 3 May 2021). [43]

Baker, P. et al. (2020), “Ultra-processed foods and the nutrition transition: Global, regional and national trends, food systems transformations and political economy drivers”, *Obesity Reviews*, Vol. 21/12, https://doi.org/10.1111/obr.13126. [3]

Bertakis, K. and R. Azari (2005), “Obesity and the Use of Health Care Services”, *Obesity Research*, Vol. 13/2, pp. 372-379, https://doi.org/10.1038/oby.2005.49. [35]

Breda, J. et al. (2018), “Promoting health-enhancing physical activity in Europe: Current state of surveillance, policy development and implementation”, *Health Policy*, Vol. 122/5, pp. 519-527, https://doi.org/10.1016/j.healthpol.2018.01.015. [54]

CDC (n.d.), *Obesity, Race/Ethnicity, and COVID-19 | Overweight & Obesity*, https://www.cdc.gov/obesity/data/obesity-and-covid-19.html. [37]

Chen, T. et al. (2018), “Patterns and Levels of Sedentary Behavior and Physical Activity in a General Japanese Population: The Hisayama Study”, *Journal of Epidemiology*, Vol. 28/5, pp. 260-265, https://doi.org/10.2188/jea.je20170012. [22]

Devaux, M. et al. (2011), “Exploring the Relationship Between Education and Obesity”, *OECD Journal: Economic Studies*, https://doi.org/10.1787/eco_studies-2011-5kg5825v1k23. [32]

Development Initiatives (2018), *2018 Global Nutrition Report: Shining a light to spur action on nutrition, Development Initiatives*, https://globalnutritionreport.org/d7447a. [50]

EC (2021), *The HealthyLifestyle4All Initiative*, https://sport.ec.europa.eu/initiatives/healthylifestyle4all (accessed on 20 October 2021). [57]

Etilé, F. and L. Oberlander (2019), *The Economics of Diet and Obesity: Understanding the Global Trends*, Oxford University Press, https://doi.org/10.1093/acrefore/9780190625979.013.19. [2]

European Commission (2021), *Europe's Beating Cancer Plan*, https://ec.europa.eu/health/sites/default/files/non_communicable_diseases/docs/eu_cancer-plan_en.pdf. [55]

European Commission (2019), *Farm to Fork Strategy: For a fair, healthy and environmentally-friendly food system*, https://ec.europa.eu/food/sites/food/files/safety/docs/f2f_action-plan_2020_strategy-info_en.pdf. [56]

European Commission (2017), *Special Eurobarometer 472: Sport and physical activity*, https://data.europa.eu/data/datasets/s2164_88_4_472_eng?locale=en. [21]

Eurostat (2021), *Passenger mobility statistics*, https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Passenger_mobility_statistics#Travel_mode. [13]

Eurostat (2019), *Passenger cars per 1 000 inhabitants*. [12]

Eurostat (2017), *Persons performing physical activity when working by type of activity, most frequent activity status, quantile and degree of urbanization*. [18]

FAO (2003), *Human energy requirements: Principles and definitions*, https://www.fao.org/3/y5686e/y5686e04.htm. [10]

Fatima, Y., S. Doi and A. Mamun (2016), "Sleep quality and obesity in young subjects: a meta-analysis", *Obesity Reviews*, Vol. 17/11, pp. 1154-1166, https://doi.org/10.1111/obr.12444. [24]

Hall, K. et al. (2019), "Ultra-Processed Diets Cause Excess Calorie Intake and Weight Gain: An Inpatient Randomized Controlled Trial of Ad Libitum Food Intake", *Cell Metabolism*, Vol. 30/1, pp. 67-77.e3, https://doi.org/10.1016/j.cmet.2019.05.008. [7]

Harding, J. et al. (2013), "Psychosocial stress is positively associated with body mass index gain over 5 years: Evidence from the longitudinal AusDiab study", *Obesity*, Vol. 22/1, pp. 277-286, https://doi.org/10.1002/oby.20423. [26]

Inchley, J. et al. (2020), *Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings*, https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf. [9]

Kim, M. et al. (2020), "Gut microbiota and metabolic health among overweight and obese individuals", *Scientific Reports*, Vol. 10/1, https://doi.org/10.1038/s41598-020-76474-8. [27]

Mackett, R. and B. Brown (2011), *Transport, Physical Activity and Health: Present knowledge and the way ahead*, UCL, http://www.cege.ucl.ac.uk/research/projects?sq_content_src=%2BdXJsPWh0dHAlM0ElMkYlMkZ3d3cyLmNlZ2UudWNsLmFjLnVrJTJGcmVzZWFyY2glMkZSZXNQcm9qRGV0LmFzcCUzRklEJTNEMTc0JmFsbD0x (accessed on 25 October 2021). [14]

Marino, M. et al. (2021), "A Systematic Review of Worldwide Consumption of Ultra-Processed Foods: Findings and Criticisms", *Nutrients*, Vol. 13/8, p. 2778, https://doi.org/10.3390/nu13082778. [8]

Nyberg, S. et al. (2018), "Obesity and loss of disease-free years owing to major non-communicable diseases: a multicohort study", *The Lancet Public Health*, Vol. 3/10, pp. e490-e497, https://doi.org/10.1016/s2468-2667(18)30139-7. [34]

OECD (2021), *Making Better Policies for Food Systems*, OECD Publishing, Paris, https://doi.org/10.1787/ddfba4de-en. [4]

OECD (2019), *Health at a Glance 2019: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/4dd50c09-en. [31]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [5]

OECD and WHO (forthcoming), *The Burden of Physical Inactivity*, OECD Publishing, Paris. [15]

Placzek, O. (2021), "Socio-economic and demographic aspects of food security and nutrition", *OECD Food, Agriculture and Fisheries Papers*, No. 150, OECD Publishing, Paris, https://doi.org/10.1787/49d7059f-en. [33]

Poore, J. and T. Nemecek (2018), "Reducing food's environmental impacts through producers and consumers", *Science*, Vol. 360/6392, pp. 987-992, https://doi.org/10.1126/science.aaq0216. [29]

Popkin, B. et al. (2020), "Individuals with obesity and COVID-19: A global perspective on the epidemiology and biological relationships", *Obesity Reviews*, Vol. 21/11, https://doi.org/10.1111/obr.13128. [41]

Public Health England (2020), *Excess Weight and COVID-19: Insights from new evidence*, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/907966/PHE_insight_Excess_weight_and_COVID-19__FINAL.pdf. [38]

Sallis, J. et al. (2012), "Role of Built Environments in Physical Activity, Obesity, and Cardiovascular Disease", *Circulation*, Vol. 125/5, pp. 729-737, https://doi.org/10.1161/circulationaha.110.969022. [11]

Stavridou, A. et al. (2021), "Obesity in Children and Adolescents during COVID-19 Pandemic", *Children*, Vol. 8/2, p. 135, https://doi.org/10.3390/children8020135. [45]

Stockwell, S. et al. (2021), "Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review", *BMJ Open Sport & Exercise Medicine*, Vol. 7/1, p. e000960, https://doi.org/10.1136/bmjsem-2020-000960. [44]

Swinburn, B., G. Egger and F. Raza (1999), “Dissecting Obesogenic Environments: The Development and Application of a Framework for Identifying and Prioritizing Environmental Interventions for Obesity”, *Preventive Medicine*, Vol. 29/6, pp. 563-570, https://doi.org/10.1006/pmed.1999.0585. [1]

Tartof, S. et al. (2020), “Obesity and Mortality Among Patients Diagnosed With COVID-19: Results From an Integrated Health Care Organization”, *Annals of Internal Medicine*, Vol. 173/10, pp. 773-781, https://doi.org/10.7326/m20-3742. [36]

The EAT-Lancet Commission (2022), *The Planetary Health Diet*, https://eatforum.org/eat-lancet-commission/the-planetary-health-diet-and-you/. [28]

the LICORN and the Lille COVID-19 and Obesity study group (2020), “High Prevalence of Obesity in Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) Requiring Invasive Mechanical Ventilation”, *Obesity*, Vol. 28/7, pp. 1195-1199, https://doi.org/10.1002/oby.22831. [40]

U.S. Bureau of Labor Statistics (2020), *Occupational Requirements Survey: Sitting and standing*, https://www.bls.gov/ors/factsheet/sit-and-stand.htm. [19]

Valdes, A. et al. (2018), “Role of the gut microbiota in nutrition and health”, *BMJ*, p. k2179, https://doi.org/10.1136/bmj.k2179. [60]

van der Ploeg, H. and M. Hillsdon (2017), “Is sedentary behaviour just physical inactivity by another name?”, *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 14/1, https://doi.org/10.1186/s12966-017-0601-0. [17]

WCRFI (2016), *NOURISHING-framework*, https://www.wcrf.org/policy/policy-databases/nourishing-framework/. [49]

WHO (2021), *Prevalence of insufficient physical activity among adults aged 18+ years (crude estimate) (%)*. [16]

WHO (2019), *Body mass index - BMI*, https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi. [59]

WHO (2019), “Existence of operational policy/strategy/action plan to reduce physical inactivity”. [47]

WHO (2019), *Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)*, https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en. [48]

WHO (2018), *Global Action Plan On Physical Activity 2018-2030: More Active People For A Healthier World-2030*, WHO, Geneva, http://apps.who.int/iris/bitstream/handle/10665/272722/9789241514187-eng.pdf?ua=1 (accessed on 3 June 2021). [58]

WHO (2016), *Prevalence of obesity among adults, BMI & GreaterEqual; 30 (age-standardized estimate) (%)*, https://apps.who.int/gho/data/view.main.CTRY2450A. [30]

WHO (2013), *Physical activity strategy for the WHO European Region 2016–2025*, https://www.euro.who.int/en/publications/abstracts/physical-activity-strategy-for-the-who-european-region-20162025 (accessed on 20 October 2021). [53]

WHO (2012), *Global database on the Implementation of Nutrition Action (GINA)*, https://www.who.int/nutrition/gina/en/. [51]

WHO Regional Office for Europe (2021), *2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region*, https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf. [52]

WHO and FAO (2003), *Diet, nutrition and the prevention of chronic diseases*, WHO Technical Report Series 916, https://www.fao.org/3/ac911e/ac911e00.pdf. [6]

Wilke, J. et al. (2021), "A Pandemic within the Pandemic? Physical Activity Levels Substantially Decreased in Countries Affected by COVID-19", *International Journal of Environmental Research and Public Health*, Vol. 18/5, p. 2235, https://doi.org/10.3390/ijerph18052235. [46]

World Obesity Federation (2021), *COVID-19 and Obesity: The 2021 Atlas*, https://www.worldobesityday.org/assets/downloads/COVID-19_and_Obesity-The_2021_Atlas.pdf. [42]

Yang, J., J. Hu and C. Zhu (2020), "Obesity aggravates COVID-19: A systematic review and meta-analysis", *Journal of Medical Virology*, Vol. 93/1, pp. 257-261, https://doi.org/10.1002/jmv.26237. [39]

Yang, L. et al. (2019), "Trends in Sedentary Behavior Among the US Population, 2001-2016", *JAMA*, Vol. 321/16, p. 1587, https://doi.org/10.1001/jama.2019.3636. [23]

Notes

[1] For adults, WHO define overweight and obesity as having a BMI >=25Kg/m^2 and 30Kg/m^2, respectively. BMI is the most widely used proxy for body adiposity to assess population-level rates of overweight, as it is easily derived from a person's weight and height (i.e. weight (kg) divided by height in metres squared) (WHO, 2019[59]).

[2] Metabolic equivalent of task (MET) is a measure to reflect the intensity of physical activities, and allows comparison between them. One MET is the energy equivalent expended per unit of time by an individual while seated at rest. More intense activities, which cost more energy expenditure than being seated at rest, are attributed higher METs.

[3] Microbiota diversity "a measure of how many different species and, dependent on the diversity indices, how evenly distributed they are in the community. Lower diversity is considered a marker of dysbiosis (microbial imbalance) in the gut and has been found in autoimmune diseases and obesity and cardiometabolic conditions, as well as in elderly people" (Valdes et al., 2018[60]).

[4] Includes all OECD countries, non-OECD European countries, non-OECD G20 countries as well as OECD accession and partner countries.

3 Nutri-Score

This chapter covers the case study of Nutri-Score, a front-of-pack nutrition-labelling scheme available in several European countries. The case study includes an assessment of Nutri-Score against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Nutri-Score: Case study overview

Description: Nutri-Score is a nutrition logo introduced and promoted by the French Government (the French Ministry of Health and the French Public Health institute) as of 2017, based on academic work, which is placed at the front of pre-packaged foods by companies that adhere on a voluntary basis. The overall objective of Nutri-Score is to improve consumer's understanding of the nutritional content, increase healthier food choices in the population, and thus reduce obesity and its related diseases.

Best practice assessment:

Table 3.1. OECD Framework assessment of the Nutri-Score

Criteria	Assessment
Effectiveness	Nutri-Score reduces the number of calories purchased, which is estimated to lead to 138 432 life years (LYs) and 204 851 disability-adjusted life years (DALYs) gained by 2050 in France
Efficiency	Nutri-Score is cost saving across France and all other OECD and EU27 countries
Equity	The design of Nutri-Score logo makes it accessible to different population groups, and these products are not relatively expensive
Evidence-base	A randomised controlled trial in real-life grocery shopping settings was used in the present report to evaluate the impact of Nutri-Score, which is considered strong-quality evidence
Extent of coverage	Extent of coverage has grown significantly since Nutri-Score's inception

Enhancement options: to *enhance equity*, policy makers could consider options such as partnering with retail outlets to offer discounts/promotions on products carrying an A- or B-grade Nutri-Score as well as initiatives to boost health literacy, particularly amongst vulnerable populations. *To enhance the evidence-base,* further studies using survey-based data on consumption would complement the evaluation on food purchases, and improve the evaluation of the equity dimension. To *enhance extent of coverage*, policy makers could explore opportunities to incentivise participation by international food and beverage companies, and enrol collective and commercial catering companies.

Transferability: Nutri-Score has been transferred from France to four European countries while two other countries announced their intention to adopt Nutri-Score, a further five OECD countries have an alternative front-of-pack traffic light system. These results suggest that Nutri-Score can be highly transferable, further, nutritional labels are likely to have political support given most countries have a national action to reduce levels of unhealthy eating.

Conclusion: Nutri-Score is a best practice and transferable intervention with the potential to significantly improve diet, reduce obesity and disease incidence when scaled-up across France and transferred to other OECD and non-OECD European countries.

Intervention description

Data from four OECD countries show that 50% of people have an unhealthy diet measured against national guidelines (OECD, 2019[1]). Poor diet is a key factor contributing to the obesity epidemic among OECD and non-OECD European countries. High rates of overweight and obesity are key risk factors for multiple chronic diseases, and are a heavy economic burden for societies and the economy.

Easy-to-understand, simplified front-of-pack (FOP) food labelling schemes are among the recent emerging interventions used by OECD countries – on a mandatory or voluntary basis – to promote a healthier diet (OECD, 2017[2]). The FOP food labelling schemes are informative, simple and coloured logos that summarise the nutritional information and make it easy to understand for consumers. Evidence shows that FOP food labelling prompts better food choice and diet than simply listing nutrient profiles (Cecchini and Warin, 2015[3]).

OECD assessed that informative and easy-to-understand FOP food labelling schemes have the potential to improve people's diet; reduce obesity and its related diseases; lower expenditure on treatment of these chronic diseases; and increase labour market participation and productivity. When all these effects are combined, the economic return on investment (ROI) for an intuitive food labelling scheme is positive (ROI 2.1:1, meaning that for every EUR invested, the intervention returns EUR 2.1 in gross domestic product) (OECD, 2019[1]).

The French Nutri-Score is a FOP food logo reflecting the nutritional quality of a product. It is based on an easy-to-understand scale of five colours (from dark green to dark orange), each of which are attached to a letter (from A to E, with A representing products with higher nutritional quality) (Figure 3.1). Following a recommendation from the French Ministry of Health, Nutri-Score was created by the French public health institute (Santé publique France), based on academic work listed in (Ministère des Solidarités et de la Santé, 2020[4]). Nutri-Score was first adopted in France in October 2017.

Figure 3.1. The Nutri-Score logo

The logo is attributed on the basis of a nutritional quality score taking into account nutrients that should be limited (e.g. calories, saturated fatty acid, salt, sugar) and nutrients that should be favoured (e.g. fibres, proteins, fruits and vegetable, olive oil). The nutritional quality score is derived from the British Food Standards Agency (FSA) nutrient profiling system (FSA score) combined with the Office of Communication (OfCom) cut-off values.

Nutri-Score is free of charge and works on a voluntary basis. Food companies that want to use Nutri-Score have to register with Santé publique France, and approve the terms and conditions for the use of the logo. Provided with a Nutri-Score calculator tool and instructions, they can then attribute and apply themselves the Nutri-score logo on their products. It was estimated that in 2020, over 400 food companies were engaged in the programme, representing about 50% of the market share in sales volume (Oqali, 2020[5]). By 2021, about 600 companies had adopted the Nutri-Score logo (Santé publique France, 2021[6]).

Nutri-score is a relatively new intervention that improves consumer knowledge on the nutritional quality of foods purchased. Two recent studies comparing the effect of various types of logo on food purchases, concluded the Nutri-Score was the "most effective" labelling scheme (Crosetto et al., 2019[7]; Dubois et al., 2020[8]). The study by Crosetto and colleagues is a laboratory field experiment with 691 adults aiming to compare the impact of five FOP labels on the FSA nutritional score of food baskets. Dubois and colleagues' study is a real-life grocery shopping setting study, aiming to compare the impact of four FOP labels on FSA score of food purchases, including more than 1.6 million purchases in 60 supermarkets in France. Since its implementation in France, Nutri-Score has been transferred to four other countries (Belgium, Germany, Luxembourg, and Switzerland). In February 2021, these countries announced the establishment of a transnational co-ordination mechanism to facilitate the use of Nutri-Score nutritional labelling, comprising a steering committee and a scientific committee (Santé publique France, 2021[9]).

OECD Best Practices Framework assessment

This section analyses Nutri-Score against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 3.1 for a high-level assessment of Nutri-Score). Further details on the OECD Framework are in Annex A.

Box 3.1. Best practice assessment overview: Nutri-Score

Effectiveness

- Nutri-Score improves the nutritional quality of food purchased (in terms of the British Food Standards Agency nutrient profiling system) and decreases the number of calories purchased from labelled food products by 3%
- According to OECD simulations, Nutri-Score would lead to 138 432 life years and 204 851 disability-adjusted life years (DALYs) gained by 2050 in France
- Across all studied countries, Nutri-Score would have the largest gross impact on musculo-skeletal diseases with 4.5 million cases avoided by 2050, and cardiovascular diseases with 2 million cases avoided by 2050.

Efficiency

- When expanded across the whole of France, it is estimated Nutri-Score will accumulate health expenditure savings of EUR 17.34 per person by 2050
- When transferred to all OECD and EU27 countries, savings equivalent to 0.05% of total health expenditure per year are expected (until 2050)
- For all OECD and EU27 countries, Nutri-Score is not only cost effective, but also cost saving

Equity

- Different population groups can easily understand the Nutri-Score logo and therefore make healthier food choices
- The average price of products with Nutri-Score and those without is similar indicating Nutri-Score does not exclude poorer population groups

Evidence-base

- A randomised-controlled trial (RCT) study in real-life conditions was used in the present report to evaluate the impact of the Nutri-Score, which is considered high-quality evidence

Extent of coverage

- Extent of coverage has grown significantly since Nutri-Score's inception with consumer awareness of the logo increasing from 58% in 2018 to 93% in 2020. Over the same period market share, based on sales volume, of food companies that adhere to Nutri-Score increased from 24% to 50%.

Effectiveness

Since the introduction of Nutri-Score, the quality of food purchased increased and the quantity of calories purchased decreased

In 2017, researchers assessed four different food labelling schemes using a real-life grocery shop setting (Allais et al., 2017[10]). As part of the study, researchers analysed differences in the content of food baskets purchased with a focus on four food products – breads, ready meals, fresh catering and pastries (see Box 3.2 for further details). The most successful food-labelling scheme, based on the study design, was Nutri-Score given it significantly increased the nutritional quality of food purchased, in particular among the low-income population (Allais et al., 2017[10]).

Box 3.2. Impact of Nutri-Score on food quality and calories purchased

The real-world study by Allais et al. (2017[10]) found Nutri-Score improved the nutritional quality of labelled food purchases by 2.5%, that is a reduction in the FSA score by 0.142 ($t=-1.66$, $p=0.097$). Based on the same data, the researchers show that the total calories of purchased labelled food products decreased by -3.0% [-4.64%; -1.36%]. In addition, the report notes that 54.6% of products purchased are labelled.

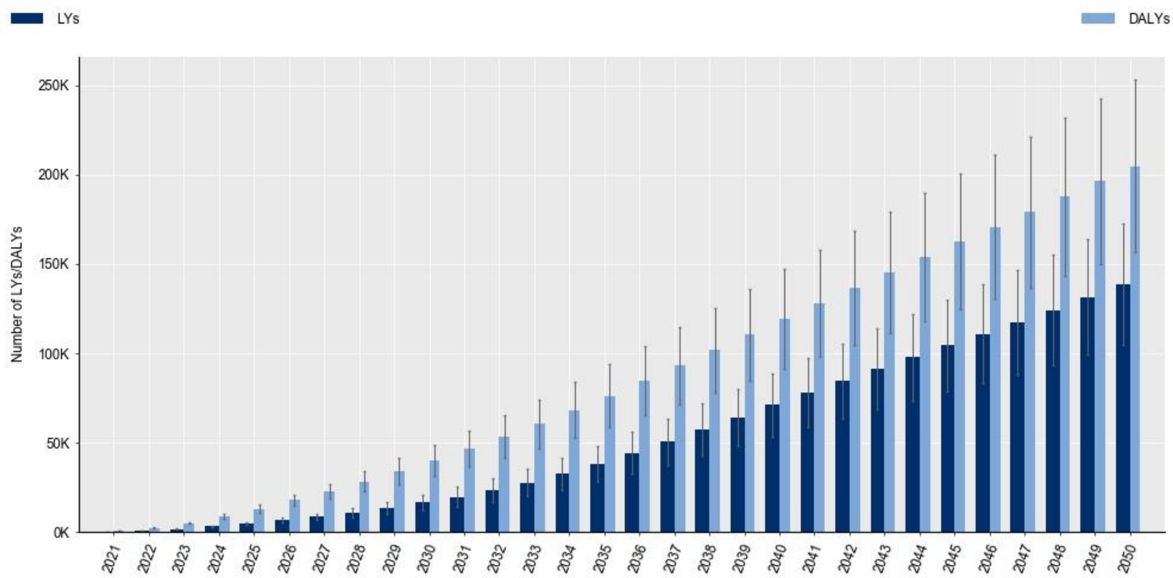
Furthermore, Nutri-Score encourages food companies to reformulate their products. For instance, previous evidence suggests that FOP labelling can motivate food manufacturers to reformulate products with lower levels of nutrients that contribute to obesity (Kloss et al., 2015[11]).

The remainder of this section presents the long-term impact of Nutri-Score in France as well as OECD and non-OECD European countries. The analysis relied on the OECD SPHeP-NCD model (Strategic Public Health Planning for non-communicable diseases) (see Annex A) using real-world inputs on the impact of Nutri-Score (i.e. Allais et al. (2017[10]) and Dubois et al. (2020[8])). In addition, the evaluation assumes that the effect observed on the four types of food products analysed in previous studies is generalisable to other types of labelled products. For a full list of assumptions, see 0.

France

The implementation of Nutri-Score in France, as it is today, three years after implementation, is estimated to lead to 12 life years (LY) and 17 disability-adjusted life years (DALYs) gained per 100 000 people, on average, per year over the period 2021-50. These figures translate into a cumulative gain of 138 432 LYs gained and 204 851 DALYs by 2050 (Figure 3.2).

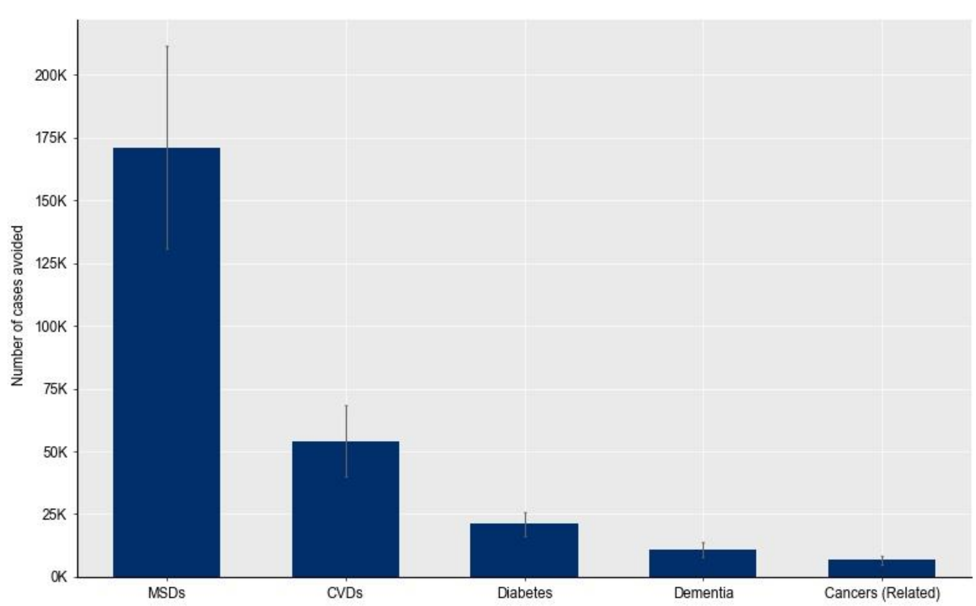
Figure 3.2. Cumulative number of LYs and DALYs gained (2021-50) – Nutri-Score, France



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, Nutri-Score is expected to have the greatest impact on musculoskeletal disorders (MSDs) and cardiovascular diseases (CVDs) (Figure 3.3). Between 2021 and 2050, the number of MSD and CVD cases is estimated to fall by 170 915 and 54 140 cases, respectively. Other diseases affected include diabetes, dementia and several cancers.

Figure 3.3. Cumulative number of disease cases avoided by 2050 – Nutri-Score, France

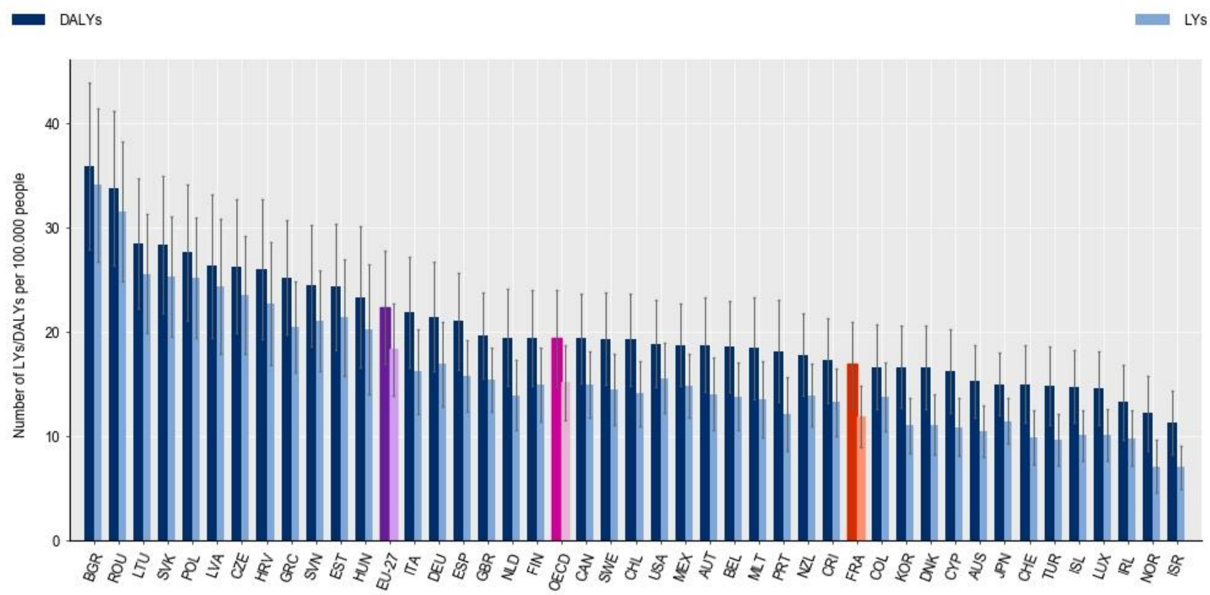


Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Transferring Nutri-Score to all OECD and EU27 countries is estimated to result in 15.2 and 18.4 LYs gained per 100 000 people, respectively, on average per year between 2021-50 (ranging from 7.0 in Israel to 34.1 in Bulgaria) (Figure 3.4). For DALYs, gains are even higher at 19.4 for OECD and 22.4 for EU27 countries.

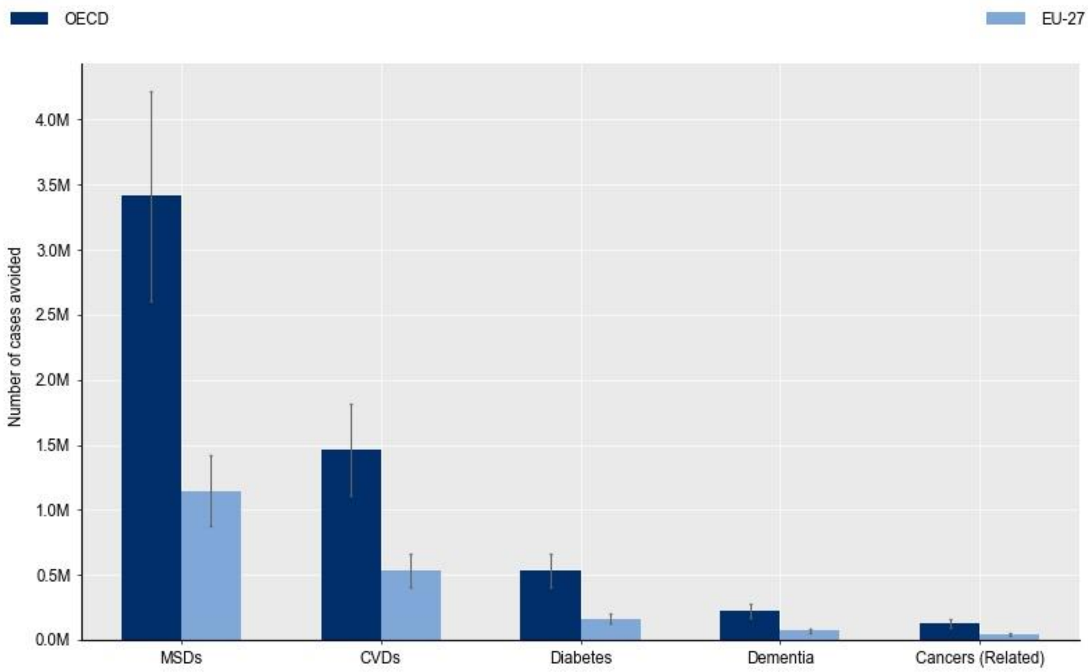
Figure 3.4. LYs and DALYs gained annually per 100 000 people, 2021-50 – Nutri-Score, all countries



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2020.

In gross terms, Nutri-Score would have the greatest impact on MSDs with the intervention estimated to reduce the number of cases by 3.4 and 1.1 million among OECD and EU27 countries, respectively, between 2021 and 2050 (Figure 3.5). Across all countries, Nutri-Score would also reduce the number of CVD cases by 1.6 million cases, diabetes cases by over 0.5 million, dementia cases by 0.2 million, and cases of cancer related to nutrition by 0.13 million.

Figure 3.5. Total disease cases avoided, between 2021 and 2050 – Nutri-Score, OECD and EU27 countries



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

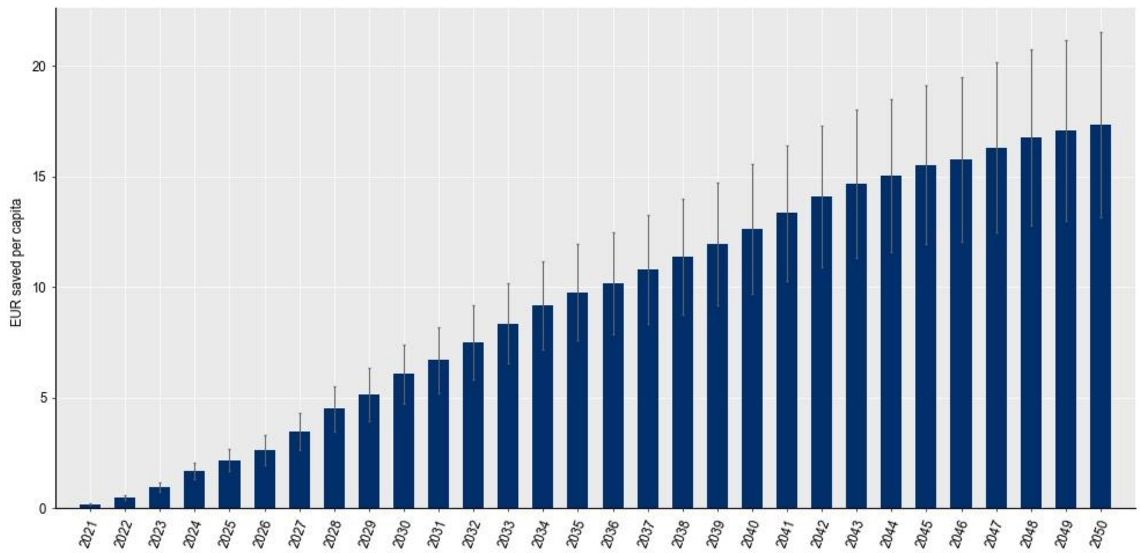
Efficiency

Similar to "Effectiveness", this section presents results for France followed by remaining OECD and non-OECD European countries.

France

By reducing rates of obesity, Nutri-Score can reduce health care costs. Over the modelled period of 2021-50, the OECD-SPHeP NCD model estimates Nutri-Score would lead to cumulative health expenditure savings of EUR 17.34 per person by 2050 (Figure 3.6) or by EUR 0.88 per person, per year. Cost savings however are to an extent offset by intervention operating costs (see Table 3.2).

Figure 3.6. Cumulative health expenditure savings per person, EUR, 2021-50 – Nutri-Score, France

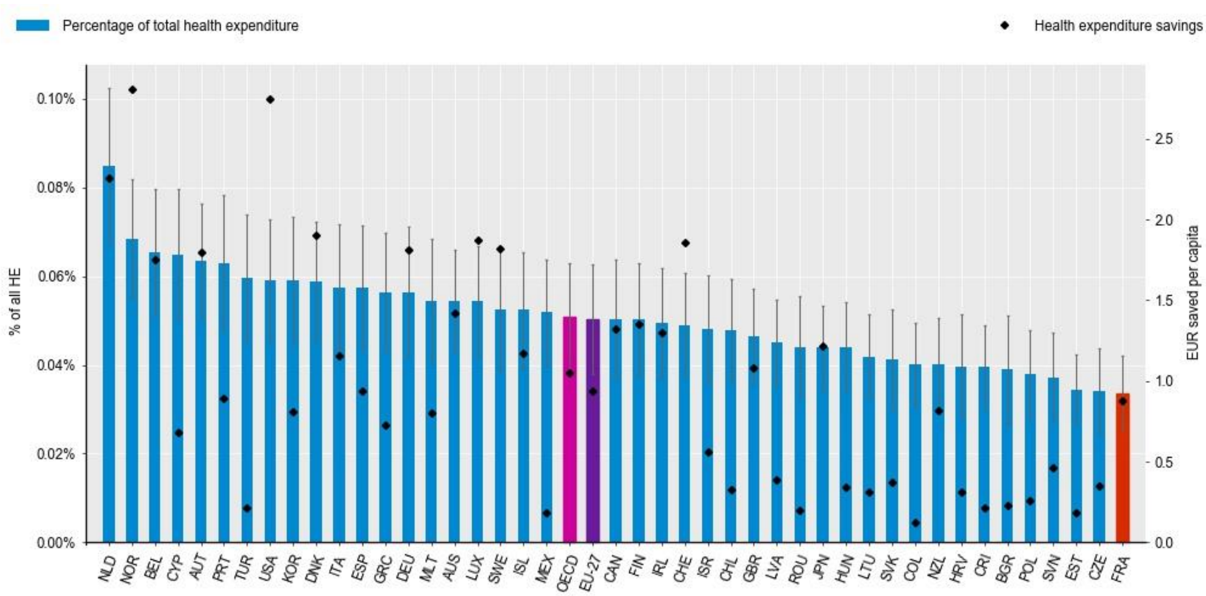


Note: The black lines represent 95% confidence intervals. Savings are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Average annual health expenditure (HE) savings as a proportion of total HE is 0.05% for both OECD and EU27 countries (Figure 3.7). On a per capita basis, this translates into average annual savings of EUR 01.05 and EUR 0.94 for OECD and EU27 countries, respectively.

Figure 3.7. Health expenditure (HE) savings as a percentage of total HE and per capita (EUR), average 2021-50 – Nutri-Score, all countries



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Table 3.2 provides information on intervention costs, total health expenditure savings and the cost per DALY gained in local currency for OECD and non-OECD European countries. All countries recorded a negative cost per DALY gained indicating the intervention is not only cost effective, but also cost saving.

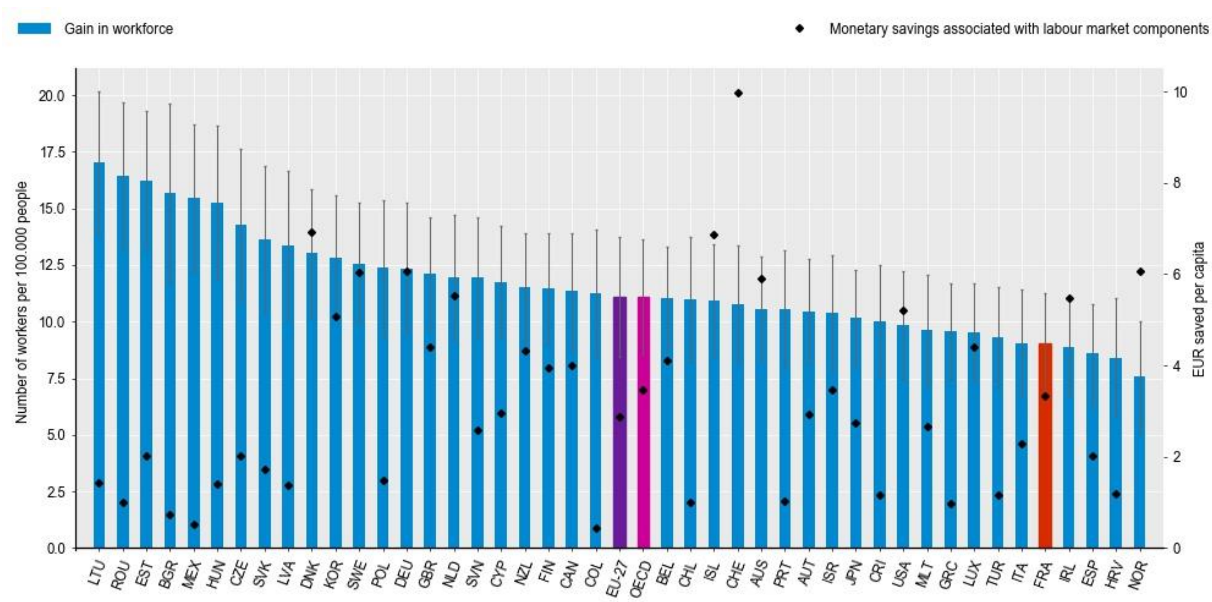
Table 3.2. Cost effectiveness figures in local currency – Nutri-Score, all countries

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Australia	AUD	0.04	66 613 451	Cost saving
Austria	EUR	0.02	15 866 029	Cost saving
Belgium	EUR	0.02	21 200 068	Cost saving
Bulgaria	BGN	0.02	2 709 630	Cost saving
Canada	CAD	0.04	80 538 557	Cost saving
Chile	CLF	11.58	5 065 312 656	Cost saving
Colombia	COP	39.17	23 879 668 417	Cost saving
Costa Rica	CRC	9.91	736 792 486	Cost saving
Croatia	HRK	0.09	8 813 145	Cost saving
Cyprus	EUR	0.02	893 225	Cost saving
Czech Republic	CZK	0.36	92 688 792	Cost saving
Denmark	DKK	0.19	85 739 175	Cost saving
Estonia	EUR	0.02	218 178	Cost saving
Finland	EUR	0.02	7 676 430	Cost saving
France	EUR	0.02	60 404 853	Cost saving
Germany	EUR	0.02	143 530 109	Cost saving
Greece	EUR	0.02	7 475 695	Cost saving
Hungary	HUF	4.16	1 016 293 605	Cost saving
Iceland	ISK	4.08	59 454 211	Cost saving
Ireland	EUR	0.02	6 822 661	Cost saving
Israel	ILS	0.11	24 453 696	Cost saving
Italy	EUR	0.02	67 470 091	Cost saving
Japan	JPY	3.01	17 112 579 423	Cost saving
Korea	KRW	25.21	53 945 778 212	Cost saving
Latvia	EUR	0.01	694 254	Cost saving
Lithuania	EUR	0.01	823 049	Cost saving
Luxembourg	EUR	0.02	1 294 288	Cost saving
Malta	EUR	0.02	337 563	Cost saving
Mexico	MXN	0.27	577 308 107	Cost saving
Netherlands	EUR	0.02	39 924 556	Cost saving
New Zealand	NZD	0.04	7 228 412	Cost saving
Norway	NOK	0.28	167 345 376	Cost saving
Poland	PLN	0.05	39 628 108	Cost saving
Portugal	EUR	0.02	8 607 799	Cost saving
Romania	RON	0.05	16 003 900	Cost saving
Slovak Republic	EUR	0.02	1 919 896	Cost saving
Slovenia	EUR	0.02	914 598	Cost saving
Spain	EUR	0.02	43 324 839	Cost saving
Sweden	SEK	0.26	210 498 463	Cost saving
Switzerland	CHE	0.03	19 335 673	Cost saving
Turkey	TRY	0.06	117 012 017	Cost saving
United Kingdom	GBP	0.02	67 550 517	Cost saving
United States	USD	0.03	1 123 262 128	Cost saving

* Cost per DALY (disability-adjusted life year) gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50. Costs and benefits have been discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

The reduction in chronic diseases resulting from Nutri-Score has, in turn, an impact on labour market participation and productivity. By reducing chronic disease incidence, Nutri-Score is expected to lead to an increase in employment and a reduction in absenteeism, presenteeism, and early retirement. Converting these labour market outputs into full-time equivalent (FTE) workers, it is estimated that OECD and EU27 countries will gain 11.1 FTE per 100 000 working age people per year between 2021 and 2050. In monetary terms, this translates into average per capita labour market production of EUR 3.5 for OECD and EUR 2.9 for EU27 countries (Figure 3.8).

Figure 3.8. Labour market impacts, average per year, 2021-50 – Nutri-Score, all countries



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Equity

All population groups can easily interpret the Nutri-Score logo, and there is no association between labelled products and higher expenditure

Food labelling schemes may have regressive equity implications when the most educated and health-conscious respond more to labelling, for instance with informational labelling. Simplified labelling with colour coding are more appropriate to reach people from all socio-economic groups (Lobstein, Neveux and Landon, 2020[12]). The Nutri-Score logo is a simplified, easy to understand, logo that associates a colour and a letter in a simple design to indicate the nutritional quality of the product (Figure 3.1) and is therefore easily interpretable by the wider population. At the stage of experimenting Nutri-Score, a laboratory study showed that the increase in nutritional quality observed in participants with lower income was nearly as large as that the one seen for the group as a whole (Crosetto et al., 2017[13]). One year after its national roll-out, Nutri-Score is well received and used by all socio-economic groups, including subgroups who are more likely to have a lower-quality diet, according to a study based on online survey data (Sarda et al., 2020[14]). In their study, Sarda and colleagues showed that awareness of the logo did not vary with household income and education level.

Regarding the impact of the logo on purchasing behaviours, people with an intermediate-income were more likely than those on a low-income to change their behaviours, while high-income groups did not differentiate from the low-income groups. People with a low-level of education were more likely than highly educated people to change their purchasing behaviours (Sarda et al., 2020[14]).

Prices of food products with the Nutri-Score label do not seem to be higher. A laboratory field experiment shows that nutritional gains associated with four food labelling schemes, including Nutri-Score, are not correlated with higher expenditure (Crosetto et al., 2019[7]). The French observatory of food quality (OQALI) confirmed these findings in a study, which showed the average price per kilogram of products with the Nutri-Score logo was similar to those without the logo (Oqali, 2020[5]).

Evidence-base

Results for the effectiveness and efficiency of Nutri-Score is based on data from a randomised-controlled trial (RCT). The RCT measured the impact of four different types of food labelling schemes, including Nutri-Score, on food purchases. Evidence from the RCT was presented in a report (Allais et al., 2017[10]) and a journal article (Dubois et al., 2020[8]).

The RCT experiment was carried out in 60 stores across France, each of which belongs to three of the largest retail chains in the country. The study tested four different FOP labelling schemes on more than 1 200 products classified into four categories – breads, ready meals, fresh catering and pastries. Purchase data were provided by retailers for two time periods, before and after the experiment took place towards the end of 2016. The outcome measures in the study included the nutritional quality of purchased food using the Ofcom nutrient profiling score developed by the British FSA, and the number of calories contained in the basket of purchased products.

The *Quality Assessment Tool for Quantitative Studies* rates the quality of evidence as strong across several domains (see Table 3.3) (Effective Public Health Practice Project, 1998[15]).

Table 3.3. Evidence-based assessment, Nutri-Score

Assessment category	Question	Rating
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	80-100%
Selection bias score: Strong		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	Yes
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	No
	What percentage of potential confounders were controlled for?	Can't tell
Confounders score: Weak		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	No
	Were the study participants aware of the research question?	Yes
Blinding score: Moderate		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes

Assessment category	Question	Rating
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	No
	Indicate the percentage of participants who completed the study?	80-100%
Withdrawals and dropouts score: Strong		

Source: Effective Public Health Practice Project (1998[15]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14; Allais et al. (2017[10]), "Évaluation Expérimentation Logos Nutritionnels, Rapport pour le FFAS", https://solidarites-sante.gouv.fr/IMG/pdf/rapport_final_groupe_traitement_evaluation_logos.pdf; Dubois et al. (2020[8]), "Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomised controlled trial", https://doi.org/10.1007/s11747-020-00723-5.

Extent of coverage

Nutri-Score's extent of coverage has expanded significantly since its inception

Key indicators reflecting the reach of the Nutri-Score to its target population are summarised below. Specifically, between 2018 and 2020:

- Consumer awareness of the logo increased from around 58% to 93% (Sarda, Ducrot and Serry, 2020[16]).
- The proportion of consumers who report changing their purchasing behaviours increased from 26.5% to 57.2% (Sarda, Ducrot and Serry, 2020[16]).
- The number of food companies that adhere to the Nutri-Score increased from 73 to 415 (Oqali, 2020[5]).
- The market share (in sales volume) of food companies that adhere to Nutri-Score increased from 24% to 50% (Oqali, 2020[5]).

Policy options to enhance performance

This section summarises policy options available to policy makers and administrators in settings where Nutri-Score is implemented (or being transferred) to further enhance the performance of this intervention.

Enhancing effectiveness

Optimise the algorithm behind the Nutri-Score. The algorithm behind Nutri-Score is based on the FSA score, and has been validated by scientific researches in France as well as in other European countries (Ministère des solidarités et de la santé, 2021[17]). The algorithm can be adapted to national public health recommendations. For instance, the initial FSA-based algorithm has been modified to reflect the public health recommendations that advocate favouring rapeseed, walnut and olive oils compared to other fats. More concretely, the percent of rapeseed, walnut and olive oils in the products is now included in the positive component "fruits, vegetables, pulses, and nuts" for the score calculation. Future developments of Nutri-Score could consider:

- Adapting and optimising the algorithm to meet each country's national dietary guidelines (e.g. regarding whole grain, oily fish).
- Personalising nutritional scores using new technologies that take into account an individual's preferences such as favouring food products low in salt for customers with heart conditions. For example, certain food retailers in France on their e-commerce platforms use INNIT technology from the United States, which creates "personalised" health food labels.

Criticisms of Nutri-Score point to the limitations of using a single overall score to rate food products. Certain stakeholders argue that information by nutrient is preferable as it provides information that is more comprehensive. However, there are also issues with using comprehensive nutrient labelling – e.g. they are harder to interpret, which may reduce motivation to change consumption behaviour. At present, evidence shows that summary labels (such as Nutri-Score) are more effective than nutrient-specific ones, however, the discussion is ongoing (Ducrot et al., 2016[18]; Dubois et al., 2020[8]).

Improve health literacy levels. Research has shown that low rates of health literacy reduce understanding of nutrition-related information (Campos, Doxey and Hammond, 2011[19]). In 18 OECD countries, at least one-third of the population shows poor health literacy levels, and in 12 of these countries, that proportion is above 50% (Moreira, 2018[20]). A study of health literacy in eight European countries revealed that approximately 47% of the population have either inadequate or problematic health literacy (Sørensen et al., 2015[21]). People with financial deprivation, low social status, low education or old age, are more likely to have higher rates of limited health literacy. To enhance the effectiveness of the Nutri-Score logo, efforts to enhance health literacy (with a focus on nutritional knowledge), particularly among vulnerable groups outlined above, are encouraged (OECD, 2019[22]). Example policies to boost health literacy are in Box 3.3.

Box 3.3. Boosting rates of health literacy

In 2018, OECD released the Health Working Paper "Health literacy for people-centred care". The paper outlined high-level policy options to boost population health literacy such as:

- Counselling and training interventions in community settings and elsewhere (e.g. workplaces)
- Encouraging health literacy in schools, for example by incorporating health literacy into the education curricula
- Media campaigns and website that promote health literacy that are easy to access and navigate.

Source: Moreira (2018[20]), "Health literacy for people-centred care: Where do OECD countries stand?", https://doi.org/10.1787/d8494d3a-en.

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore, policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

Analyse price differences across the different Nutri-Score categories. To date, two studies suggest that the prices of food products with the Nutri-Score logo are no higher than similar products which do not use the logo (Crosetto et al., 2019[7]) (Oqali, 2020[5]) (see "Equity"). These studies compared the price of products with the Nutri-Score logo and those without. A step further would be to analyse the price difference between products with an A or B grade Nutri-Score logo (higher-quality products) and those with a C, D or E grade Nutri-Score logo (lower-quality products). Such analysis would provide important information on whether lower socio-economic groups face barriers to purchasing high-quality food products.

Enhancing the evidence-base

Enhance the evidence-based supporting Nutri-Score using survey-based data. There are a number of experimental studies on FOP food labelling, but studies in real life settings are less common. While experimental studies, using for instance an experimental online supermarket, are indeed useful to study the effect of the logo itself net of other factors that may influence purchase behaviours, they are likely to overestimate the impact of food labelling, with effect sizes 17 times higher on average than those found in real-life condition studies (Dubois et al., 2020[8]).

Food purchases from retail stores are a reliable data source however they are not directly linked to consumption. Further, this type of data cannot be used to analyse the impact of FOP labelling schemes across population groups (for instance, by age, gender and education), except for data using registration to loyalty cards. Future studies using survey-based data on consumption may help enhance the evidence-base supporting Nutri-score, although similar studies tend to suffer from recording errors.

Estimate whether Nutri-Score has an impact on food reformulation. Food manufacturers may respond to labelling schemes by voluntary reformulating their product so that it is more attractive to consumers (e.g. reduce salt or sugar content). Therefore, future studies could examine what, if any, impact Nutri-Score has had on food reformulation (e.g. using data collected by France’s observatory that monitors the quality of food (i.e. Observatoire de la Qualité de l’Alimientation – Oqali)).

Implement strategies to increase affordability. The rise of cheap foods low in nutritional value contributes to high rates of overweight and obesity in poorer populations (e.g. in France, 19.1% of the population are obese in the lowest income quintile compared to 10.3% in the highest income quintile) (Eurostat, 2014[23]). To improve access to high-quality foods, policy makers could partner with retail outlets (e.g. supermarkets) to offer discounts/offers/promotions on products with high grades on the Nutri-Score logo (A or B grades). This would improve equity by making nutritious foods more affordable as well as enhance the extent of coverage.

Enhancing the extent of coverage

Encourage food companies to use the Nutri-Score logo. In 2020, over 400 food companies were engaged in the programme, representing about 50% of the market share in sales volume (Oqali, 2020[5]). In 2021, the number of companies engaged in Nutri-Score increased to about 600 (Santé publique France, 2021[6]). A large majority of products displaying the Nutri-Score logo are own-brand products from major food retailers and national branded products (Oqali, 2020[5]). To increase the number of products with the logo, policy makers could use incentives or other techniques to encourage larger companies to use the logo. It is important to note here that at present there are ongoing discussions at the European level to introduce a streamlined mandatory FOP-labelling scheme.

Extend the Nutri-Score to collective and commercial catering. France is currently working on the roll-out of Nutri-Score to collective and commercial catering (Ministère des solidarités et de la santé, 2021[17]). For example, Nutri-Score has already been introduced in some school canteens in France (Elior Group, 2020[24]). The aim is not to choose products that are only classified A or B and to exclude D and E altogether (for instance cheese, a great source of calcium, is classified D or E), but rather to provide education on healthy eating.

A step further would be to **use the scoring from Nutri-Score to limit the promotion of poor nutritional quality products for vulnerable populations**. For instance, Santé publique France recommends banning advertising targeting children on TV and the internet for food products that are classified D or E (Santé publique France, 2020[25]).

Introduce policies that nudge consumers towards products with a healthier Nutri-Score. For example, after scanning a products barcode, it is possible to present consumers with a healthier alternative (e.g. product with a high Nutri-Score). For example, the NHS Food Scanner (United Kingdom) app allows consumers to scan product barcodes to identify if the item is a “Good choice”, if not, the app suggests alternative products with less saturated fat, sugar and salt, for example (NHS, 2022[26]).

Transferability

This section explores the transferability of Nutri-Score and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring Nutri-Score.

Previous transfers

Nutri-Score was adopted in France in October 2017. Four European countries also adopted Nutri-Score: Belgium in April 2018, Germany and Switzerland in September 2019, and Luxembourg in 2020. These countries are at different stages of implementation. Two countries announced their intention to adopt Nutri-Score – Spain in November 2018 (ongoing debate) and the Netherlands in November 2019 (European Food Agency News, 2021[27]).

Across OECD countries, there are a number of exiting food-labelling schemes. In Europe, the adoption of an EU-wide FOP labelling system is under discussion (European Commission, 2021[28]). Within the framework of the Farm-to-Fork initiative, the European Commission aims to propose a harmonised mandatory FOP food-labelling scheme by the end of 2022. While some countries are in support of the Nutri-Score, other countries, such as Italy, the Czech Republic and Greece, raise concerns about the ratings of certain national food products (e.g. cheese, olive oil) using Nutri-Score. Italy proposed an alternative FOP food-labelling scheme, Nutrinform, which uses battery symbols to indicate the percentage of energy, fats, sugars and salt in a recommended portion of food. Different preferences among European Member States highlights the challenges associated with international governance of a streamlined FOP-labelling scheme.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability are in Annex A.

Several indicators to assess the transferability of Nutri-Score were identified (Table 3.4). Indicators were drawn from international databases and surveys to maximise coverage across OECD and non-OECD European countries. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

The transferability assessment for Nutri-Score is in particular limited given indicators related to the food retail market/consumer behaviour are collected by private research companies and are therefore not available for public use.

Nutri-Score, or similar FOP traffic light labelling schemes, are available in certain OECD/EU countries, therefore results from the transferability assessment can instead be used to identify areas to enhance the impact of the intervention.

Table 3.4. Indicators to assess the transferability of Nutri-Score

Indicator	Reasoning	Interpretation
Sector specific context (retail food sector)		
Current nutrition labelling policies for pre-packaged foods	Nutri-Score is more transferable to countries that have with existing structures in place to support FOP nutrition labels (e.g. regulatory frameworks). Certain countries already have traffic light FOP schemes – therefore results from the assessment are less relevant. Some countries adopt other FOP schemes, which may be less effective than Nutri-Score.	FOP scheme in place = more transferable
Political context		
Operational strategy/action plan/policy to reduce unhealthy eating	Nutri-Score will be more successful in countries with a political priority to address unhealthy eating	"Yes" = more transferable
Economic context		
Prevention expenditure as a percentage of current health expenditure (CHE)	Nutri-Score is a prevention intervention, therefore, it is more transferable to countries that allocate a higher proportion of health spending to prevention	↑ value = more transferable

Source: OECD (2018[29]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[30]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[1]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Results

At present, 26 OECD countries have FOP nutrition labelling schemes: seven countries with Nutri-Score, two countries with a Health Star Rating system (Australia and New Zealand), two countries with a traffic light system per nutrient (Portugal and the United Kingdom), while a further 15 countries use either a mixture of FOP schemes or a different scheme altogether, such as the Nordic Keyhole Logo in Norway, Sweden, Denmark and Iceland (see Table 3.5). These results indicate there are high levels of political support for nutrition food-labelling schemes. Further, the majority of countries have in place a national action plan to reduce levels of unhealthy eating (90%) and spend proportionally more on preventative care than France (1.8% versus 2.6% of current health expenditure) – similarly, these results reflect political support for interventions that encourage people to eat better.

Table 3.5. Transferability assessment by country, Nutri-Score (OECD and non-OECD European countries)

Darker shades indicate Nutri-Score is more transferable to that particular country

Country	FOP* labelling	Mandatory or voluntary FOP**	Unhealthy eating action plan	Prevention expenditure percentage CHE***
France	**Yes**	**V**	**Yes**	**1.80**
Australia	Yes	V	Yes	1.93
Austria	No	None	Yes	2.11
Belgium†	Yes	V	Yes	1.65
Bulgaria	Yes	V	Yes	2.83
Canada	No	None	Yes	5.96
Chile	Yes	M	Yes	n/a
Colombia	No	None	Yes	2.05
Costa Rica	No	None	Yes	0.60
Croatia	Yes	V	Yes	3.16
Cyprus	No	None	No	1.26
Czech Republic	Yes	V	Yes	2.65

Country	FOP* labelling	Mandatory or voluntary FOP**	Unhealthy eating action plan	Prevention expenditure percentage CHE***
France	**Yes**	**V**	**Yes**	**1.80**
Denmark	Yes	V	Yes	2.44
Estonia	No	None	Yes	3.30
Finland	Yes	M	Yes	3.98
Germany†	Yes	V	Yes	3.20
Greece	No	None	No	1.27
Hungary	No	None	Yes	3.04
Iceland	Yes	V	Yes	2.68
Ireland	Yes	V	Yes	2.60
Israel	Yes	M	Yes	0.37
Italy	No	None	Yes	4.41
Japan	No	None	Yes	2.86
Latvia	No	None	Yes	2.58
Lithuania	Yes	V	Yes	2.17
Luxembourg†	Yes	V	Yes	2.18
Malta	No	None	Yes	1.30
Mexico	Yes	M	Yes	2.92
Netherlands	Yes	V	Yes	3.26
New Zealand	Yes	V	No	n/a
Norway	Yes	V	Yes	2.45
Poland	Yes	V	Yes	2.28
Portugal	Yes	V	Yes	1.68
Republic of Korea	Yes	V	Yes	3.48
Romania	No	None	Yes	1.42
Slovak Republic	No	None	Yes	0.77
Slovenia	Yes	V	Yes	3.13
Spain	Yes	V	Yes	2.13
Sweden	Yes	V	No	3.27
Switzerland†	Yes	V	Yes	2.63
Turkey	No	None	Yes	n/a
United Kingdom	Yes	V	Yes	5.08
United States	No	None	Yes	2.91

Note: † = operate Nutri-Score. *FOP = front-of-pack; **M = mandatory; V = voluntary. **CHE = current health expenditure. n/a = no available data. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details).
Source: OECD (2018[29]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[30]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[1]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

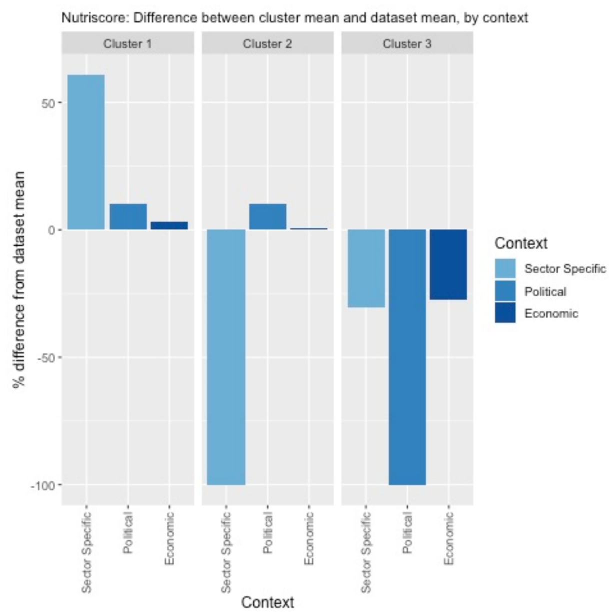
To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 3.4. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 3.9 and Table 3.6:

- Countries in cluster one have sector specific, political and economic arrangements in place to transfer Nutri-Score and therefore have conditions in place to readily transfer Nutri-Score to their local context. This cluster includes France and countries with plans to transfer Nutri-Score to their local country.

- Countries in cluster two, prior to transferring Nutri-Score, would benefit from assessing whether the sector is ready to implement such an intervention (e.g. determining whether front-of-pack labelling is allowed).
- Countries in cluster three would similarly benefit from assessing the sector's readiness to implement Nutri-Score, as well as ensuring that the intervention aligns with overarching political priorities and is affordable in the long-term, given relatively low levels of spending on health prevention.

Figure 3.9. Transferability assessment using clustering, Nutri-Score



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD (2018[29]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[30]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[1]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Table 3.6. Countries by cluster, Nutri-Score

Cluster 1	Cluster 2	Cluster 3
Australia	Austria	Cyprus
Belgium	Canada	Greece
Bulgaria	Colombia	New Zealand
Chile	Costa Rica	Sweden
Croatia	Estonia	
Czech Republic	Hungary	
Denmark	Italy	
Finland	Japan	
France	Latvia	
Germany	Malta	
Iceland	Romania	
Ireland	Slovak Republic	
Israel	Turkey	
Lithuania	United States	
Luxembourg		
Mexico		
Netherlands		

Cluster 1	Cluster 2	Cluster 3
Norway		
Poland		
Portugal		
Republic of Korea		
Slovenia		
Spain		
Switzerland		
United Kingdom		

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of public health interventions, in particular for food labelling schemes such as Nutri-Score given indicators on the food retail market and consumer behaviour are collected by private research companies (e.g. Euromonitor International). Box 3.4 outlines several new indicators policy makers could consider before transferring Nutri-Score.

Box 3.4. New indicators to assess transferability

In addition to the indicators from secondary sources of data outlined above, the following primary source indicators to measure transferability are recommended:

Population context

- What is the level of health literacy in the population?
- What proportion of food consumed is pre-packaged?
- Where do people purchase their food (e.g. supermarkets (online vs in-person), locally in fresh-food markets)?
- What proportion of people report using nutrition food labels to guide food-purchasing decisions?
- What is the impact of the food labelling scheme on different socio-economic groups?

Intervention-specific context (retail food sector)

- What is the effect of the food labelling scheme on the price of products?
- What other, non-nutritional, quality labels already exist on products? (e.g. origin of food product, organic food label)
- What is the level of support among food manufacturers for a food labelling scheme?
- Does the legal and regulatory framework support nutrition food labels?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?
- What would be the effect of the intervention of traditional national products (e.g. olive oil and cheese)?

Economic context

- What is the cost of implementing the intervention in the target setting?
- What would be the economic impact on food producers and retailers particularly for certain national food products (such as cheese, olive oil)?

Conclusion and next steps

The Nutri-Score FOP labelling scheme is a best practice NCD intervention targeting unhealthy diets. Nutri-Score aligns with international evidence which states logos should be visible (e.g. large and front-of-package) and easily interpretable (WHO, 2019[31]). For this reason, a larger number of people can interpret the Nutri-Score logo, which may be reflected by growing consumer awareness. Evidence on the impact of Nutri-Score indicates it successfully reduces the number of calories people purchase, further, the impact was assessed using high-quality evidence (i.e. RCT).

Using OECD's SPHeP-NCD model, it is estimated that Nutri-Score would lead to 12 LYs gained and 17 DALYs gained per 100 000 people per year over the period 2021-50 in France. By reducing disease incidence, Nutri-Score is expected to lead to total health expenditure savings of EUR 17.34 per person by 2050, also in France. Across all OECD and EU27 countries, Nutri-Score would not only be cost effective, but also cost saving.

An assessment of Nutri-Score's performance against the best practice criteria highlighted potential areas for improvement. These include, but are not limited to, enhancing levels of health literacy, analysing price differences across different Nutri-Score products, improving affordability of products with a high Nutri-Score.

Based on available information, Nutri-Score is considered broadly transferable – however, the difficulty associated with streamlining mandatory FOP-labelling across Europe is acknowledged. At present, six OECD European countries have adopted, or are in process to adopt, Nutri-Score, several other countries have a FOP label with a traffic light per nutrient, while others use health food logos or nutrient labelling schemes. An assessment of the Nutri-Score's transferability potential was limited given relevant indicators (e.g. related to the food retail market) are collected by private research companies and not available for public use. Therefore, countries interested in transferring Nutri-Score should undertake their own assessment based on indicators outline in this document.

Box 3.5 outlines next steps for policy makers and funding agencies regarding PAP.

Box 3.5. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance Nutri-Score are listed below:

- Support policy efforts to enhance population health literacy to encourage people to make healthy choices (such as purchasing products with a high Nutri-Score)
- Support and encourage food companies to use the Nutri-Score label, to improve coverage
- Promote findings from the Nutri-Score case study to understand what countries are interested in transferring the intervention
- Continue to invest in complementary prevention policies, such as procurement policies and regulation of food advertisement to children that help build healthier environments encouraging people to do physical activity and eat well.

References

Allais, O. et al. (2017), *Évaluation Expérimentation Logos Nutritionnels, Rapport pour le FFAS*, https://solidarites-sante.gouv.fr/IMG/pdf/rapport_final_groupe_traitement_evaluation_logos.pdf. [10]

Campos, S., J. Doxey and D. Hammond (2011), “Nutrition labels on pre-packaged foods: a systematic review”, *Public Health Nutrition*, Vol. 14/8, pp. 1496-1506, https://doi.org/10.1017/s1368980010003290. [19]

Cecchini, M. and L. Warin (2015), “Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies”, *Obesity Reviews*, Vol. 17/3, pp. 201-210, https://doi.org/10.1111/obr.12364. [3]

Crosetto, P. et al. (2019), “Nutritional and economic impact of five alternative front-of-pack nutritional labels: experimental evidence”, *European Review of Agricultural Economics*, Vol. 47/2, pp. 785-818, https://doi.org/10.1093/erae/jbz037. [7]

Crosetto, P. et al. (2017), “Modification des achats alimentaires en réponse à cinq logos nutritionnels”, *Cahiers de Nutrition et de Dietetique*, Vol. 52/3, pp. 129-133, https://doi.org/10.1016/J.CND.2017.04.002. [13]

Dubois, P. et al. (2020), “Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomized controlled trial”, *Journal of the Academy of Marketing Science*, Vol. 49/1, pp. 119-138, https://doi.org/10.1007/s11747-020-00723-5. [8]

Ducrot, P. et al. (2016), “Impact of Different Front-of-Pack Nutrition Labels on Consumer Purchasing Intentions”, *American Journal of Preventive Medicine*, Vol. 50/5, pp. 627-636, https://doi.org/10.1016/j.amepre.2015.10.020. [18]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [15]

Elior Group (2020), *Elior rolls out the Nutri-Score label in school canteens, a first in contract catering*, https://www.eliorgroup.com/press/press-releases/elior-rolls-out-nutri-score-label-school-canteens-first-contract-catering (accessed on 30 June 2021). [24]

European Commission (2021), *Nutrition labelling*, https://ec.europa.eu/food/food/labelling-and-nutrition/food-information-consumers-legislation/nutrition-labelling_en (accessed on 1 July 2021). [28]

European Food Agency News (2021), *Nutri-Score, the Spanish government splits up*, https://www.efanews.eu/en/item/17737-nutri-score-the-spanish-government-splits-up.html (accessed on 1 July 2021). [27]

Eurostat (2014), *Body mass index (BMI) by sex, age and income quintile*. [23]

Hall, D. (2011), *How Much Does a Good Wellness Program Cost?*, https://blog.wellsource.com/much-good-wellness-program-cost (accessed on 1 July 2021). [32]

Kloss, L. et al. (2015), *Sodium intake and its reduction by food reformulation in the European Union - A review*, Elsevier GmbH, https://doi.org/10.1016/j.nfs.2015.03.001. [11]

Lobstein, T., M. Neveux and J. Landon (2020), "Costs, equity and acceptability of three policies to prevent obesity: A narrative review to support policy development", *Obesity Science & Practice*, Vol. 6/5, pp. 562-583, https://doi.org/10.1002/OSP4.423. [12]

Ministère des Solidarités et de la Santé (2020), *Etudes et rapports scientifiques*, https://solidarites-sante.gouv.fr/prevention-en-sante/preserver-sa-sante/nutrition/nutri-score/etudes-et-rapports-scientifiques/ (accessed on 30 June 2021). [4]

Ministère des solidarités et de la santé (2021), *NUTRI-SCORE ÉVALUATION À 3 ANS DU LOGO NUTRITIONNEL NUTRI-SCORE*. [17]

Moreira, L. (2018), "Health literacy for people-centred care: Where do OECD countries stand?", *OECD Health Working Papers*, No. 107, OECD Publishing, Paris, https://doi.org/10.1787/d8494d3a-en. [20]

NHS (2022), *Better Health, healthier families*, https://www.nhs.uk/healthier-families/food-facts/nhs-food-scanner-app/. [26]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [22]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [1]

OECD (2018), *Preventative care spending as a proportion of current health expenditure*, OECD, Paris. [29]

OECD (2017), *Obesity Update 2017*, OECD, Paris, http://www.oecd.org/health/obesity-update.htm (accessed on 24 May 2018). [2]

Oqali (2020), *Suivi du NUTRI-SCORE par l'Oqali, Analyse à trois ans, Edition 2020*. [5]

Santé publique France (2021), *7 pays européens se sont engagés à faciliter le déploiement du Nutri-Score*, https://www.santepubliquefrance.fr/presse/2021/7-pays-europeens-se-sont-engages-a-faciliter-le-deploiement-du-nutri-score (accessed on 5 March 2021). [9]

Santé publique France (2021), *Le Nutri-Score : un logo bien intégré dans le quotidien des Français*, https://www.santepubliquefrance.fr/les-actualites/2021/le-nutri-score-un-logo-bien-integre-dans-le-quotidien-des-francais (accessed on 8 June 2021). [33]

Santé publique France (2021), *Nutri-Score*, https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/articles/nutri-score (accessed on 30 June 2021). [6]

Santé publique France (2020), *Comment limiter le marketing alimentaire, en particulier pour les produits gras, sucrés, salés en direction des enfants et des adolescents ?*, https://www.santepubliquefrance.fr/les-actualites/2020/comment-limiter-le-marketing-alimentaire-en-particulier-pour-les-produits-gras-sucres-sales-en-direction-des-enfants-et-des-adolescents (accessed on 19 July 2021). [25]

Sarda, B., P. Ducrot and A. Serry (2020), *Nutri-Score : Évolution de sa notoriété, sa perception et son impact sur les comportements d'achat déclarés entre 2018 et 2020*, Santé Publique France, Saint-Maurice, https://www.santepubliquefrance.fr/determinants-de-sante/nutrition-et-activite-physique/documents/enquetes-etudes/nutri-score-evolution-de-sa-notoriete-sa-perception-et-son-impact-sur-les-comportements-d-achat-declares-entre-2018-et-2020 (accessed on 9 March 2021). [16]

Sarda, B. et al. (2020), "Appropriation of the front-of-pack nutrition label nutri-score across the french population: Evolution of awareness, support, and purchasing behaviors between 2018 and 2019", *Nutrients*, Vol. 12/9, pp. 1-12, https://doi.org/10.3390/nu12092887. [14]

Sørensen, K. et al. (2015), "Health literacy in Europe: Comparative results of the European health literacy survey (HLS-EU)", *European Journal of Public Health*, Vol. 25/6, pp. 1053-1058, https://doi.org/10.1093/eurpub/ckv043. [21]

WHO (2019), *Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)*, https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en. [30]

WHO (2019), *Guiding principles and framework manuel for front-of-pack labelling for promoting healthy diet*, Department of Nutrition for Health and Development, https://www.who.int/nutrition/publications/policies/guidingprinciples-labelling-promoting-healthydiet.pdf?ua=1. [31]

Annex 3.A. Modelling assumptions for Nutri-Score

Annex Table 3.A.1. Parameters to model the impact of Nutri-Score

Model parameters	Nutri-Score model inputs
Effectiveness	-0.86% decline in BMI as a result of a 3% calorie reduction (Allais et al., 2017[10]). The resulting change in calorie intake is converted into changes in body-mass index (BMI), by using the methodology developed by (Hall, 2011[32]). Information on converting the 3% calorie reduction to -0.86% is provided below: • We assumed that total calories of the basket of labelled product decrease by -3.0% [-4.64%; -1.36%] based on exchanges with the authors of (Allais et al., 2017[10]). • The study only looks at four types of products (breads, pastry; ready meals; fresh catering; pastries). We assume that the effect observed on these products can be generalised to other types of products that are labelled. • The report notes that 54.6% of the product purchased are labelled. This is aligned with recent findings from OQALI that states that 50% of firms adhere to Nutri-Score. • Evidence from (Allais et al., 2017[10]) only applies to shopping in supermarkets, and excludes calories consumed while eating out, as well as food purchased in smaller shops/farmer's markets. Therefore, we have made a simplifying assumption that this reduction will apply to 80% of calories consumed**.** • In addition, the studies reviewed mostly applied to processed foods only, and therefore we make an assumption that the reduction will only apply to the foods in this group. Based on another study, processed and highly processed foods account for about 65% of all calories consumed in European countries. • Therefore, the final parameter to model the effectiveness of food labelling intervention on the total calorie consumption is assumed to be -0.86% (-3.0%*0.55*0.8*0.65= -0.86%).
Time to maximum effectiveness	The effect increases over 2 years and then plateaus, this is in line with the fact that food companies who engaged, have 2 years to put in place the logo on the food products
Target age	Whole population aged at least one year
Exposure	53% of the whole population (Santé publique France, 2021[33])
Per capita cost, EUR	Nutri-Score costs EUR 0.021 per capita in France The cost of implementation of Nutri-Score (borne by the government) is composed of: (1) a pre-implementation cost that is related to evaluation, desk research, policy administration and planning in the preparatory phase before the actual implementation of the logo; and (2) a post-implementation cost which accounts for monitoring of the roll-out, evaluation, legal advice, and communication. The cost does not include the evaluation of the effectiveness of Nutri-Score against other logos (e.g. cost for running a random control trial study). And, it does not account for the additional costs associated with designing and printing nutrition labels or for the potential cost associated with the reformulation of certain foods, likely to be borne by the private sector. The implementation costs are evaluated based on data provided by Santé publique France, the Ministry of Health and the OQALI institute in charge of monitoring the overall food supply and measuring changes in nutritional quality. All costs are expressed in 2019 Euros.

4 Physical Activity on Prescription

This chapter covers the case study of Physical Activity on Prescription (PAP), a programme in Sweden where health professionals write individualised prescriptions for physical activity to patients. The case study includes an assessment of PAP against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Physical Activity on Prescription (PAP): Case study overview

Description: Under the Swedish PAP programme, health professionals write individualised prescriptions for physical activity based on the patient's health status, motivation, prior experiences and preferences. A handbook is available detailing the latest evidence on physical activity and its impact on specific diseases. After the prescription, a follow-up meeting is used to adjust the prescription and foster motivation.

Best practice assessment:

Table 4.1. OECD best practice assessment of Physical Activity on Prescription

Criteria	Assessment
Effectiveness	The implementation of PAP with a coverage rate of 2.39% in Sweden is estimated to result in a cumulative gain of 10 995 LYs and 13 113 DALY by 2050.
Efficiency	Due to its low cost, the PAP intervention is cost saving, with a net saving of approximately SEK 91 000 (EUR 9 000) per DALY gained.
Equity	Data from the region of Stockholm suggest that PAP reaches people across socio-economic groups. However, as implementation of the intervention is decentralised, variation across the regions risks creating inequalities.
Evidence-base	The RCT upon which the effectiveness modelling parameters are based is rated as strong, and there are a large number of other RCTs and observational studies of the PAP programme. An evidence-based handbook with physical activity recommendations was developed and is regularly being updated.
Extent of coverage	In 2019, 45 000 prescriptions for physical activity were prescribed in primary care, equating to 5.6 prescriptions per 1 000 population. However, in some regions the coverage rate was considerably higher.

Enhancement options: Evidence suggests that there are a number of factors that can enhance the effectiveness of the intervention, such as prescribing a higher frequency of physical activity rather than intensity. To enhance the equity of the intervention, a national register can help provide the information needed to ensure that the programme is implemented effectively and equitably in all regions. A high population coverage is crucial for this intervention, and can be enhanced by increasing knowledge and affirmative attitude among the health care professionals, clear and supportive management for the intervention, putting in place supporting structures, and potentially through incentives.

Transferability: Transfer of the Swedish PAP intervention to nine other European countries has already started under the EU-funded "European Physical Activity on Prescription Model" project (EUPAP). Based on publically available indicators, many countries have structures and policies in place to support PAP.

Conclusion: PAP is a cost-effective, evidence-based intervention which can help increase physical activity, prevent disease and reduce health care expenditures.

Intervention description

For almost 20 years, Sweden has used the physical activity on prescription (PAP) intervention to address low levels of physical activity in the adult population (Onerup et al., 2019[1]). The intervention is currently being transferred to nine other EU countries as part of EUPAP – a three-year project co-funded by the European Commission (EUPAP.org, n.d.[2]).

The intervention consists of five key components (EUPAP, 2020[3]):

- Person-centred individualised counselling

- Written prescription
- Evidence based physical activity recommendation
- Follow-up
- Supporting environment, community-based network.

The person-centred individualised counselling is central to the intervention, providing patients with a personalised advice that takes into account their health status, motivation, prior experiences and preferences (EUPAP, 2020[3]). This advice is given as a written prescription (see 0) and documented in the patient's medical file. It includes the recommended type and dose of physical activity, possible contraindications and a plan for follow-up. To ensure that the prescription is evidence-based, a handbook is available to prescribers (Box 4.1). Follow-up, in person or via phone, letter or email, is used to adjust the prescription and foster motivation. This generally takes place once after six months. Finally, the patient can be referred to structured exercise through a community-based network of activity organisers, such as NGOs, public or private facilities. However, it is important to note that in most cases the physical activity agreed upon in the prescription is handled and paid for by the patient, outside the health care system.

While there are no formal referral criteria, prescriptions are generally written for people who are insufficiently physically active, have overweight or who have chronic conditions that would benefit from increased physical activity.

The execution of the PAP intervention differs across regions in Sweden. While many prescriptions come from primary health care providers, all licensed Swedish health care professionals may prescribe PAP (Onerup et al. (2019[1]) and EUPAP (2020[3])). This includes for example community nurses, physiotherapists, midwifes, dietitians, specialist doctors and psychologists. In some cases, specific PAP coaches or PAP-co-ordinators are available. Moreover, local collaborations between health care services and activity organisers can be set up. There are no requirements or incentives to prescribers to participate in the programme.

While there is no central funding for the PAP programme, in some cases funding is available from specific projects or for certain diagnoses, or through agreements between regions and sports federations or facilities. Resources made available for the programme include a prescription form (see 0) and the handbook (see Box 4.1). These are updated regularly, as the PAP programme in general is continuously under development.

Box 4.1. The FYSS (Physical activity in Disease Prevention and Treatment) handbook

The FYSS (Physical activity in Disease Prevention and Treatment) handbook consists of 53 chapters, each providing an overview of the evidence of how physical activity can help prevent or manage a specific condition.

The production of the book has taken place more or less non-stop for the last 20 years. The first edition was published in 2003, while the second edition came out 2008 and the third in 2017. The fourth edition is to be published later in 2021. The work is performed by a steering committee (YFA) which is a working group within the Swedish Society of Exercise and Sports Medicine (part of the Swedish Medical Association). The steering committee, consisting of 7-10 specialists (medical doctors, professors, personal trainers) co-ordinate the work, with more than 100 experts writing the different chapters.

The process has been supported by grants from the Swedish Bureau of Health and Welfare, and also by the Norwegian Public Health Agency. The book has a budget of around SEK 6-8 million (EUR 600 000) for each version, covering writers fees and administration.

An online version is available on the website www.fyss.se, and a paperback version can be ordered from the website of the YFA. For copyright reasons, currently 33 of 53 FYSS chapters are available on the website, but in the long run all chapters will be freely available.

For the EUPAP programme, which aims to transfer the Swedish PAP model to other European countries, a concise, English-language version was created: the FYSS-short. This version covers 32 diagnoses and has been systematically compiled with uniform terminology and evidence-based recommendations. All of the diagnosis chapters in FYSS-short are organised into five sections:

- **Prevention**: this section presents any evidence to suggest that physical activity can prevent the condition.
- **Indication**: this section notes whether physical activity is indicated or recommended for someone with this particular diagnosis.
- **Effects of physical activity**: this section provides evidence of the effects of physical activity on the condition, covering both "acute effects" (during and directly after exercising) and the effects of regular physical activity over a longer period of time.
- **Recommended physical activity**: this section provides specific recommendations in terms of doses and types of physical activity for each specific diagnosis.
- **Diagnosis-specific advice**: this section provides disease-specific advice that is particularly important to follow, such as intensity, medical supervision (e.g. cardiac monitoring), instructor-led exercise, managed by a physiotherapist or exercise scientist, warm up/cool down, progress, medication, pain, motivational issues, equipment and dietary issues.

Source: YFA (2022[4]), "FYSS – vägen till bättre folkhälsa", https://www.yfa.se/fyss/vad-ar-fyss/; FYSS (2022[5]), "FYSS – EVIDENSBASERAD KUNSKAPSBAS", https://www.fyss.se/.

OECD Best Practices Framework assessment

This section analyses PAP against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 4.2 for a high-level assessment of PAP). Further details on the OECD Framework can be found in Annex A.

Box 4.2. Assessment of PAP, Sweden

Effectiveness

- The implementation of PAP with the current coverage rate of 0.56% in Sweden is estimated to result in a cumulative total gain of 737 life years (LY) and 979 disability-adjusted life years (DALYs) by 2050
- At a higher coverage rate of 2.39%, PAP is estimated to result in a cumulative gain of 10 995 LYs and 13 113 DALY by 2050

Efficiency

- At a coverage rate of 2.39%, PAP would lead to cumulative health expenditure savings of EUR 19.37 (SEK 205.06) per person by 2050 or EUR 1.03 on average per person, per year, in Sweden
- At a net saving of approximately SEK 91 000 (EUR 9 000) per DALY gained, the PAP intervention is cost-saving

Equity

- Data from the region of Stockholm suggest that PAP reaches people across socio-economic groups
- However, as implementation of the programme is decentralised, there is large variation across the regions, which risks creating inequalities

Evidence-base

- The randomised control trial (RCT) upon which the effectiveness modelling parameters are based in rated as strong by the *Quality Assessment Tool for Quantitative Studies*
- A large number of other RCTs and observational studies of the PAP intervention exist, and a five-year follow-up study is currently underway to understand the long-term impact
- To ensure that the prescribed PA is evidence-based, a handbook with physical activity recommendations was developed and is regularly updated

Extent of coverage

- In 2019, 45 000 prescriptions for physical activity were prescribed in primary care, equating to 5.6 prescriptions per 1 000 population, or approximately 14.1 prescriptions per 1 000 eligible people
- In some regions the coverage rate is up to eight times higher than the national average

Effectiveness

A randomised controlled trial (RCT) of the PAP programme found that individuals who received the PAP intervention increased their physical activity level by 159 minutes of (at least) moderate-intensity activity per week, from a baseline of 120 minutes, compared to no change in the control group. Using a weight of four METs for moderate intensity activities (WHO, n.d.[6]), this equates to an increase of 636 MET-minutes per week (approximately one hour of running per week, at 10 kilometres per hour). In addition, they report that body-mass index (BMI) decreased by 0.6 in the intervention group, compared to 0.2 in the controls. A decrease of 0.4 BMI points can therefore be attributed to the intervention (Kallings et al., 2009[7]) (Sjögren et al., 2012[8]).

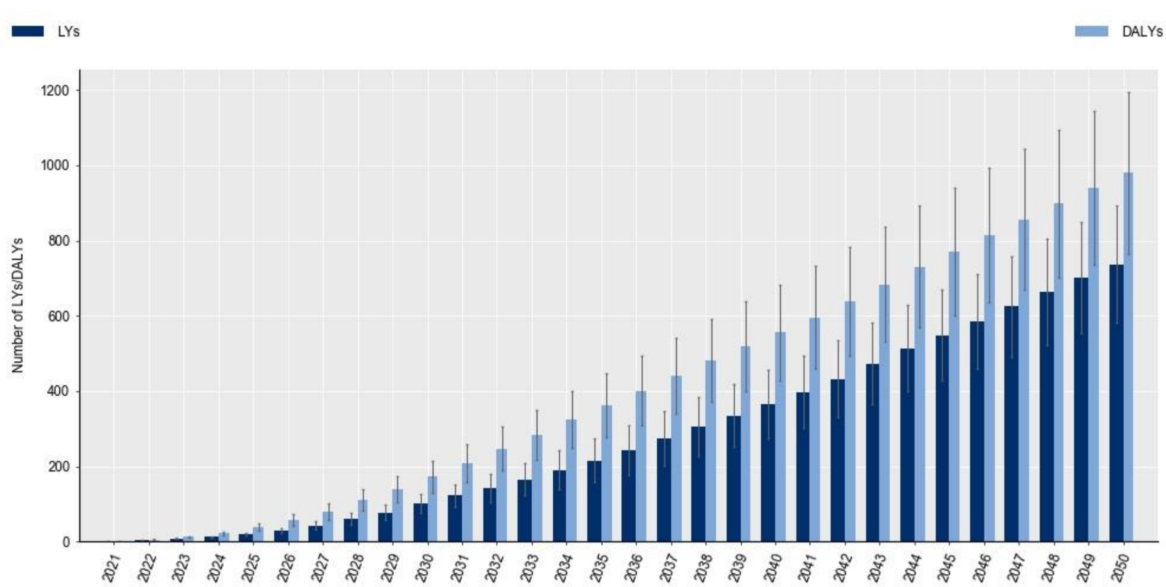
These results were used to estimate the potential impact of the PAP programme on population health and the economy if scaled-up and transferred to all OECD and EU27 countries up until year 2050, using the OECD SPHeP-NCDs model. This microsimulation model compared a "business-as-usual" scenario, to a scenario where all countries implement the PAP programme, to be able to measure the difference in health and economic outcomes. The results presented in this section (Effectiveness) and the next (Efficiency) are based on this modelling exercise (see Annex 4.B for more details on modelling assumptions).

The coverage rate of the intervention in Sweden is about 5.6 prescriptions per 1 000 population (0.56%). Assuming 40% of the adult population is eligible for the PAP scheme, the exposure would be 14.1 prescriptions per 1 000 of eligible people. This uptake is relatively low. Therefore, a higher coverage rate was also explored. In the region of Norrbotten, overall population coverage rate was 23.9 per 1 000 population (2.39%), or 59.7 per 1 000 eligible population. The scenario with a 0.56% coverage rate was modelled only for Sweden, to show the current impact the programme has. The scenario with a 2.39% coverage rate was used for Sweden and all other countries to compare the potential impact the programme could have. (Note that the 2.39% scenario is considered the main scenario, and that any results refer to this scenario unless specifically stated that the coverage rate is 0.56%.)

Sweden

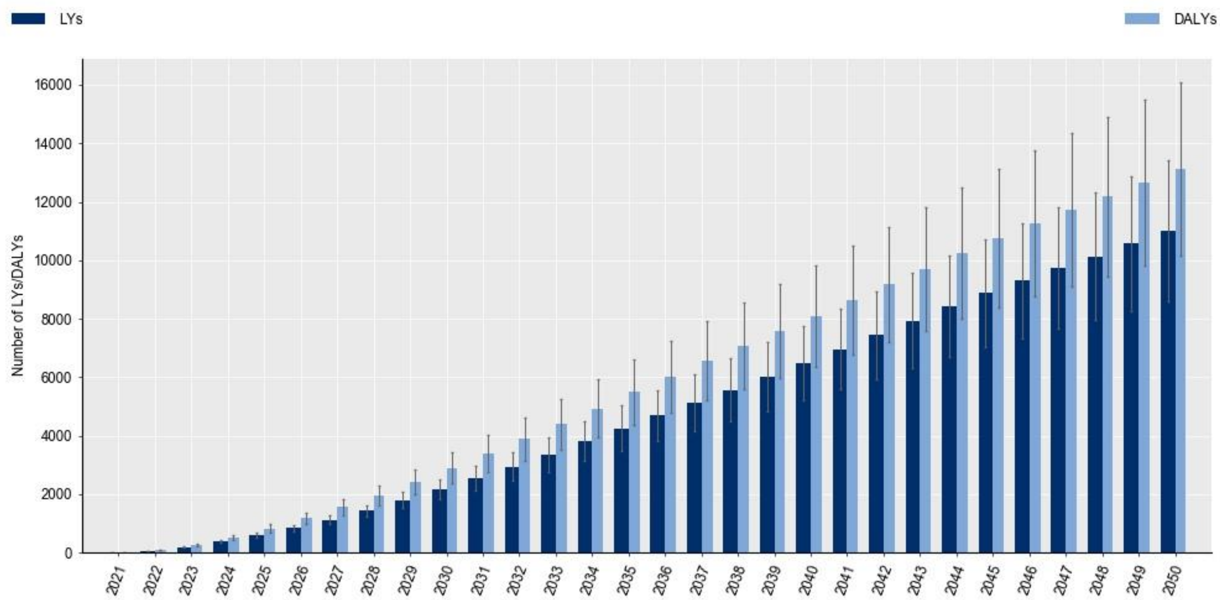
With the current coverage rate of 0.56%, the PAP programme is estimated to result in a cumulative gain of 737 life years (LY) and 979 disability-adjusted life years (DALYs) by 2050 (Figure 4.1). The implementation of PAP with a coverage rate of 2.39% in Sweden is estimated to gain a cumulative total of 10 995 LYs and 13 113 DALYs by 2050 (Figure 4.2). This translates into a rate of 5.62 and 6.61 DALYs gained per 100 000 people, on average, per year over the period 2021-50.

Figure 4.1. Cumulative number of LYs and DALYs gained (2021-50) – PAP, Sweden (0.56% coverage rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

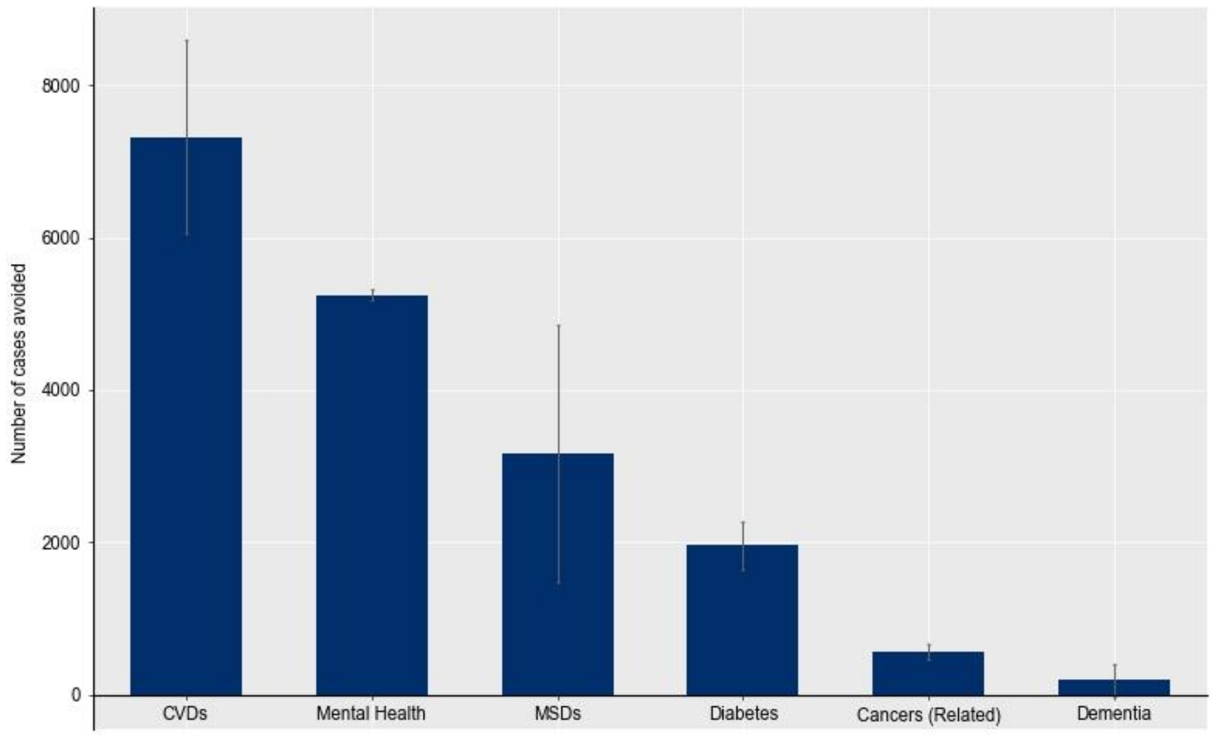
Figure 4.2. Cumulative number of LYs and DALYs gained (2021-50) – PAP, Sweden (2.39% coverage rate)



Note: The black lines represent 95% confidence intervals. Figures are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, PAP is expected to have the greatest impact on cardiovascular diseases (CVDs), mental health conditions and musculoskeletal disorders (MSDs) (Figure 4.3). Between 2021 and 2050, the number of CVD cases is estimated to be reduced by 7 316 cases due to the PAP intervention. Other diseases affected include diabetes, dementia and several cancers.

Figure 4.3. Cumulative number of disease cases avoided by 2050 – PAP, Sweden (2.39% coverage rate)

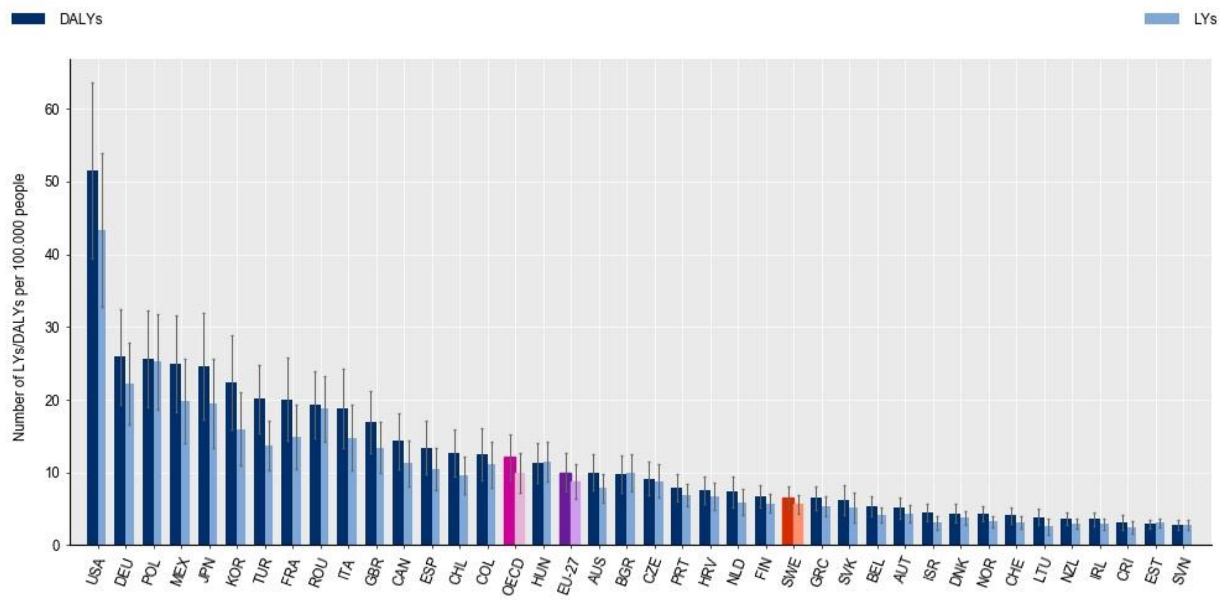


Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Transferring PAP to all OECD and EU27 countries, with a coverage rate of 2.39%, is estimated to result in 9.90 and 8.76 LYs gained per 100 000 people, respectively, on average per year between 2021 and 2050 (Figure 4.4). For DALYs, gains are even higher at 12.10 for OECD and 10.01 for EU27 countries. The impact is as high as 51.55 DALYs per 100 000 in the United States. On the other hand, in some smaller countries like Malta, Iceland, Cyprus, Latvia and Luxembourg, the low coverage rate means that the effects of the intervention were not significant.

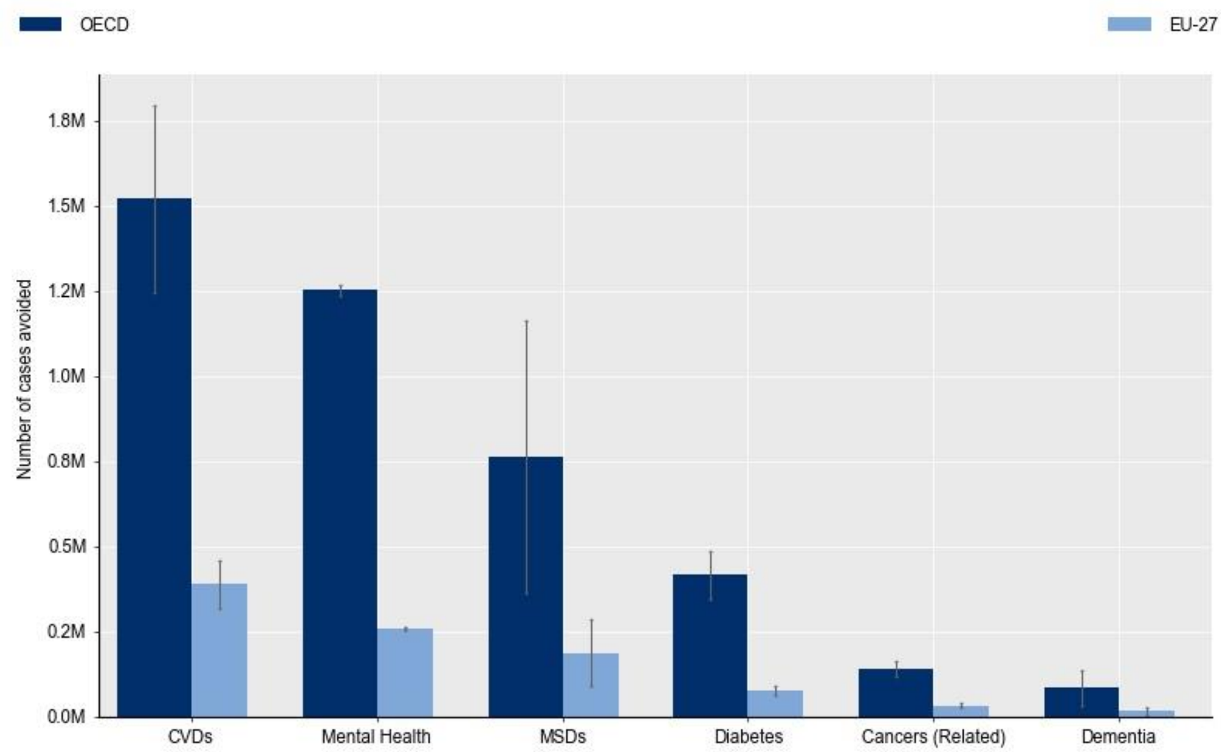
Figure 4.4. LYs and DALYs gained annually per 100 000 people, 2021-50 – PAP, all countries (2.39% coverage rate)



Note: The black lines represent 95% confidence intervals. Results for Cyprus, Iceland, Malta, Latvia and Luxembourg were not significant.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, in OECD countries, PAP would have the greatest impact on cardiovascular diseases (CVD), reducing the number of cases by 1.5 million between 2021 and 2050 (Figure 4.5). The OECD total is considerably higher than the EU27, as the OECD includes a number of large countries with high impacts, such as Mexico, the United States, and Japan. In the EU27, PAP is estimate to prevent 0.39 million cases of CVDs over 2021 to 2050.

Figure 4.5. Total disease cases avoided, between 2021 and 2050 – PAP, OECD and EU27 countries (2.39% coverage rate)



Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

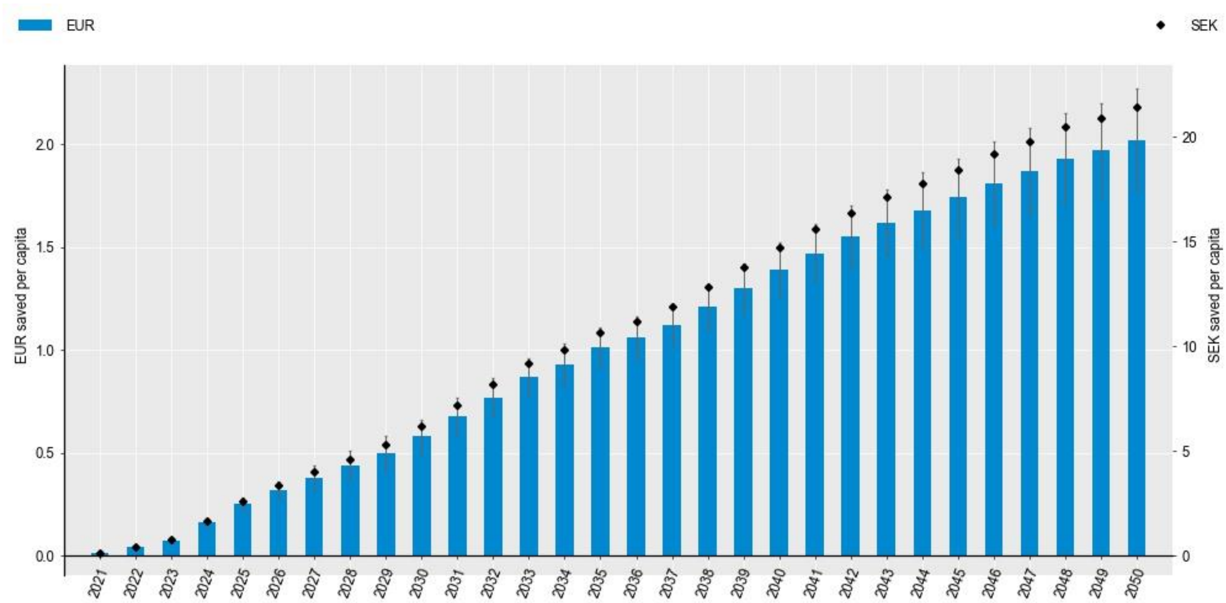
Efficiency

Similar to "Effectiveness", this section presents results for the Sweden followed by remaining OECD and non-OECD European countries.

Sweden

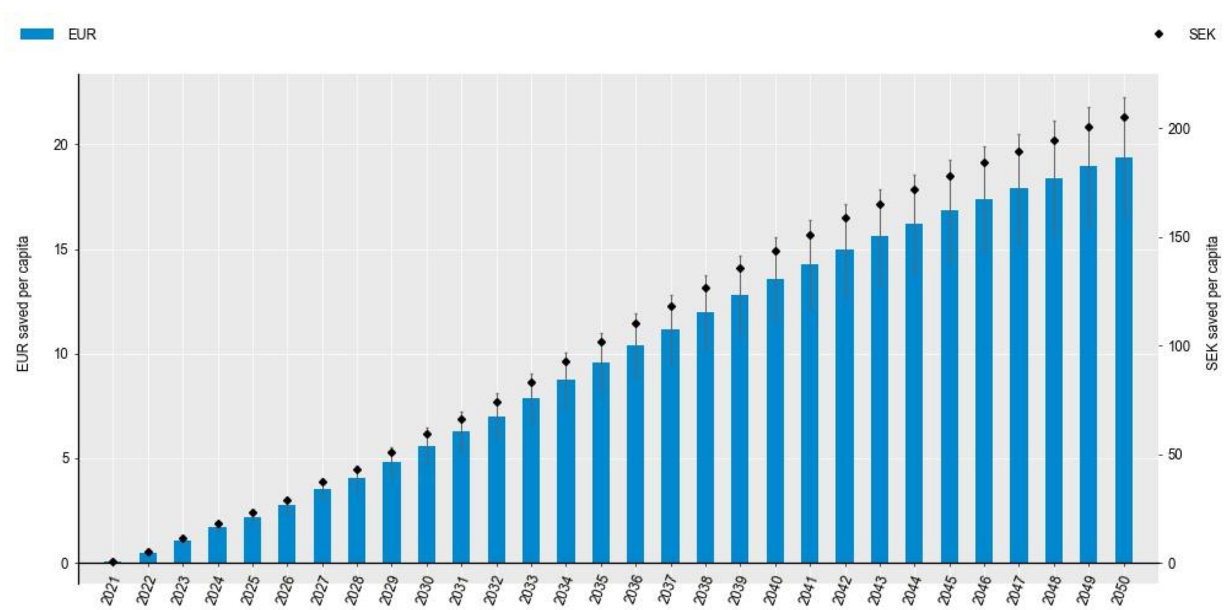
By improving levels of physical activity, PAP can reduce health care costs. At the current coverage rate of 0.56%, over the modelled period of 2021-50, the OECD-SPHeP NCD model estimates that PAP would lead to cumulative health expenditure savings of EUR 2.02 (SEK 21.42) per person by 2050 (Figure 4.6). A coverage rate of 2.39% would lead to considerably higher cumulative health expenditure savings, of EUR 19.37 (SEK 205.06) per person by 2050 (Figure 4.7) or EUR 1.03 on average per person, per year. Cost savings however are to an extent offset by intervention operating costs (see Table 4.2).

Figure 4.6. Cumulative health expenditure savings per person, EUR, 2021-50 – PAP, Sweden (0.56% coverage rate)



Note: The black lines represent 95% confidence intervals; values are discounted at 3% annually.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Figure 4.7. Cumulative health expenditure savings per person, EUR, 2021-50 – PAP, Sweden (2.39% coverage rate)

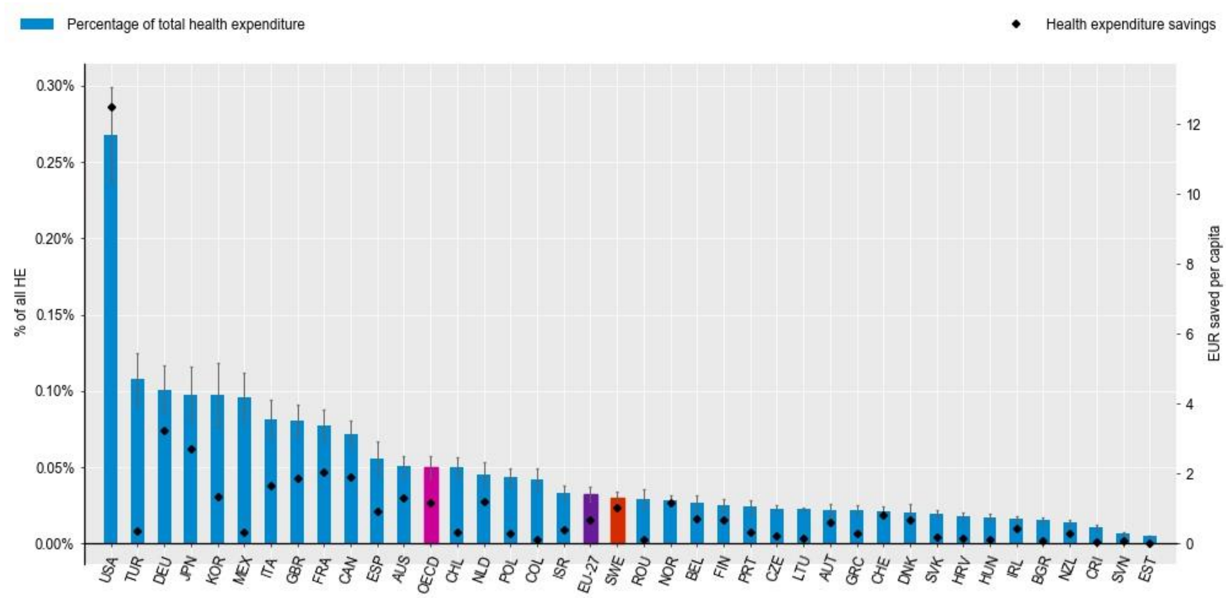


Note: The black lines represent 95% confidence intervals; values are discounted at 3% annually.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Average annual health expenditure (HE) savings as a proportion of total HE is around 0.03% for EU27 countries, and 0.05% for OECD countries, at a coverage rate of 2.39% (Figure 4.8). On a per capita basis, this translates into average annual savings of EUR 0.67 and EUR 1.16 for EU27 and OECD countries, respectively. The impact on health care expenditure in the United States is considerably larger than in other countries, which is driven both by the large impact on health and high health care cost.

Figure 4.8. Health expenditure (HE) savings as a percentage of total HE and per capita (EUR), average 2021-50 – PAP, all countries (2.39% coverage rate)



Note: The black lines represent 95% confidence intervals. Results for Cyprus, Iceland, Malta, Latvia and Luxembourg were not significant.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Table 4.2 provides information on intervention costs, total health expenditure savings and the cost per DALY gained in local currency for OECD and non-OECD European countries. In most countries, PAP is cost-saving (i.e. there is a negative cost per DALY gained). In all countries PAP is considered cost-effective with the cost per DALY far below the average cost-effectiveness threshold applied in European countries (i.e. EUR 50 000 based on (Vallejo-Torres et al., 2016[9]). This is largely due to the low cost of the intervention.

Table 4.2. Cost effectiveness figures in local currency – PAP, all countries (2.39% coverage rate)

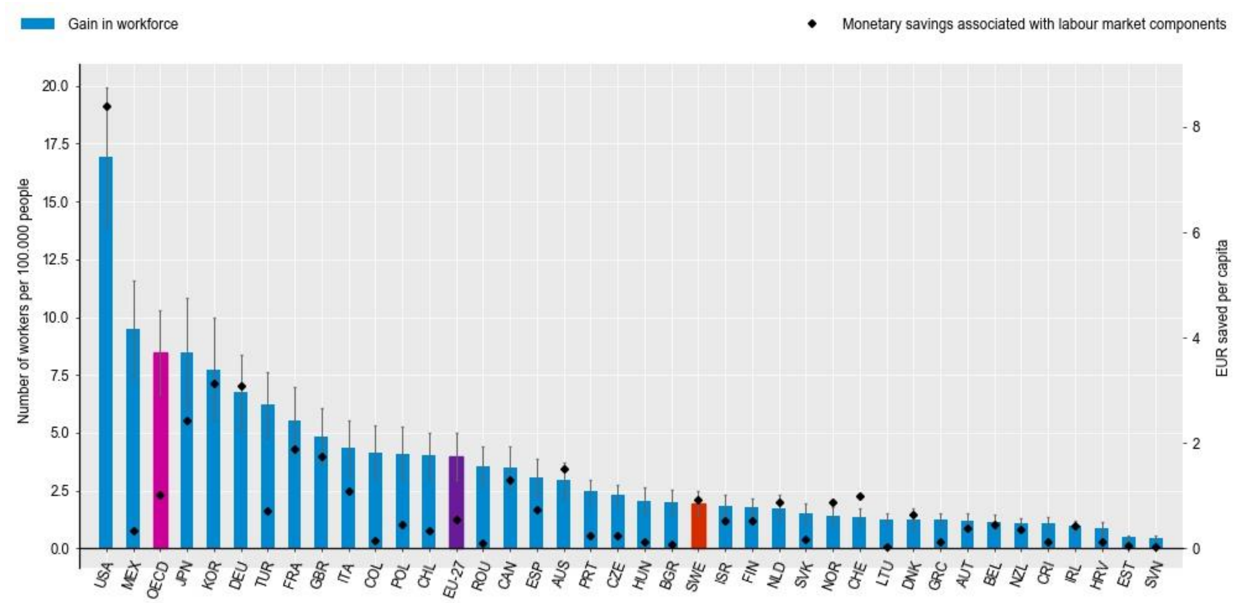
Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Australia	AUD	1.48	62 646 363	Cost saving
Austria	EUR	0.44	5 509 234	Cost saving
Belgium	EUR	0.45	8 856 137	Cost saving
Bulgaria	BGN	0.22	1 067 921	411
Canada	CAD	1.37	116 464 815	Cost saving
Chile	CLF	245.08	5 314 162 395	Cost saving
Colombia	COP	632.3	25 429 120 003	1 239 432

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Costa Rica	CRC	103.19	197 430 561	2 116 606
Croatia	HRK	1.17	4 024 441	1 591
Czech Republic	CZK	5.23	62 726 895	Cost saving
Denmark	DKK	3.8	30 391 196	Cost saving
Estonia	EUR	0.15	32 125	4 120
Finland	EUR	0.46	3 844 272	Cost saving
France	EUR	1.19	140 174 902	Cost saving
Germany	EUR	1.15	257 243 029	Cost saving
Greece	EUR	0.31	2 906 213	464
Hungary	HUF	50.88	392 154 086	66 079
Ireland	EUR	0.37	2 231 457	Cost saving
Israel	ILS	1.86	17 338 079	6 496
Italy	EUR	0.91	95 979 662	Cost saving
Japan	JPY	115.43	38 048 054 235	Cost saving
Korea	KRW	842.54	89 851 794 792	Cost saving
Lithuania	EUR	0.14	438 553	Cost saving
Mexico	MXN	9.53	1 083 401 157	9 278
Netherlands	EUR	0.56	21 389 850	Cost saving
New Zealand	NZD	0.58	2 517 493	2 883
Norway	NOK	5.78	69 603 206	Cost saving
Poland	PLN	1.05	45 261 027	Cost saving
Portugal	EUR	0.3	3 290 442	Cost saving
Romania	RON	0.73	10 730 606	518
Slovak Republic	EUR	0.17	908 205	Cost saving
Slovenia	EUR	0.17	165 225	3 215
Spain	EUR	0.7	42 493 946	Cost saving
Sweden	SEK	4.91	120 193 131	Cost saving
Switzerland	CHE	0.64	8 550 738	Cost saving
Turkey	TRY	1.68	213 713 413	Cost saving
United Kingdom	GBP	0.93	117 403 932	Cost saving
United States	USD	3.92	5 137 720 257	Cost saving

* Cost per DALY (disability-adjusted life year) gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50. Results for Cyprus, Iceland, Malta, Latvia and Luxembourg were not significant and therefore not included in the table above.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

The reduction in chronic diseases resulting from PAP has, in turn, an impact on labour market participation and productivity. By reducing chronic disease incidence, PAP is expected to lead to increases in employment and reductions in absenteeism, presenteeism, and early retirement. Converting these labour market outputs into full-time equivalent (FTE) workers, it is estimated that OECD and EU27 countries will gain 8.50 and 3.97 FTE per 100 000 working age people per year between 2021 and 2050, respectively. The high rate in OECD countries as compared to EU27 countries is driven by the high impact in non-EU countries such as the United States, Mexico, Japan and Korea. In monetary terms, this translates into average per capita increase in labour market production of EUR 1.02 for OECD and EUR 0.56 for EU27 countries (Figure 4.9).

Figure 4.9. Labour market impacts, average per year, 2021-50 – PAP, all countries (2.39% coverage rate)



Note: The black lines represent 95% confidence intervals. Results for Cyprus, Iceland, Malta, Latvia and Luxembourg were not significant.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Equity

The Swedish health care system is based on 21 autonomous regions, and each is in charge of the implementation of PAP in their region. As a result, there is large variation across the regions in the number of prescriptions for physical activity (see also section on the "Extent of the coverage"). While this approach allows regions to tailor the intervention to local resources and population needs (e.g. working with local sports facilities, focusing on specific diagnoses), it risks creating regional inequalities in access to the programme.

Data on PA prescriptions in the region of Stockholm shows that people of the high socio-economic group (SEG) made up 21% of individuals receiving a PAP, the middle group accounted for 36% of prescriptions and 42% went to people in the low SEG. This distribution is similar to the population distribution of the main diagnoses for which PAP is given (e.g. the prevalence of overweight and obesity is 20% in highest SEG, 30% in middle SEG and 50% in lowest SEG), suggesting that different SEGs benefit equally from the intervention in the Stockholm region.

Evidence-base

Evidence-base of the modelling exercise

The data used to model effectiveness and efficiency is based on a randomised controlled trial (RCT) (Kallings et al., 2009[7]) (Kallings, 2008[10]). The *Quality Assessment Tool for Quantitative Studies* rates this study as "strong" (Table 4.3) (Effective Public Health Practice Project, 1998[11]). The study design, randomisation of participants and low drop-out rate all contribute to reliable estimates of the true effect of the intervention. The main limitation of the study is the representativeness of the study population. The trial focused on people aged 67 or 68 years old, with obesity but without heart disease, hypertension, diabetes, cancer or other serious conditions. In reality PAP targets people of all ages, and in particular those with chronic conditions that may benefit from physical activity.

Table 4.3. Evidence-based assessment, PAP

Assessment category	Question	Rating
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Representative of target population of the study: very likely Representative of target population of the intervention: not likely
	What percentage of selected individuals agreed to participate?	60-79%
Selection bias score: Moderate		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	Yes
	If Yes, was the method of randomisation described?	Yes
	If Yes, was the method appropriate?	Yes
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	No
Confounders score: Strong		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Not specified
	Were the study participants aware of the research question?	Not specified
Blinding score: Poor		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	80 -100%
Withdrawals and dropouts score: Strong		

Source: Effective Public Health Practice Project (1998[11]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

The RCT by Kallings was chosen to use in the OECD SPHeP-NCDs model because of its strong design and because it measured physical activity in MET-minutes (see Annex 4.B). However, a large number of other RCTs and observational studies of the PAP programme exist (Onerup et al., 2019[1]). Moreover, a five-year follow-up study is currently underway to understand the long-term impact of the intervention. The overall evidence base of the evaluation of this intervention is therefore robust.

Evidence-base of the individual prescriptions

To ensure that the prescribed PA is evidence-based, a handbook with physical activity recommendations was developed. The FYSS handbook is regularly updated with input from a large number of experts and based on a systematic literature review. Grading of Recommendations, Assessment, Development and Evaluations (GRADE) has been used to rate the quality of evidence underpinning the clinical practice recommendations in the handbook (BMJ Best Practice, n.d.[12]).

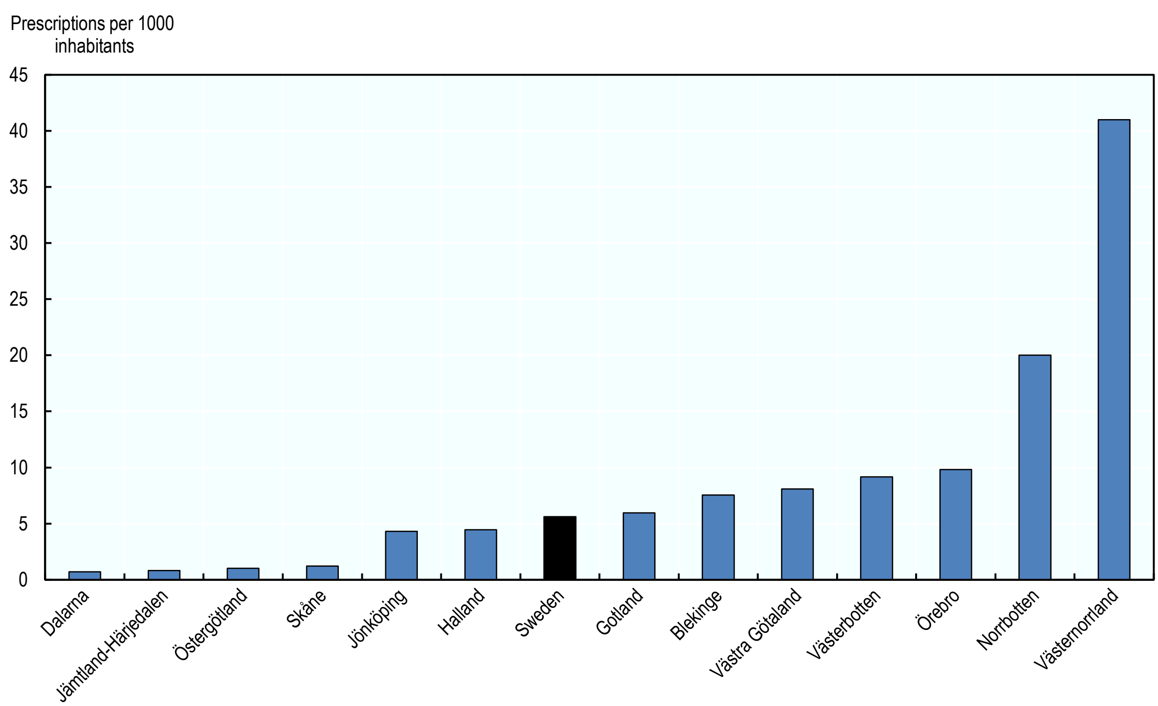
Extent of coverage

The extent of coverage criterion measures two key measures – the participation rate and the dropout rate. For the participation rate, data on the number of PA prescriptions can be used. The Swedish Board of Health and Welfare has collected data on the number of PA prescriptions from the regions during the years 2014-19. In 2019, the regions reported that approximately 45 000 prescriptions for physical activity were prescribed in primary care. As the Swedish adult population in 2019 was around 8 million, this is roughly 5.6 prescriptions per 1 000 people. Looking only at the adult population with insufficient physical activity (around 40%), the coverage would be 14.1 prescriptions per 1 000 eligible people. This number has been relatively constant over time, though some regions decreased their numbers while others increased their prescriptions. The number of prescriptions per capita more than doubles when examining the eligible population only – i.e. those living with overweight or obese, who make up 56% of the adult population in Sweden (WHO Global Health Observatory, 2018[13]).

There is considerable variation in coverage across regions (Figure 4.10). While in some regions less than one prescription is written per 1 000 inhabitants, in others it is four to eight times higher than the national average. In the region of Västernorrland there are approximately 40 prescriptions for physical activity per 1 000 inhabitants – but this number also includes other types counselling on physical activity.

Figure 4.10. Prescription rate per region

Number of prescriptions for physical activity per year as compared to the relevant population



Source: OECD analysis on data from SVT News (2019[14]), "Stor skillnad på hur mycket motion på recept som skrivs ut i riket [Large difference in how much exercise on prescription is prescribed in the country]", https://www.svt.se/nyheter/lokalt/orebro/regioner-anser-att-motion-pa-recept-borde-oka.

Besides PAP, there are other types of counselling in primary care on physical activity in Sweden. For example, health care professionals are recommended to use a Brief Intervention, for instance motivational interviewing or counselling, to promote physical activity. Furthermore, sometimes PAP is registered under

Brief Intervention and therefore not included in the PAP count. In 2019, a total of 426 571 interventions were performed to promote physical activity in primary care. The majority of interventions were brief advice. Out of all the reported interventions in primary care, approximately 10% were reported to be PAP.

The dropout rate for this intervention is difficult to determine, as the physical activity takes place on the participant's own initiative and is not monitored. However, as a proxy the percentage of people who do not have their follow-up meeting with the prescriber can be used. Data shows that in the region of Norrbotten, over the period 2013 to 2020, approximately 50 to 65% of prescriptions were followed up after six months. In the region of Stockholm, this figure was approximately 50%.

Policy options to enhance performance

This section summarises policy options available to policy makers in settings where PAP is implemented (or being transferred) to further enhance the performance of this intervention.

Enhancing effectiveness

While a written prescription with a follow-up meeting sometime later form the basis of the PAP model, the intervention can be adjusted and expanded to include counselling from physiotherapists or personal trainers, structured exercise groups, or subsidised access to sports facilities. A number of factors have been identified as increasing the effectiveness of the PAP intervention:

- Two systematic reviews found that a longer intervention duration, as well as a longer follow-up period, are associated with a greater impact (Goryakin, Suhlrie and Cecchini, 2018[15]) (Arsenijevic and Groot, 2017[16]).
- A study of adherence to physical activity prescriptions found that non-adherence was more frequent among subjects who were issued with referrals for facility-based activities rather than home-based activities. However, low motivation was often cited as the reason for non-adherence to home-based activities, suggesting that facility-based activities may be preferred for participants with a lower motivation (Leijon et al., 2011[17]).
- An RCT looking at intensity and frequency found that prescribing a higher frequency of physical activity increased the accumulation of exercise without a decline in adherence, while a higher intensity decreased adherence (Duncan et al., 2005[18]) (Perri et al., 2002[19]).
- Prescriptions need to be carefully tailored to the participant's capability (e.g. physical capacity), opportunity (e.g. having access to appropriate activities) and motivation (e.g. finding activities that encouraged continuation) to undertake physical activity (Andersen et al., 2019[20]).

Enhancing efficiency

PAP is a low-cost intervention, taking place within the existing health system and with minimal overhead or per-capita cost. Measures to enhance efficiency have therefore not been identified.

Enhancing equity

The PAP intervention is available nationally, but in practice access varies by region, as implementation is done locally by the health boards. This may create inequalities across regions. Moreover, while the data from the Stockholm region suggests that the intervention reaches people in different socio-economic groups equally, it is unclear whether this applies to other regions and other population groups.

In addition to prescribing physical activity to all population groups, it is also important that all have access to physical activity resources. Since the PAP programme does not include provision or financing of the actual physical activities, this might create barriers for lower-income population groups. Linking the PAP programme to existing or new policies aimed at increasing access to sport facilities for disadvantaged groups might increase adherence and equity.

To ensure an equitable intervention, providing access and quality to everyone, more data is needed on who receives a prescription, and what their outcomes are. Currently, there is no national register for PAP programme in Sweden. Sweden could therefore looked to the Netherlands who are in the process of establishing a national register to monitor a similar lifestyle intervention (see Box 4.3). This would also support the evidence base of the programme, as it would provide detailed impact data by population group.

Box 4.3. Monitoring of the Combined Lifestyle Intervention in the Netherlands

Since January 2019, participation in a Combined Lifestyle Intervention (CLI) to combat overweight is reimbursed by health insurers in the Netherlands under the base health insurance package. Under the CLI, participants receive individual or group counselling on healthy diet, physical activity and other factors contributing to a healthy lifestyle.

Similar to the PAP in Sweden, CLI, in practice is delivered locally, following different programmes and by different care providers. To ensure the effectiveness, cost-effectiveness and equity of the programme, monitoring is undertaken centrally by the national public health organisation RIVM. Twice a year, RIVM analyses claims data collected from health insurers. The data is published in a factsheet which includes information on the number of reimbursements, the age, sex, education, health and regional distribution of participants, as well as the type of programmes and providers.

In addition to the monitor based on insurance claims data, RIVM is in the process of setting up a register to capture intervention outcomes. This register will record information such as weight, BMI, waist circumference and quality of life among participants before and after CLI. Analysing this data for different population groups and regions can identify potential inequalities, and highlight areas where additional resources or efforts are needed.

Enhancing the evidence-base

PAP is based on a robust evidence base – both the prescriptions and the evaluation of the intervention itself. Of note will be the results of the ongoing trial looking at the longer-term effect of PAP. A register of participations, as described above could also provide additional insights into the effectiveness of the programme across different population groups.

Enhancing extent of coverage

Compared to the large potential target population of the intervention, the uptake of the intervention is relatively low. For a low-cost, low-intensity intervention such as PAP, a higher population coverage is needed to produce desired effects.

In an interview study with primary health care staff and management, Gustavsson et al. (2018[21]) identified the following elements that could facilitate implementation and increased uptake of PAP:

- **Increased knowledge and affirmative attitude among the health care professionals**. This includes knowledge on how to talk about health behaviours in patient consultations, and knowledge of and belief in the PAP method. A study in New York City found that a two-session practitioner education and a toolbox of resources significantly increased prescriber confidence and the number of prescriptions written (Kyei-Frimpong et al., 2021[22]).

- **Clear and supportive management.** Policies and clinical guidelines need to be developed, shared and approved at all levels, central management needs to show clear support for the intervention and earmark time and resources for PAP consultations.
- Supporting structures. This includes a centralised or local support function, such as a central PAP-co-ordinator or PAP-educator, tailored written routines at health care centres on how to provide PAP, and co-operation with external physical activity organisers through for example a contact list.

These elements correspond with the barriers to uptake identified in a different study, which include difficulties in finding time for PAP, uncertainty about the effectiveness, and a lack of procedures and clear guidelines (Persson et al., 2013[23]).

In addition to removing barriers to uptake, incentives could be explored. Financial incentives to prescribers or their practice can encourage uptake, especially when combined with efforts to simplify the prescription routine (Persson, Ovhed and Hansson, 2010[24]). Non-economic incentives such a public reporting of prescription data by provider or region, or personalised letters to prescribers comparing their prescribing rate to their peers, could provide a "nudge" to increase the number of prescriptions (Hallsworth et al., 2016[25]) (Wang and Groene, 2020[26]). Other nudges that could be explored include automatic prompts and programmes to encourage public commitment (Wang and Groene, 2020[26]).

Transferability

This section explores the transferability of PAP and is broken into three components: 1) an examination of existing transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring PAP.

Existing transfers of PAP

Transfer of the Swedish PAP intervention to other European countries has begun under the EU-funded "European Physical Activity on Prescription Model" project (EUPAP). This three-year project (2019-22), co-ordinated by the Public Health Agency of Sweden, will transfer the Swedish PAP to a further nine countries: Portugal, Romania, Lithuania, Spain, Germany, Denmark, Belgium, Italy and Malta.

EUPAP will provide education and training initiatives according to the needs of different partner countries, targeting both health care professionals responsible for prescribing as well as trainers or educators. In addition, several tools will be developed in English, which countries can translate into their local language, including:

- An electronic version of the FYSS handbook
- Concise guidelines on the PAP methodology
- A sample prescription form.

Another important part of the EUPAP project is the feasibility study (EUPAP, 2020[3]). Each of the target countries was analysed to understand the context in which PAP would operate and how this compares to the Swedish situation. At the macro level, the feasibility study looked at the political context, past experiences with PAP schemes, relevant regulations and budget. At the micro level, the study assessed the preparedness for implementation among four groups: stakeholders (e.g. whether agreements were in place between the health and the sports sector), health care settings (e.g. which health care settings confirmed participation in the intervention), prescribers (e.g. who will be prescribing physical activity), and end-users/patients (e.g. what the target population would be, mostly based on age, conditions and/or use of specific health care services). Finally, the proposed plan in the target country was compared to the Swedish model following the five key components of the PAP programme.

An evaluation of these transfers is not yet possible as the intervention is ongoing and has experienced some delays due to the COVID-19 pandemic.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of PAP are listed in Table 4.4. These cover indicators related to the population, sector, political and economic contexts. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 4.4. Indicators to assess the transferability of PAP

Indicator	Reasoning	Interpretation
Population context		
% of the population with access to recreational green space within 10min walking distance	PAP participants are responsible for undertaking prescribed physical activity. Given the link between green space and physical activity, PAP may be more successful in countries with better access to green space.	↑ value = more transferable
Sector specific context (primary care)		
Health professionals are trained in health-enhancing physical activity	PAP requires health professionals to make recommendations on physical activity, and is therefore more likely to be successful if health professionals have been trained on this topic	"Implemented" or "Foreseen" = more transferable
General practitioners density per 1 000 people	General practitioners are one of the main prescribers. If there are few GPs per population, it is less likely they will have time to commit to PAP	↑ value = more transferable
% people who visited a GP in the last 12 months at least once	PAP candidates are identified during routine primary care. The more often people see their GP, the more likely PAP reaches the right people	↑ value = more transferable
Implementation of specific framework to support access to recreational or exercise facilities for socially disadvantaged groups	Participants are required to cover access to exercise facilities themselves. In countries where such access is supported to target population groups, PAP is more likely to be successful.	"Implemented" or "Foreseen" = more transferable
Political context		
Programme or scheme to promote counselling on physical activity by health professionals	PAP is more likely to have political support in a country that already supports counselling on physical activity by health professionals	"Implemented" or "Foreseen" = more transferable
Operational strategy/action plan/policy to reduce physical inactivity	PAP is more likely to have political support in a country that explicitly aims to reduce physical inactivity	"Yes" = more transferable
Economic context		
Gross domestic product per capita (purchasing power parity, international dollars)	As participants need to cover any cost associated with the physical activities themselves PAP will have a greater reach in wealthier countries	↑ value = more transferable

Source: WHO Regional Office for Europe (2021[27]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; Eurostat (2021[28]), "Persons visiting a doctor in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age", http://eurostat.ec.europa.eu/; WHO (n.d.[29]), "Global Health Observatory", https://www.who.int/data/gho'; World Bank (2020[30]), "GDP, PPP (current international $)", https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD.

Results

Results from the transferability assessment using publically available data are available in Table 4.5. The analysis shows number of GPs as well as the number of visits per year are similar or higher in most countries. Moreover, while Sweden does not have a national strategy on physical activity, a specific framework to support access to recreational or exercise facilities for socially disadvantaged groups, nor is physical activity included in the curriculum of health professionals, these enablers are in place in several potential transfer countries. The main limitation to the transfer of PAP to other countries is the cost for the participant. Since organised exercise classes or access to sports facilities is not covered by the intervention, PAP is more likely to be successful in wealthier countries.

Table 4.5. Transferability assessment by country, PAP (OECD and non-OECD European countries)

Darker shades indicate PAP is more transferable to that particular country

	Access to green space (%)	Healthy lifestyle curriculum for health professionals	General practitioners: density per 1 000 people	% people who visited a GP in the last 12 months at least once	Access to exercise facilities for disadvantaged groups	Programs to support PA counselling by health professionals
Sweden	**99**	**Implemented**	**0.6**	**62**	**Not implemented**	**Implemente**
Australia	90*	n/a	1.2	83	n/a	n/
Austria	98	Implemented	0.8	84	Not implemented	Implemente
Belgium	95	Implemented	1.2	87	Implemented	Implemente
Bulgaria	n/a	Foreseen	0.6	47	Not implemented	Foresee
Canada	n/a	n/a	1.3	n/a	n/a	n/
Chile	n/a	n/a	1.3	n/a	n/a	n/
Colombia	n/a	n/a	n/a	n/a	n/a	n/
Costa Rica	n/a	n/a	n/a	n/a	n/a	n/
Croatia	n/a	Not implemented	0.6	68	Not implemented	Implemente
Cyprus	n/a	Not implemented	n/a	68	Not implemented	Foresee
Czech Republic	98	Implemented	0.7	86	Foreseen	Foresee
Denmark	89	Implemented	n/a	86	Implemented	Foresee
Estonia	97	Implemented	0.7	73	Not implemented	Foresee
Finland	100	Implemented	n/a	68	Implemented	Implemente
France	93	Implemented	0.9	85	Foreseen	Implemente
Germany	96	Implemented	0.7	89	Implemented	Implemente
Greece	94	Not implemented	0.3	40	n/a	n/
Hungary	91	Implemented	0.5	71	Implemented	Implemente
Iceland	61	n/a	0.6	n/a	n/a	n/
Ireland	94	Implemented	0.8	76	Implemented	Implemente
Israel	n/a	n/a	0.3	n/a	n/a	n/
Italy	88	Not implemented	0.7	71	Implemented	Implemente

	Access to green space (%)	Healthy lifestyle curriculum for health professionals	General practitioners: density per 1 000 people	% people who visited a GP in the last 12 months at least once	Access to exercise facilities for disadvantaged groups	Programs to support PA counselling by health professionals
Sweden	**99**	**Implemented**	**0.6**	**62**	**Not implemented**	**Implemente**
Japan	n/a	n/a	n/a	n/a	n/a	n/
Latvia	95	Implemented	0.7	80	Not implemented	Implemente
Lithuania	95	Implemented	0.9	76	Not implemented	Implemente
Luxembourg	99	Implemented	n/a..	89	Not implemented	Not implemente
Malta	n/a	Implemented	0.8	83	Not implemented	Foresee
Mexico	n/a	n/a	0.6	n/a	n/a	n/
Netherlands	97	Implemented	0.9	71	Implemented	Implemente
New Zealand	n/a	n/a	1.0	n/a	n/a	n/
Norway	95	n/a	0.8	79	n/a	n/
Poland	93	Implemented	0.2	64	Not implemented	Not implemente
Portugal	83	Implemented	2.4	81	Implemented	Implemente
Republic of Korea	n/a	n/a	0.1	n/a	n/a	n/
Romania	n/a	Implemented	0.6	57	Not implemented	Foresee
Slovak Republic	96	Not implemented	n/a	82	Not implemented	Implemente
Slovenia	94	Implemented	0.6	76	Implemented	Implemente
Spain	93	Not implemented	0.8	80	Not implemented	Implemente
Switzerland	97	n/a	n/a	n/a	n/a	n/
Turkey	n/a	n/a	0.6	n/a	n/a	n/
United Kingdom	91	Implemented	0.8	74	Implemented	Implemente
United States	n/a	n/a	0.3	n/a	n/a	n/

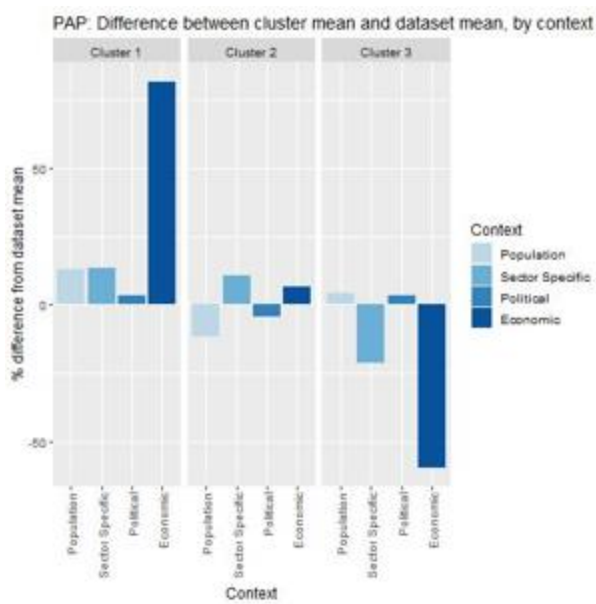
Note:*The figure for Australia represents the average cross each major city and refer to access to green space within 400m. n/a = no data available; GNI = g
parity. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating g
indicator (see Annex A for further methodological details).

Source: WHO Regional Office for Europe (2021[27]), "2021 Physical Activity Factsheets for the European Union Member S
https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; Eurostat (2021[28]), "Persons visiting a doctor in the
visits, educational attainment level, sex and age", http://eurostat.ec.europa.eu/; WHO (n.d.[29]), "Global Health Observatory", https://www.who.int/data/gh
international $)", https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups (see Figure 4.11 and Table 4.6). Countries in clusters with more positive values have the greatest transfer potential. Findings from the each of the clusters are below:

- Countries in cluster one have population, political, economic and sector specific arrangements in place to transfer PAP and are therefore good transfer candidates. The original of the intervention is in this cluster: Sweden.
- Countries in cluster two have policies in place that would support PAP. However, certain countries would benefit from assessing whether PAP is affordable among the population, as well as ensuring health professionals are properly trained, for example.
- Countries in cluster three may want to consider the overall affordability of PAP as well as whether the sector is ready for such an intervention (e.g. such as an appropriately trained workforce).

Figure 4.11. Transferability assessment using clustering, PAP



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: WHO Regional Office for Europe (2021[27]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; Eurostat (2021[28]), "Persons visiting a doctor in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age", http://eurostat.ec.europa.eu/; WHO (n.d.[29]), "Global Health Observatory", https://www.who.int/data/gho'; World Bank (2020[30]), "GDP, PPP (current international $)", https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD.

Table 4.6. Countries by cluster, PAP

Cluster 1	Cluster 2	Cluster 3
Austria	Australia	Bulgaria
Germany	Belgium	Croatia
Ireland	Cyprus	Estonia
Luxembourg	Czech Republic	Greece
Netherlands	Denmark	Hungary
Norway	Finland	Latvia
Sweden	France	Lithuania
	Iceland	Poland
	Italy	Romania
	Malta	Slovak Republic
	Portugal	Slovenia
	Spain	
	United Kingdom	

Note: Due to high levels of missing data, the following countries were omitted from the analysis: Australia, Canada, Chile, Colombia, Costa Rica, Israel, Japan, Mexico, New Zealand, Republic of Korea, Switzerland, Turkey and the United States.

New indicators to assess transferability

Data from publically available datasets is not sufficient to assess the transferability of PAP. Box 4.4 outlines several new indicators policy makers should consider before transferring PAP.

Box 4.4. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect information on the following questions:

Population context

- Who are the target population groups for this intervention?
- What is the population’s attitude towards physical exercise?
- What is the level of health literacy in the population?

Sector specific context (primary care)

- What, if any, compatible interventions exist?
- What, if any, competing interventions exist?
- Which health care professionals are best placed to prescribe physical activity? Do these health care professionals have the appropriate skills?
- What is the level of access to structured physical activity or sporting facilities?
- Is there a culture of health promotion and disease prevention in the health system?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention?
- Does the intervention reach lower-income population groups?
- Do lower-income groups have access to sporting facilities?

Conclusion and next steps

In Sweden, the PAP intervention provides people with personalised and evidence-based advice on how to increase their physical activity. Using OECD's SPHeP-NCD model, it is estimated that the resulting reduction in disease incidence leads to annual health expenditure savings of SEK 205.06 (EUR 19.37) per person by 2050. At a net saving of around SEK 91 000 (approximately EUR 9 000) per DALY, the PAP programme is cost saving.

Various factors have been identified to increase the effectiveness of the PAP intervention, including a longer duration and a high frequency of physical activity. To ensure an equitable intervention, providing access and quality to everyone, more data is needed on who receives a prescription, and what their outcomes are. For a low-cost, low-intensity intervention such as PAP, it is important to ensure a higher population coverage.

Transfer of the Swedish PAP intervention to nine other European countries has already started under the EU-funded "European Physical Activity on Prescription Model" project (EUPAP). Data from publically available sources indicates many potential transfer countries have policies in place to support PAP such as the inclusion of healthy lifestyle in the curriculum for health professionals.

Box 4.5 outlines next steps for policy makers and funding agencies regarding PAP.

Box 4.5. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance PAP are listed below:

- To understand the differences in uptake across the regions, and potentially even differences in outcomes, policy makers should consider setting up a register to follow participants and their outcomes
- To enhance the uptake of the intervention, policy makers are advised to explore whether and how health care professionals can be encouraged and enabled to prescribe more.

References

Aittasalo, M. et al. (2006), "A randomized intervention of physical activity promotion and patient self-monitoring in primary health care", *Preventive Medicine*, Vol. 42/1, pp. 40-46, https://doi.org/10.1016/j.ypmed.2005.10.003. [34]

Andersen, P. et al. (2019), "Patients' experiences of physical activity on prescription with access to counsellors in routine care: A qualitative study in Sweden", *BMC Public Health*, Vol. 19/1, pp. 1-11, https://doi.org/10.1186/s12889-019-6535-5. [20]

Arsenijevic, J. and W. Groot (2017), "Physical activity on prescription schemes (PARS): Do programme characteristics influence effectiveness? Results of a systematic review and meta-analyses", *BMJ Open*, Vol. 7/2, p. 12156, https://doi.org/10.1136/bmjopen-2016-012156. [16]

BMJ Best Practice (n.d.), *What is GRADE?*, https://bestpractice.bmj.com/info/toolkit/learn-ebm/what-is-grade/ (accessed on 10 November 2021). [12]

Duncan, G. et al. (2005), "Prescribing exercise at varied levels of intensity and frequency: A randomized trial", *Archives of Internal Medicine*, Vol. 165/20, pp. 2362-2369, https://doi.org/10.1001/archinte.165.20.2362. [18]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [11]

EUPAP (2020), *EUPAP Feasibility Study - Final Report*, https://www.eupap.org/storage/app/media/WP4%20Feasibility%20Study.pdf (accessed on 4 February 2021). [3]

EUPAP.org (n.d.), *EUPAP leaflet*, https://www.eupap.org/storage/app/media/EUPAP_skrajute_atvartas.pdf (accessed on 4 February 2021). [2]

Eurostat (2021), *Persons visiting a doctor in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age*, http://eurostat.ec.europa.eu/ (accessed on 25 August 2021). [28]

FYSS (2022), *FYSS – Evidensbaserad Kunskapsbas*, https://www.fyss.se/. [5]

Goryakin, Y., L. Suhlrie and M. Cecchini (2018), *Impact of primary care-initiated interventions promoting physical activity on body mass index: systematic review and meta-analysis*, Blackwell Publishing Ltd, https://doi.org/10.1111/obr.12654. [15]

Gustavsson, C. et al. (2018), "What is required to facilitate implementation of Swedish physical activity on prescription? - Interview study with primary healthcare staff and management", *BMC Health Services Research*, Vol. 18/1, https://doi.org/10.1186/s12913-018-3021-1. [21]

Hallsworth, M. et al. (2016), "Provision of social norm feedback to high prescribers of antibiotics in general practice: a pragmatic national randomised controlled trial", *The Lancet*, Vol. 387/10029, pp. 1743-1752, https://doi.org/10.1016/s0140-6736(16)00215-4. [25]

Hellgren, M. et al. (2016), "A lifestyle intervention in primary care prevents deterioration of insulin resistance in patients with impaired glucose tolerance: A randomised controlled trial", *Scandinavian Journal of Public Health*, Vol. 44/7, pp. 718-725, https://doi.org/10.1177/1403494816663539. [33]

Hemmingsson, E. et al. (2009), "Increased physical activity in abdominally obese women through support for changed commuting habits: A randomized clinical trial", *International Journal of Obesity*, Vol. 33/6, pp. 645-652, https://doi.org/10.1038/ijo.2009.77. [32]

Kallings, L. (2008), *Physical activity on prescription: Studies on physical activity level, adherence and cardiovascular risk factors*, Karolinska Institutet, Stockholm. [10]

Kallings, L. et al. (2009), "Beneficial effects of individualized physical activity on prescription on body composition and cardiometabolic risk factors: results from a randomized controlled trial", *European Journal of Cardiovascular Prevention & Rehabilitation*, Vol. 16/1, pp. 80-84, https://doi.org/10.1097/HJR.0b013e32831e953a. [7]

Kyei-Frimpong, J. et al. (2021), "Exercise as medicine: Providing practitioner guidance on exercise prescription", *Preventive Medicine Reports*, Vol. 22, p. 101323, https://doi.org/10.1016/j.pmedr.2021.101323. [22]

Leijon, M. et al. (2008), "Physical activity referrals in Swedish primary health care - Prescriber and patient characteristics, reasons for prescriptions, and prescribed activities", *BMC Health Services Research*, Vol. 8, p. 201, https://doi.org/10.1186/1472-6963-8-201. [35]

Leijon, M. et al. (2010), "Factors associated with patients self-reported adherence to prescribed physical activity in routine primary health care", *BMC Family Practice*, Vol. 11, p. 38, https://doi.org/10.1186/1471-2296-11-38. [36]

Leijon, M. et al. (2011), "Who is not adhering to physical activity referrals, and why?", *Scandinavian Journal of Primary Health Care*, Vol. 29/4, pp. 234-240, https://doi.org/10.3109/02813432.2011.628238. [17]

Morén, C. et al. (2016), "The Effects of "Physical Activity on Prescription" in Persons With Transient Ischemic Attack: A Randomized Controlled Study", *Journal of Neurologic Physical Therapy*, Vol. 40/3, pp. 176-183, https://doi.org/10.1097/NPT.0000000000000134. [31]

OECD (2019), *SPHeP-NCDs documentation*, http://oecdpublichealthexplorer.org/ncd-doc/ (accessed on 16 December 2019). [38]

Onerup, A. et al. (2019), *Physical activity on prescription in accordance with the Swedish model increases physical activity: A systematic review*, BMJ Publishing Group, https://doi.org/10.1136/bjsports-2018-099598. [1]

Perri, M. et al. (2002), "Adherence to exercise prescriptions: Effects of prescribing moderate versus higher levels of intensity and frequency", *Health Psychology*, Vol. 21/5, pp. 452-458, https://doi.org/10.1037/0278-6133.21.5.452. [19]

Persson, G. et al. (2013), "Physical activity on prescription (PAP) from the general practitioner's perspective - A qualitative study", *BMC Family Practice*, Vol. 14/1, p. 128, https://doi.org/10.1186/1471-2296-14-128. [23]

Persson, G., I. Ovhed and E. Hansson (2010), "Simplified routines in prescribing physical activity can increase the amount of prescriptions by doctors, more than economic incentives only: an observational intervention study", *BMC Research Notes*, Vol. 3/1, https://doi.org/10.1186/1756-0500-3-304. [24]

Romé, Å. et al. (2009), "Physical activity on prescription (PAP): Costs and consequences of a randomized, controlled trial in primary healthcare", *Scandinavian Journal of Primary Health Care*, Vol. 27/4, pp. 216-222, https://doi.org/10.3109/02813430903438734. [37]

Sjögren, P. et al. (2012), "Functional changes in adipose tissue in a randomised controlled trial of physical activity", *Lipids in Health and Disease*, Vol. 11/1, p. 80, https://doi.org/10.1186/1476-511X-11-80. [8]

SVT Nyheter (2019), *Stor skillnad på hur mycket motion på recept som skrivs ut i riket [Large difference in how much exercise on prescription is prescribed in the country]*, https://www.svt.se/nyheter/lokalt/orebro/regioner-anser-att-motion-pa-recept-borde-oka (accessed on 6 October 2021). [14]

Triberti, S. (ed.) (2020), "The effectiveness of behavioral economics-informed interventions on physician behavioral change: A systematic literature review", *PLOS ONE*, Vol. 15/6, p. e0234149, https://doi.org/10.1371/journal.pone.0234149. [26]

Vallejo-Torres, L. et al. (2016), “On the Estimation of the Cost-Effectiveness Threshold: Why, What, How?”, *Value in Health*, Vol. 19/5, pp. 558-566, https://doi.org/10.1016/j.jval.2016.02.020. [9]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [29]

WHO (n.d.), *Global Physical Activity Questionnaire (GPAQ) Analysis Guide*, http://www.who.int/chp/steps/GPAQ/en/index.html (accessed on 29 January 2021). [6]

WHO Global Health Observatory (2018), *Mean body mass index (BMI) trends among adults*, https://apps.who.int/gho/data/view.main.CTRY12461. [13]

WHO Regional Office for Europe (2021), *2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region*, https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf. [27]

World Bank (2020), *GDP, PPP (current international $)*, https://data.worldbank.org/indicator/NY.GDP.MKTP.PP.CD (accessed on 25 August 2021). [30]

YFA (2022), *FYSS – vägen till bättre folkhälsa*, https://www.yfa.se/fyss/vad-ar-fyss/. [4]

Annex 4.A. Sample of the PAP prescription form

EU PHYSICAL ACTIVITY ON PRESCRIPTION

Ref. Ares(2019)5069446 - 02/08/2019

Co-funded by the Health Programme of the European Union

Prescription form

PHYSICAL ACTIVITY ON PRESCRIPTION (PAP-S)	
Name First name, surname	ID number Enter
Telephone Enter	Date Enter

Current physical activity [essential part]

Question: During a usual week, how much time do you spend being physically active in vigorous intensity activities that make you breathe hard and fast, such as running, aerobics, or ball sports?	Choose an alternative
Question: During a usual week, how much time do you spend being physically active in moderate intensity activities, that raise your heart rate, and make you breathe somewhat faster, such as walking, cycling, or gardening?	Choose an alternative
Calculate 'activity minutes' from the answers above (median value) using the formula: Vigorous activity x 2 + moderate activity (see manual).	Sum Enter
Question: How many days in a usual week do you engage in muscle strengthening activity? For example, by using your bodyweight, dumbbells or training equipment as resistance.	Choose an alternative
Question: How much time do you sit during a usual day, excluding sleep?	Choose an alternative

Current status

Physical function/capacity	Test 1 Choose a test Test 2 Choose a test	Result 1 Enter Result 2 Enter
Disease related factors	Test 1 Choose a test Test 2 Choose a test	Result 1 Enter Result 2 Enter
Health related quality of life	Test 1 Choose a test Test 2 Choose a test	Result 1 Enter Result 2 Enter
Question: How do you rate your general health status?	Answer options	

Person's own goals

Question: Why do you want to increase your physical activity? (In person´s own words) Click here to enter text

Reason for prescription

Choose an alternative	Choose an alternative
Choose an alternative	Enter other alternative

Remember

- If the diagnosis-specific recommendation does not meet the global recommendation on physical activity for health (see the manual for reference), additional activities can be discussed and prescribed if the person's health condition allows.

EU PHYSICAL ACTIVITY ON PRESCRIPTION

Co-funded by the Health Programme of the European Union

Prescription – type and dose of physical activity

Aerobic physical activity			Muscle strengthening activity			
Intensity	Duration minutes/session	Frequency days/week	Exercises number/session	Repetitions number/set	Sets number/exercise	Frequency days/week
☐ Moderate ☐ Vigorous ☐ Combined	Enter	Enter	Enter	Enter	Enter	Enter

Prescription – form of activity and planning

Choose an alternative	Choose an alternative	Enter other activity
Note how/where/when the activity/activities should be implemented		

☐ Reduce sitting time/sedentary behaviour by: Enter

To consider

Enter

☐ Support for behaviour change Choose	Enter

Expected medical effect

Enter

Follow-up (essential part)

Follow-up by		☐Prescriber	☐ Other, who Enter	
When Enter time Enter date	By	☐Follow-up visit	☐ Telephone follow-up	☐ Video follow-up

Evaluation

☐ Physical activity (activity minutes per week) [essential part]	☐ Physical function/capacity
☐ Muscle strengthening activity (days per week)	☐ Disease related factors
☐ Sitting time	☐ Health-Related Quality of Life
☐ Person's own goal(s) [essential part]	☐ Other Enter

Referral to activity organiser

Enter the organizer		
Diagnosis visible on PAP-S sent to activity organiser	Yes ☐	No ☐

Approval

Approval to send PAP-S to activity organiser	
☐ Yes, to Enter	☐ No

Prescriber

Name First name, surname	Title Choose an alternative
Telephone Enter	Workplace Enter

Annex 4.B. Modelling assumptions for PAP

Annex Table 4.B.1. Parameters to model the impact of PAP

	Physical Activity on Prescription model inputs
Effectiveness	BMI: -0.4 kg/m^2 MET min / week: +636
Time to maximum effectiveness	6 months to maximum effectiveness, after which the effect stays stable for 1 year, and then reverts to zero after another 6 months All changes are modelled as a linear increase/decrease
Target population	People of both sexes, over the age of 18, who do less than 600 MET min/week; and have overweight (BMI >25), high blood pressure, diabetes, COPD, asthma, depression, cardiovascular disease or musculoskeletal disorders
Exposure	*Base scenario*: Overall participation rate = 0.56% of the total adult population Dropout rate: 50% *Higher scenario*: Overall participation rate = 2.39% of the total adult population Dropout rate: 50%
Per capita cost, SEK and EUR	SEK 2.08 (EUR 0.21) per capita SEK 532.77 (EUR 53.26) per treated person

Effectiveness

As the Swedish PAP model has been in use for over 20 years, a number of studies exist on its effectiveness. In 2019, Onerup et al. conducted a systematic review to evaluate the existing scientific evidence for the efficacy of the Swedish PAP model, focusing on studies that have a control group (Onerup et al., 2019[1]). However, as many of the studies included in the review used different measures for the level of PA, often with different follow-up times, no meta-analysis was performed. Moreover, some studies looked at specific subpopulations (e.g. people with transient ischemic attack (Morén et al., 2016[31])), considered a broader set of interventions besides PAP (e.g. group counselling and free bicycles (Hemmingsson et al., 2009[32])), did not measure physical activity in a way that can be included in the OECD SPHeP-NCDs model (e.g. a four level scale (Hellgren et al., 2016[33])) or not based in Sweden (e.g. Finland (Aittasalo et al., 2006[34]))

A number of the studies included in the review were based on data from the same randomised controlled trial (RCT) (Kallings et al., 2009[7]) (Sjögren et al., 2012[8]). In this RCT, 101 healthy but insufficiently physically active 67 to 68-year-olds with overweight either received a 6-month intervention of PAP or a low-intensity intervention, with one page of written general information about the importance of PA for health. Individuals who received the PAP intervention were found to have increased their physical activity level by 159 minutes of (at least) moderate-intensity activity per week, from a baseline of 120 minutes, compared to no change in the control group. Using a weight of 4 METs for moderate intensity activities (WHO, n.d.[6]), this equates to an increase of 636 MET-minutes per week.

In addition, they report that BMI decreased by 0.6 in the intervention group, compared to 0.2 in the controls. A decrease of 0.4 BMI points (95% CI 0.1 to 0.8) can therefore be attributed to the intervention.

Time to maximum effectiveness

The follow-up time of the RCT by (Kallings et al., 2009[7]) was 6 months, coinciding with the 6-month follow-up counselling session. After reaching a maximum impact at 6 months, the effect is expected to remain at its maximum level for 12 months, after which it wears off over another 6 months. Any increase or decrease is modelled linearly (Goryakin, Suhlrie and Cecchini, 2018[15]).

Target population

Anyone over the age of 18 can receive a prescription for physical activity, regardless of their health status. However, in practice the intervention is prescribed to people whom health care professionals believe would benefit from increased physical activity, due to sedentary lifestyles and diagnoses such as high blood pressure, diabetes, overweight, COPD, asthma, depression, cardiovascular disease and musculoskeletal disorders (Leijon et al., 2008[35]) (Morén et al., 2016[31]). Therefore, people doing less than 600 MET-minutes per week (the WHO guidelines for physical activity) who also have high BMI or other NCDs are considered to be the target population.

Exposure

One study found that 1.3% of primary health care (PHC) patients visiting a PHC centre in the study area was prescribed physical activity annually (Leijon et al., 2008[35]). However, these rates were observed more than 15 years ago. In 2019, a total of 45 000 prescriptions were made across all regions. As the Swedish adult population in 2019 was around 8 million, this amounts to 5.6 prescriptions per 1 000 population. Assuming 40% of the adult population is eligible for the PAP scheme, the exposure would be 14.1 prescriptions per 1000.

As this exposure is relatively low, the coverage rate of one of the better preforming regions was also modelled. In Norrbotten in 2019, 4 776 patients received PAP, out of a population of approximately 200 000. This equated to an overall population coverage rate of 23.9 per 1 000 population, or 59.7 per 1 000 eligible population.

Self-reported adherence to the prescribed PA was 56% at 3 months and 50% at 12 months (Leijon et al., 2010[36]). An RCT looking at the PAP programme has a dropout rate of 53% at 4 months (Romé et al., 2009[37]). Data from practice shows that in the region of Norrbotten over the period 2013 to 2020, approximately 50 to 65% of prescriptions was followed up six months later. In the region of Stockholm this figure was approximately 50%. Overall, a 50% drop out rate was therefore assumed for the model. For people who drop out, no effect was assumed. This is a conservative assumption, as some might have increased their physical activity level despite not coming in for a follow-up meeting, but there is no data to confirm this.

Eligible persons can participate again in the future.

Cost of implementation and delivery

Cost are estimated using the WHO Costing Tool (see section 7.4 of the SPHeP-NCD documentation (OECD, 2019[38]), and consider the base PAP programme only, and no potential additional cost associated with providing exercise classes or access to facilities. In the RCT, the individualised patient-centred counselling based on which the prescription was written took approximately 30 minutes (Kallings et al., 2009[7]). The follow-up meeting is assumed to take 10 minutes. To calculate the cost of these two meetings, both the initial and follow-up appointments are assumed to be provided by an equal mix of GPs, physiotherapists and nurses. In Sweden, this mix varies by region and it will also differ per country. Actual cost may be higher if PAP is mostly delivered by GPs, or lower if it is mostly done by nurses. Moreover, under the EUPAP programme, a number of EU countries have implemented PAP but with a longer length of consultations, or with more follow-up meetings, both of which would also increase the cost of the programme. The cost of the initial meeting for people who drop out of the intervention is included in the cost of treated people. Per treated person, the cost were estimated to be SEK 532.77 (EUR 53.26).

In addition to these treatment cost, central cost were calculated. These include a charge for providing GPs with a copy of the handbook. While there are cost associated with the development and maintenance of the handbook, this is already covered by the Swedish programme and translation/adaptation cost for other countries is expected to be minimal. There are however some overheads associated with the central planning of the programme. In all, the central cost of the programme were estimated at SEK 2.08 (EUR 0.21) per capita.

5 Combined Lifestyle Intervention

This chapter covers the case study of the Combined Lifestyle Intervention (CLI), a lifestyle-counselling programme offered in the Netherlands, which provides dietary advice, physical activity training, and counselling on behavioural change over a period of two years. The case study includes an assessment of CLI against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Combined Lifestyle Intervention (CLI), the Netherlands: Case study overview

Description: The Combined Lifestyle Intervention (CLI) is a Dutch programme designed to help people living with overweight or other risk factors improve their lifestyle. Participants are referred by their general practitioner (GP) to a local CLI programme, where they get dietary advice, physical activity training, and counselling on behavioural change over a period of two years.

Best practice assessment:

Table 5.1. OECD best practice assessment of CLI, the Netherlands

Criteria	Assessment
Effectiveness	By improving diet and physical activity, an estimated 12 565 life years (LYs) and 16 704 disability-adjusted life years (DALYs) will be gained from CLI by 2050 in the Netherlands.
Efficiency	If scaled-up to the national level and transferred to all OECD and EU27 members, CLI is estimated to be cost-effective in 95% of countries.
Equity	The intervention reaches people from different educational levels, and appears effectives across different socio-economic groups. However, there are pronounced differences in coverage between regions
Evidence-base	One of the key criteria for CLI programmes to be accepted and reimbursed is that there is evidence of their cost-effectiveness. The evidence resulting from the RCT of the Slimmer programme is judged as strong. To evaluate CLI as a whole in the long term, a registry is being set up to track outcomes such as weight and waist circumference, as well as demographic and socio-economic data. There will also be an option to link the registry to claims data
Extent of coverage	While the programme is still in its early stages, the uptake so far has been relatively low due to the impact of COVID-19 as well as a low referral rate by GPs.

Enhancement options: Currently a number of CLI programmes are evaluating the effectiveness of delivering care digitally rather than in person. If this proves to be successful, it could help lower cost and increase coverage. To further increase coverage the referral rate by GPs may be increased. An analysis of outcomes by regions could help understand whether there are important differences in the quality of the interventions across the country.

Transferability: CLI has not been transferred nor are there plans to transfer CLI to other countries. Overweight and obesity is a top priority, therefore CLI would likely receive political support from potential transfer countries in the OECD making them good targets. CLI would also likely be accepted among stakeholders given, for example, health professionals currently offer physical activity counselling in many countries.

Conclusion: The CLI is an effective and often cost-effective programme, with a strong and growing evidence base. Further research into digital delivery and measures to increase the uptake of the programme can help increase its impact on health and the economy.

Intervention description

The Combined Lifestyle Intervention (CLI) is a Dutch programme designed to help adults with overweight or other risk factors improve their lifestyle. It was first implemented at the start of 2019, after a 12-year process of pilots, evaluations, research and political discussions. Its cost are covered under the basic health insurance package in the Netherlands. As of March 2021, 18 000 people currently participate or previously participated in CLI, leading to a total reimbursement cost from health insurers of EUR 4.6 million (RIVM, 2021[1]).

Participants are referred by their general practitioner (GP) to a local CLI provider. These include physiotherapists, lifestyle coaches and dieticians – either working individually or in a group. Registered providers need to get a license for the specific CLI programme they intend to offer, as well as a contract with a health insurer to reimburse the programme. It is up to the insurer to decide which CLI programme(s) to reimburse. Several programmes are approved as CLIs (see Box 5.1), all of which consist of three key, compulsory components:

- Healthy eating
- Physical activity
- Behavioural change to sustain a healthy lifestyle.

Each CLI programme last two years. The programmes start with an intervention phase, which lasts between seven and 12 months, during which participants receive advice and training from health professionals on how to improve diet, exercise and overall health. Afterwards there is a maintenance phase, with less intense involvement of health professionals. Participants are organised into groups that move through the two years together, in order to enhance motivation.

Box 5.1. Approved CLI programmes

Currently there are four recognised CLI programmes, owned and managed by different organisations, that are covered by the basic health insurance. Patient allocation to the different programme is based on local availability as well as their health insurer.

Coaching on Lifestyle (CooL) (53% of CLI participants*): this programme is delivered by an accredited lifestyle coach, or a physiotherapist or dietician with a lifestyle coach specialisation. The intervention phase lasts eight months, during which participants have one intake session of 1 hour, 2.5 hours of individual coaching and eight group sessions of 90 minutes – all with the lifestyle coach.

BeweegKuur *[Move therapy]* (19% of CLI participants*): this programme is delivered by a multidisciplinary team, including a GP, dietician, physical activity professional, lifestyle coach, and local sport coaches and providers. Participants meet with the various professionals to develop individual plans and participate in group sessions.

Slimmer [*Smarter*] (6% of CLI participants*): this programme, which focuses on diabetes prevention, is delivered by a multidisciplinary team including a GP, dietician, physical therapist, lifestyle coach and local sports coach or broker. Participants engage in a physical activity programme (24 group classes) and a nutrition programme (one nutrition analysis and treatment plan, three individual consultations and one group session) over the first seven months.

Samen Sportief in Beweging [*Together sporty in motion*] (no data yet): the latest programme to be approved as a CLI is a co-operation between GPs, lifestyle coaches, physical activity professionals, nutrition professionals, sports providers and municipal sports supporters. Participants first receive an intensive eight week course, which includes eight individual sessions with a lifestyle coach, 16 group physical activity sessions and eight nutrition sessions. Afterwards participants receive a further three group sessions with a lifestyle coach as part of the intervention phase.

* Percentages based on participants at March 2021; for 22% of participants the programme was not known.
Source: RIVM (2021[1])., "Gecombineerde leefstijlinterventie 2021: verdubbeling aantal deelnemers", https://www.rivm.nl/sites/default/files/2021-07/factsheet%20GLI%20juni%202021.pdf.

OECD Best Practices Framework assessment

This section analyses CLI against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 5.2 for a high-level assessment of CLI). Further details on the OECD Framework are in Annex A.

Box 5.2. Assessment of CLI, the Netherlands

Effectiveness

- According to OECD simulations, CLI would lead to 12 565 life years (LYs) and 16 704 disability-adjusted life years (DALYs) gained by 2050 in the Netherlands
- Across all studied countries, CLI would have the largest gross impact on musculo-skeletal diseases with 0.79 million cases avoided by 2050, and cardiovascular diseases with 0.63 million cases avoided by 2050.

Efficiency

- By 2050, CLI will accumulative health expenditure savings equivalent to EUR 11.2 per person in the Netherlands
- When transferred to all OECD and EU27 countries, savings equivalent to 0.02% of total health expenditure per year are expected (until 2050)
- For the vast majority of OECD and EU27 countries, CLI is considered a cost-effective intervention

Equity

- The intervention reaches people from different educational levels, and appears effectives across different socio-economic groups. However, there are pronounced differences in coverage between regions

Evidence-base

- One of the key criteria for CLI programmes to be accepted and reimbursed is that there is evidence of their cost-effectiveness.
- The evidence resulting from the randomised control trial (RCT) of the Slimmer programme is judged as strong according to the *Quality Assessment Tool for Quantitative Studies*
- To be able to evaluate CLI as a whole and in the long term, RIVM is in the process of setting up a registry of CLI participants, which will track outcomes such as weight and waist circumference, as well as demographic and socio-economic data. There will also be an option to link registry data with claims data.

Extent of coverage

- Around 18 000 people have participated in CLI since its inception in 2019.
- While still in its early stages, the uptake so far has been relatively low due to the impact of COVID-19 as well as a low referral rate by GPs.

Effectiveness

A randomised controlled trial (RCT) of the Slimmer programme found that, after 12 months, people in the intervention group saw their BMI decrease by 0.9 points more than those in the control group. After 18 months this difference was 0.8 BMI points. The intervention group also did 1 244 MET-minutes[1] of physical activity per week more than the control group after 12 months. As running 10 kilometre per hour (6 minutes per km kilometre) is roughly equivalent with a value of 10 METs, this amounts to an additional 2 hours of running per week. After 18 months, this difference was 616 MET-minutes per week, or 1 hour of running at 10 kilometre per hour. (Duijzer et al., 2017[2]).

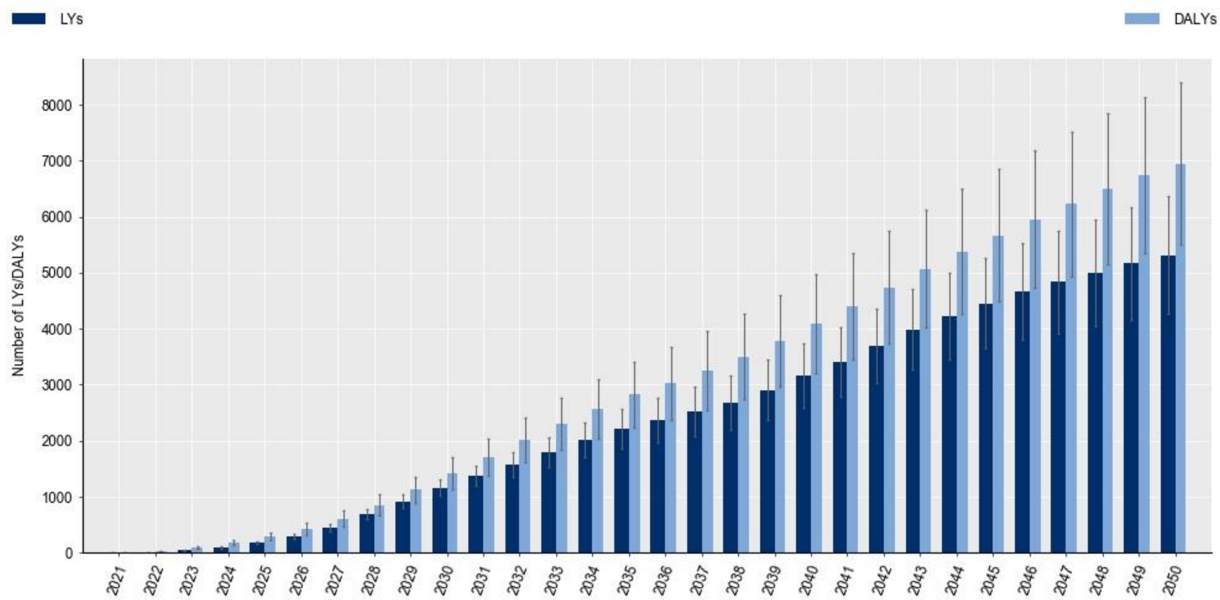
These results were used to estimate the potential impact of the CLI programme on population health and the economy if scaled-up and transferred to all OECD and EU27 countries up until year 2050, using the OECD SPHeP-NCDs model. This microsimulation model compared a “business-as-usual” scenario, to a scenario where all countries implement the CLI programme, to be able to measure the difference in health and economic outcomes. The results presented in this section (Effectiveness) and the next (Efficiency) are based on this modelling exercise.

The referral rate of eligible people by GPs is estimated to be 1.03%, which is relatively low (see 0 for more information on modelling assumptions). This is partially due to the fact that the programme is still in its early stages, which may affect awareness among GPs and uptake, as well as the impact of the COVID-19 pandemic. While a referral rate of 1.03% was considered the best estimate in the budget impact analysis of the programme, a higher estimate of 2.5% was also considered realistic, once awareness of and demand for CLI increased (RIVM, 2018[3]). The scenario with a 1.03% referral rate was modelled only for the Netherlands, to show the current impact the programme has. The scenario with a 2.5% referral rate was used for the Netherlands and all other countries to compare the potential impact the programme could have. (Note that the 2.5% scenario is considered the main scenario, and that any results refer to this scenario unless specifically stated that the referral rate is 1.03%)

The Netherlands

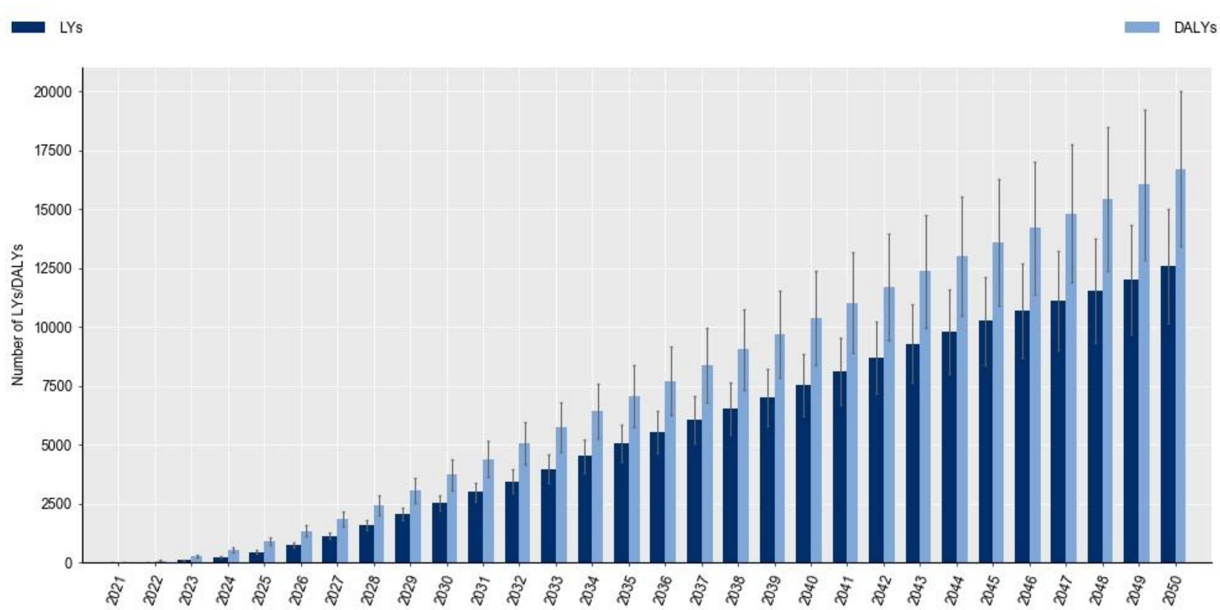
With the current referral rate of 1.03%, the CLI programme is estimate to result in a cumulative gain of 5 318 LYs and 6 951 DALYs by 2050 (Figure 5.1). The implementation of CLI with a referral rate of 2.5% in the Netherlands is estimated gain a cumulative total of 12 565 LYs and 16 704 DALYs by 2050 (Figure 5.2). This translates into a rate of 3.99 life years (LY) and 5.25 disability-adjusted life years (DALYs) gained per 100 000 people, on average, per year over the period 2021-50.

Figure 5.1. Cumulative number of LYs and DALYs gained (2021-50) – CLI, the Netherlands (1.03% referral rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

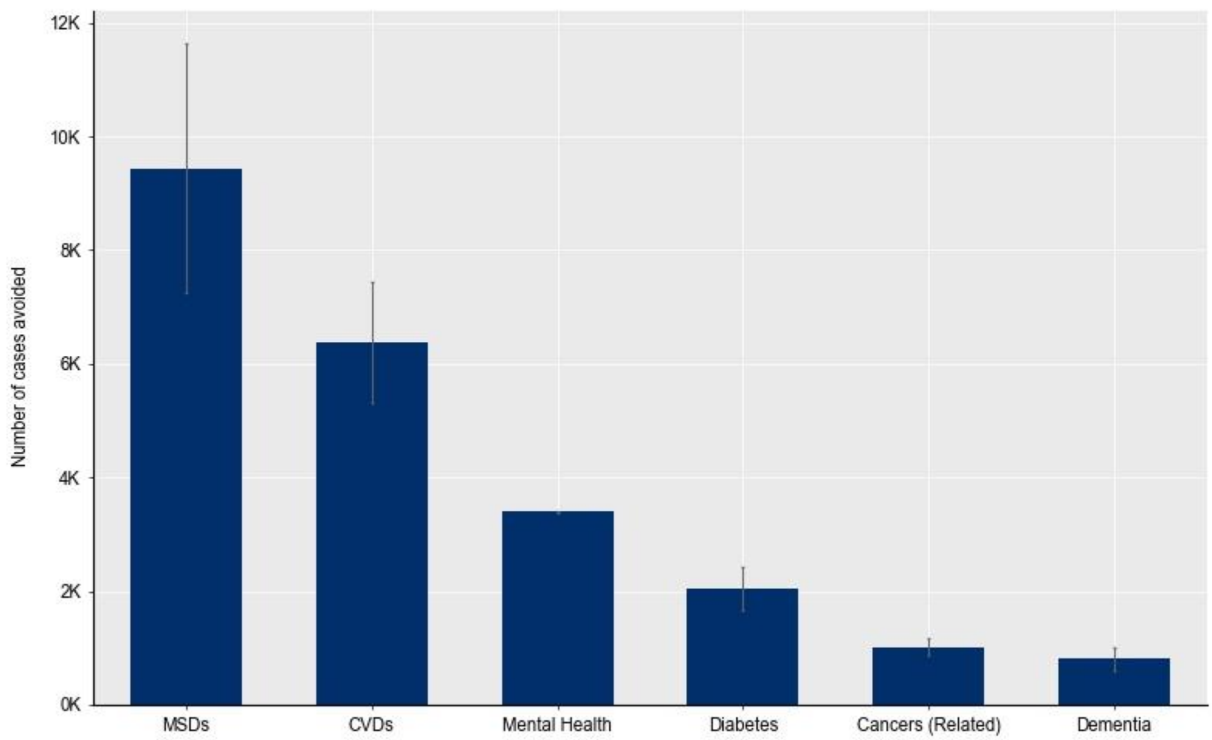
Figure 5.2. Cumulative number of LYs and DALYs gained (2021-50) – CLI, the Netherlands (2.5% referral rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, CLI is expected to have the greatest impact on musculoskeletal disorders (MSDs) and cardiovascular diseases (CVDs) (Figure 5.3). Between 2021 and 2050, the number of MSD and CVD cases is estimated to fall by 9 434 and 6 383 cases, respectively. Other diseases affected include mental health, diabetes, dementia and several cancers.

Figure 5.3. Cumulative number of disease cases avoided by 2050 – CLI, the Netherlands (2.5% referral rate)

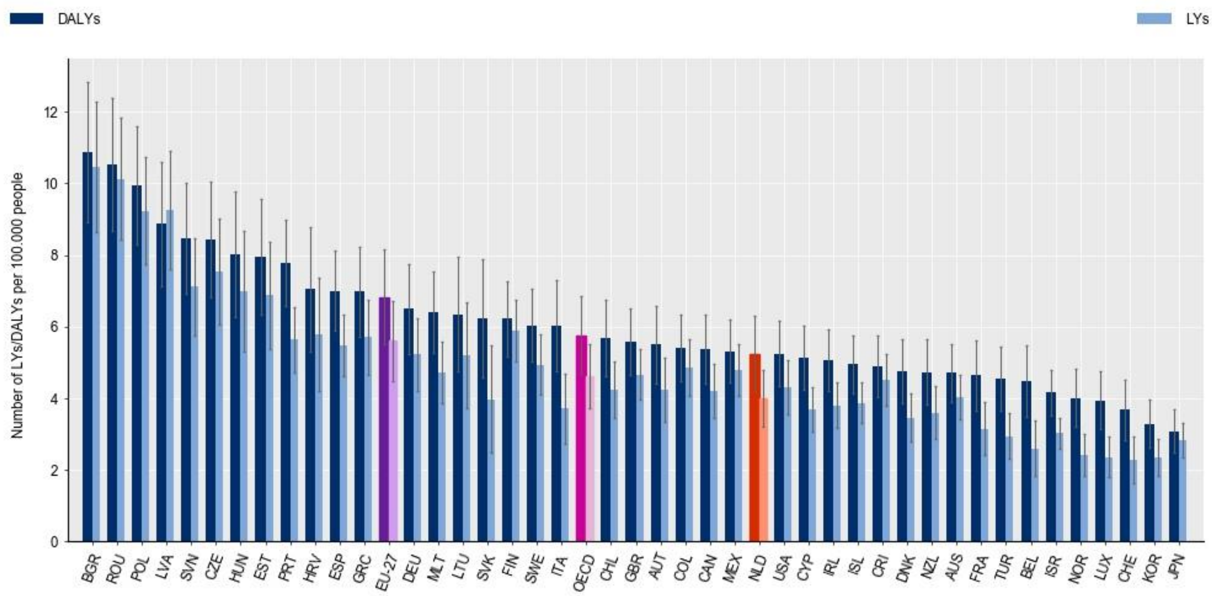


Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Transferring CLI to all OECD and EU27 countries, with a referral rate of 2.5%, is estimated to result in 4.61 and 5.6 LYs gained per 100 000 people, respectively, on average per year between 2021-50 (ranging from 2.29 in Switzerland to 10.47 in Bulgaria) (Figure 5.4). For DALYs, gains are even higher at 5.77 for OECD and 6.83 for EU27 countries.

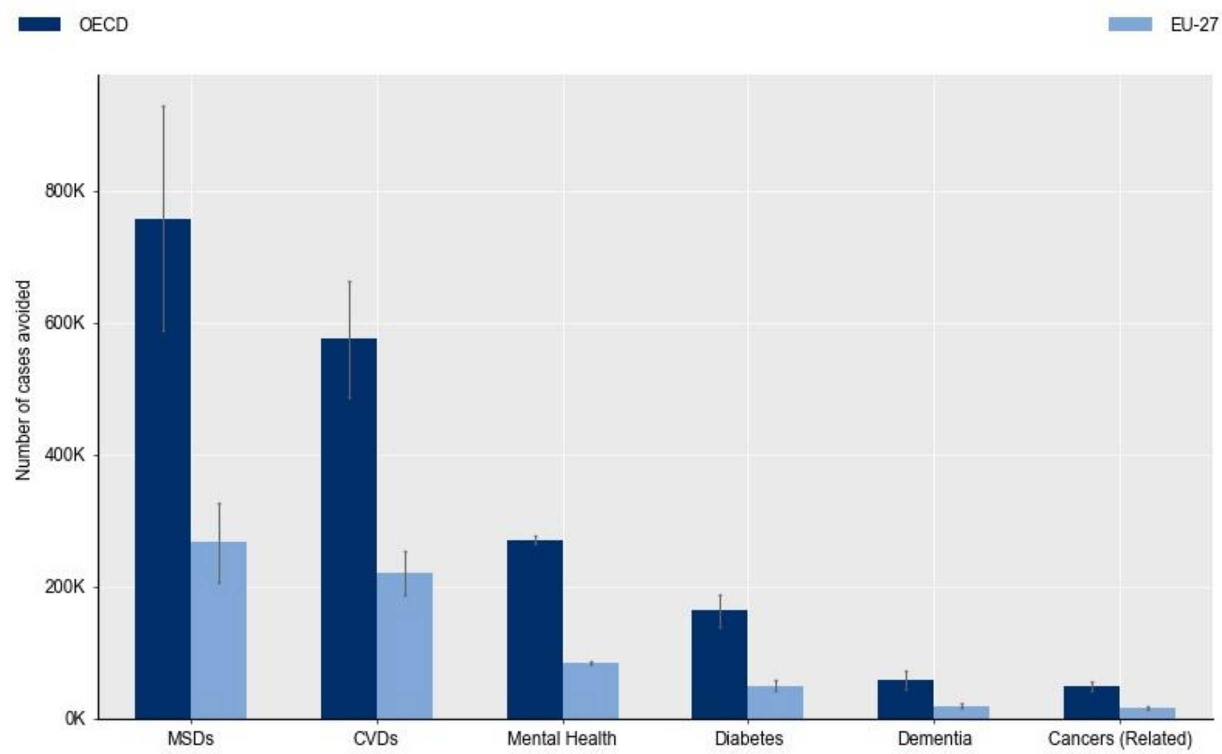
Figure 5.4. LYs and DALYs gained annually per 100 000 people, 2021-50 – CLI, all countries (2.5% referral rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2020.

In gross terms, CLI would have the greatest impact on MSDs with the intervention estimated to reduce the number of cases by 0.76 million and 0.27 million among OECD and EU27 countries, respectively, between 2021 and 2050 (Figure 5.5). Across all countries, CLI would also reduce the number of CVD cases by 0.63 million cases, mental health cases by 0.28 million, diabetes cases by 0.17 million, dementia cases by 56 000, and related cancers by 50 000.

Figure 5.5. Total disease cases avoided, between 2021 and 2050 – CLI, OECD and EU27 countries (2.5% referral rate)



Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

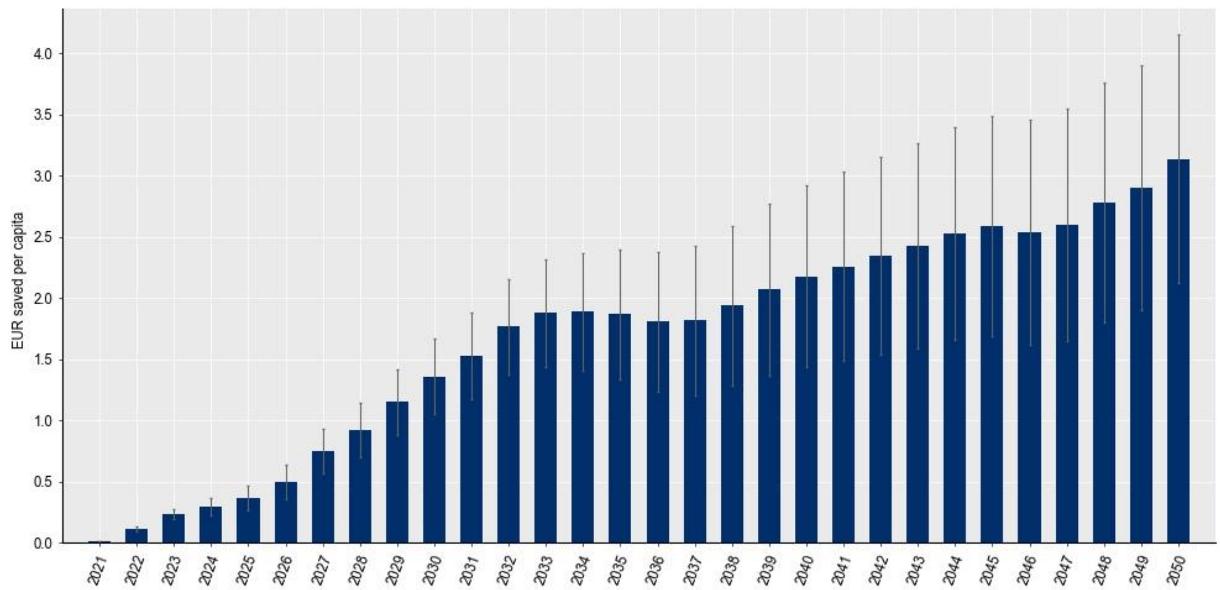
Efficiency

Similar to "Effectiveness", this section presents results for the Netherlands followed by remaining OECD and non-OECD European countries.

The Netherlands

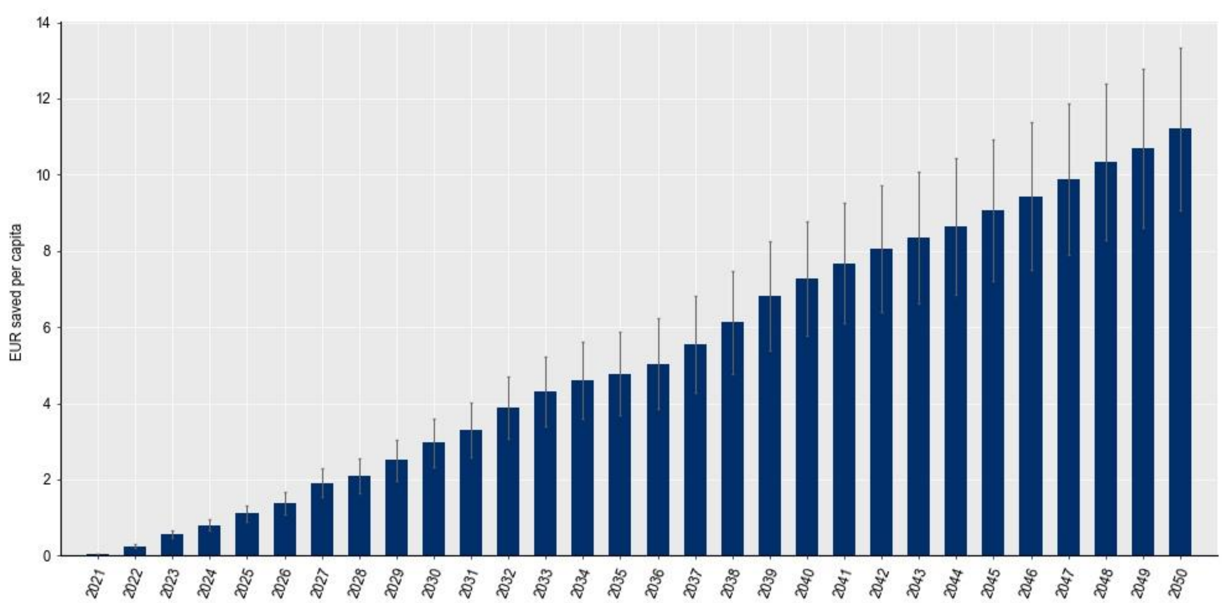
By improving levels of physical activity, CLI can reduce health care costs. At the current referral rate of 1.03%, over the modelled period of 2021-50, the OECD-SPHeP NCD model estimates CLI would lead to cumulative health expenditure savings of EUR 3.14 per person by 2050 (Figure 5.6). At a referral rate of 2.5%, CLI would lead to cumulative health expenditure savings of EUR 11.2 per person by 2050 (Figure 5.7) or EUR 0.61 on average per person, per year. Cost savings however are to an extent offset by intervention operating costs (see Table 5.2).

Figure 5.6. Cumulative health expenditure savings per person, EUR, 2021-50 – CLI, the Netherlands (1.03% referral rate)



Note: The black lines represent 95% confidence intervals. Savings are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Figure 5.7. Cumulative health expenditure savings per person, EUR, 2021-50 – CLI, the Netherlands (2.5% referral rate)

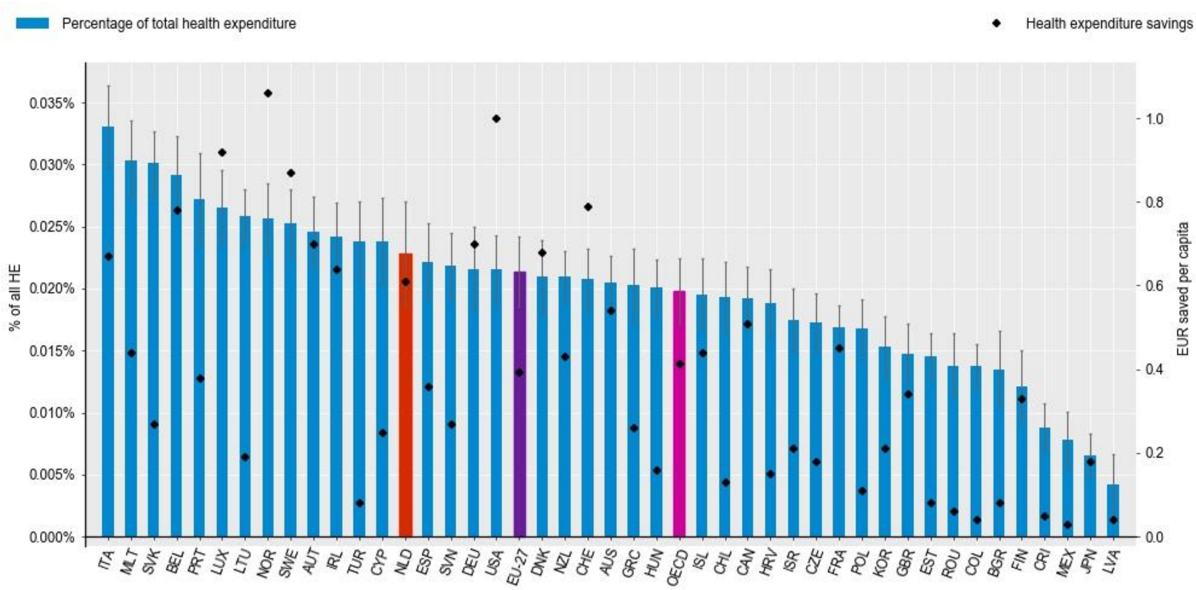


Note: The black lines represent 95% confidence intervals. Savings are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Average annual health expenditure (HE) savings as a proportion of total HE is around 0.02% for both OECD and EU27 countries, at a referral rate of 2.5% (Figure 5.8). On a per capita basis, this translates into average annual savings of EUR 0.41 and EUR 0.39 for OECD and EU27 countries, respectively.

Figure 5.8. Health expenditure (HE) savings as a percentage of total HE and per capita (EUR), average 2021-50 – CLI, all countries (2.5% referral rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Table 5.2 provides information on intervention costs, total health expenditure savings and the cost per DALY gained in local currency for OECD and non-OECD European countries. Although CLI is not cost-saving in any country (i.e. as measured by a negative cost per DALY gained), it is considered cost effective in many based on international thresholds. For example, in countries such as the Netherlands, France, Austria and Germany, the cost per DALY gained ranges between EUR 28 000 and EUR 38 000, which is less than the average cost effectiveness threshold applied in European countries (i.e. EUR 50 000 based on (Vallejo-Torres et al., 2016[4])). However, due to the relatively high cost of the intervention it is close to or higher than the threshold in a couple of countries.

Table 5.2. Cost effectiveness figures in local currency – CLI, all countries

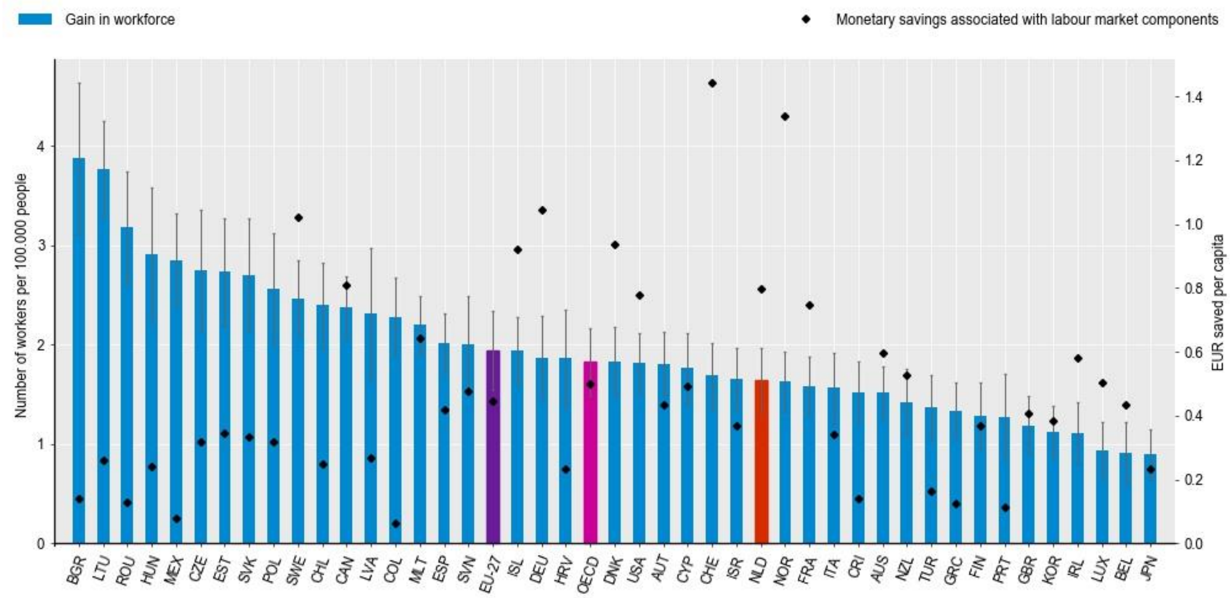
Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Australia	AUD	4.66	25 425 508	80 597
Austria	EUR	2.27	6 168 950	28 623
Belgium	EUR	2.27	9 481 024	33 122
Bulgaria	BGN	2.31	930 951	19 853
Canada	CAD	4.03	31 043 210	60 994
Chile	CLF	1407.26	2 062 888 426	22 892 139
Colombia	COP	3516.07	8 210 738 939	62 125 509
Costa Rica	CRC	1008.01	164 823 160	20 013 072

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Croatia	HRK	11.31	4 163 374	145 268
Cyprus	EUR	1.98	329 673	33 692
Czech Republic	CZK	45.94	46 960 326	490 030
Denmark	DKK	18.7	30 790 511	286 497
Estonia	EUR	1.73	91 526	20 778
Finland	EUR	2.49	1 858 846	34 668
France	EUR	2.24	30 543 912	38 615
Germany	EUR	2.47	54 981 289	27 223
Greece	EUR	1.89	2 687 982	23 396
Hungary	HUF	492.56	464 484 685	5 502 273
Iceland	ISK	402.04	22 341 821	6 913 223
Ireland	EUR	2.57	3 377 985	38 090
Israel	ILS	9.9	9 036 900	218 177
Italy	EUR	2.35	38 896 469	27 848
Japan	JPY	109.91	2 553 734 009	2 842 202
Korea	KRW	1153.96	14 112 728 260	26 692 881
Latvia	EUR	1.69	64 181	18 564
Lithuania	EUR	1.58	505 260	21 917
Luxembourg	EUR	2.57	640 323	41 769
Malta	EUR	2.12	188 634	26 188
Mexico	MXN	28.98	87 406 864	534 877
Netherlands	EUR	2.26	10 797 628	31 373
New Zealand	NZD	4.72	3 813 768	84 318
Norway	NOK	29.75	63 361 544	481 557
Poland	PLN	6.46	17 518 701	60 094
Portugal	EUR	1.9	3 721 465	19 509
Romania	RON	5.6	4 999 339	50 349
Slovak Republic	EUR	1.77	1 401 745	24 113
Slovenia	EUR	1.94	537 142	19 742
Spain	EUR	2.26	16 759 901	27 128
Sweden	SEK	24.66	101 711 232	255 477
Switzerland	CHE	3.3	8 245 141	65 704
Turkey	TRY	6.4	47 269 320	128 963
United Kingdom	GBP	2.2	21 552 151	33 973
United States	USD	3.52	412 769 762	45 656

* Cost per DALY (disability-adjusted life year) gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50. Costs and benefits have been discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

The reduction in chronic diseases resulting from CLI has, in turn, an impact on labour market participation and productivity. By reducing chronic disease incidence, CLI is expected to lead to increases in employment and reductions in absenteeism, presenteeism, and early retirement. Converting these labour market outputs into full-time equivalent (FTE) workers, it is estimated that OECD and EU27 countries will gain 1.82 and 1.95 FTE per 100 000 working age people per year between 2021 and 2050, respectively. In monetary terms, this translates into average per capita increase in labour market production of EUR 0.50 for OECD and EUR 0.45 for EU27 countries (Figure 5.9).

Figure 5.9. Labour market impacts, average per year, 2021-50 – CLI, all countries (2.5% referral rate)



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Equity

Analysis of claims data found that the plurality of participants (40%) are from a moderate educational level; similar to the national distribution. At 32% of CLI participants, people with a low educational level are slightly overrepresented when compared to the national distribution. There are however regional inequalities, with rates of participation differing three-fold between provinces (RIVM, 2021[1]).

Using data from the Slimmer RCT, Bukman et al. looked at the effectiveness of the intervention across different socio-economic groups (Bukman et al., 2017[5]). While there were some differences regarding the reason why people did not participate, overall participation, attendance, acceptability, adherence, drop-out, and effectiveness of the Slimmer intervention were not affected by socio-economic status. This suggests that the CLI can be used for both high and low socio-economic groups.

The fact that CLI is covered by the basic health insurance package and does not require a co-pay ensures there are no major financial barriers to participation. Access inequalities may arise, however, if the probability of visiting a GP is lower among disadvantaged groups. This is not the case in the Netherlands with the probability of visiting a GP the same among those in the poorest and richest income quintiles. However, access inequalities exist when examining all OECD countries: 74% of those in the richest quintile visit their GP compared to 70% in the poorest quintile (OECD, 2019[6]).

Evidence-base

One of the key criteria for CLI programmes to be accepted and reimbursed is that there is evidence of their cost-effectiveness. The Dutch public health institute, RIVM, reviews the evidence submitted by programmes and determines whether they will be recognised CLIs based on the quality of a written programme plan, effectiveness and feasibility. As such, all four of the current CLI programmes have evidence of effectiveness.

For the OECD SPHeP NCDs model, data from the Slimmer programme was used, as this was based on a RCT (Duijzer et al., 2017[2]) (0). The *Quality Assessment Tool for Quantitative Studies* rates this study as "strong" (see Table 5.3) (Effective Public Health Practice Project, 1998[7]). The study design, randomisation of participants and low drop-out rate all contribute to reliable estimates of the true effect of the intervention. The main limitation of the study is a potential selection bias, as only 54% of invited people agreed to participate in the study. It is not clear if the study was blinded to participants and assessors, but the nature of the intervention makes this difficult.

Table 5.3. Evidence-based assessment, CLI

Assessment category	Question	Rating
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	Less than 60%
Selection bias score: Weak		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	Yes
	If Yes, was the method of randomisation described?	Yes
	If Yes, was the method appropriate?	Yes
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	No
Confounders score: Strong		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Can't tell
	Were the study participants aware of the research question?	Can't tell
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	80-100%
Withdrawals and dropouts score: Strong		

Source: Effective Public Health Practice Project (1998[7]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

At the moment, there is not yet an evaluation of the effectiveness of CLI as a whole. To be able to do so in the future, the RIVM is in the process of setting up a registry of CLI participants. The registry would track outcome measures over a two-year period, including as weight and waist circumference, demographic and socio-economic data, and can be combined with claims data on cost and care utilisation broken down by care type.

While the RIVM is working with a data storage provider and the government to set up the necessary infrastructure and data sharing agreements, CLI providers are already collecting data from participants locally. This means that once the register is up and running, data can be added retrospectively.

Participation depends on the CLI providers, who report the data into the register, as well as the participants, who need to give permission.

The nation-wide and cross-programme coverage of the register, as well as the potential to link the CLI data to health insurance claims data, will provide a solid evidence base to test the effectiveness of the CLI programme, and to monitor its implementation and impact in real-time. Whether a control group can be created, potentially from an existing cohort study, is being explored.

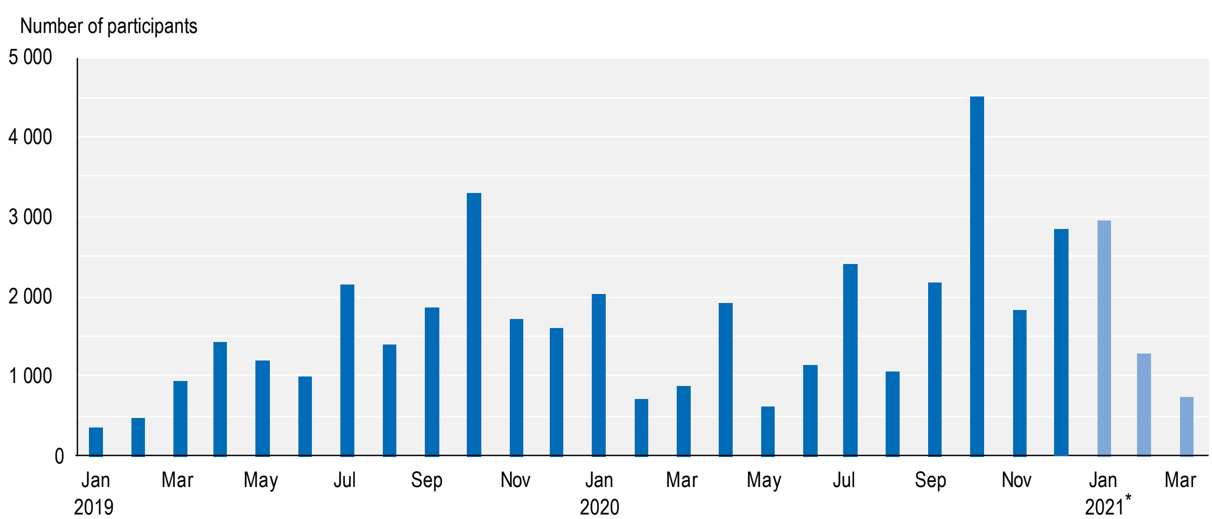
Extent of coverage

The roll-out of the CLI programme has been affected – like many other public health initiatives – by the COVID-19 pandemic. While the number of new participants increased over 2019, once the pandemic hit there was a pronounced dip (see Figure 5.10). However, after it was agreed in March 2020 that the group sessions could take place virtually, the number of new participants increased again. The exception to allow digital meetings is temporary, and will last until the COVID-19 measures in the Netherlands have been lifted. However, several programme owners have indicated that they will use this time to evaluate the effectiveness of digital interventions (Zorgverzekeraars Nederland, 2020[8]).

A total of around 18 000 people have participated in CLI so far (RIVM, 2021[1]). While the programme is still in an early phase, this is considerably lower than the potential eligible population, which was estimated at 3.5 million people (RIVM, 2018[3]). This gap is mostly due to a low referral rate by GPs, which is currently estimated at around 1% of eligible people. While increased familiarity with the programme as it becomes more established may boost referrals, scepticism among GPs about the effectiveness of the programme also plays a role.

Figure 5.10. CLI monthly enrolment

Number of new participants per month



* Data for 2021 not yet reliable.
Source: Adapted from RIVM (2021[1]), "Gecombineerde leefstijlinterventie 2021: verdubbeling aantal deelnemers", https://www.rivm.nl/sites/default/files/2021-07/factsheet%20GLI%20juni%202021.pdf.

Policy options to enhance performance

The CLI is an effective programme to improve population health and reduce health care expenditure, built on a strong evidence base. To further enhance CLI, in the Netherlands or in any transfer countries, there are a few policy options to consider.

Enhancing effectiveness

While the various CLI programmes have all been studies for their effectiveness before being included in the reimbursement scheme, it is worth exploring whether effectiveness can be further increased. The new register data will provide an invaluable source for this, as it will allow comparative analysis across programmes and population groups.

There is relatively little evidence in the literature on combined lifestyle-type programmes, but physical activity on prescription (PAP) programmes are well-researched. These are similar to the CLI programme, with the main difference being that CLI looks at diet as well as physical activity. Studies on PAP and CLI programmes found that there are a number of factors that can increase their effectiveness. These include:

- Two systematic reviews found that a longer intervention duration, as well as a longer follow-up period, are associated with a greater impact (Goryakin, Suhlrie and Cecchini, 2018[9]) (Arsenijevic and Groot, 2017[10]).
- A study of adherence to physical activity prescriptions found that non-adherence was more frequent among subjects who were issued with referrals for facility-based activities rather than home-based activities. However, low motivation was often cited as the reason for non-adherence to home-based activities, suggesting that facility-based activities may be preferred for participants with a lower motivation (Leijon et al., 2011[11]).
- An RCT looking at intensity and frequency found that prescribing a higher frequency of physical activity increased the accumulation of exercise without a decline in adherence, while a higher intensity decreased adherence (Duncan et al., 2005[12]) (Perri et al., 2002[13]).
- Prescriptions need to be carefully tailored to the participant's capability (e.g. physical capacity), opportunity (e.g. having access to appropriate activities) and motivation (e.g. finding activities that encouraged continuation) to undertake physical activity (Andersen et al., 2019[14]).
- There appears to be a trade-off between sufficient intensity to achieve results, and over-burdening participants. A study of the BeweegKuur CLI noted that dieticians reduced the number of group meetings, to ensure participation (Berendsen et al., 2015[15]).
- This same study noted the importance of managing expectations. Many participants engage in the programme with the aim of losing weight, while the adoption of physical activity and a healthier diet does not necessarily lead to immediate weight loss. Managing expectations and clarifying the goal of the programme beforehand could have a positive impact on adherence and therefore effectiveness (Berendsen et al., 2015[15]).

Enhancing efficiency

The CLI is a relatively high-cost intervention. This is mainly due to the requirement (temporarily lifted due to COVID-19) to conduct all meetings in-person. It is therefore a positive development that the various programmes are evaluating the effectiveness of digital meetings while this is temporarily allowed. Digital interventions generally have a lower per-participant cost as they can be offered to a larger group of participants. It could also address the issue regarding availability of licensed lifestyle coaches, which is one of the limiting factors to expanding programme coverage.

When evaluating the digitalisation of the CLI programme, the following elements should be considered:

- **Effectiveness**: Do participants who receive sessions digitally have the same outcomes as those participating in in-person sessions? How does this compare to a hybrid system? Which population groups respond best to the digital intervention?
- **Cost-effectiveness**: What is the change in per-person cost? How does this compare to the effectiveness of the programme?
- **Adherence**: Is there is difference in adherence between the digital and the in-person programme? What is the session attendance rate?
- **Digital inclusion**: Which population groups do not respond well to a digital intervention, and how can they be given specific consideration if digitalisation continues?

Enhancing the evidence base

The CLI already performs very well on its evidence base – for example, an RCT, which is considered the "gold standard" study design, was used to evaluate one of the four approved CLI programmes. Future evaluations of CLI, as a whole, are also like to be of high quality given the planned registry of CLI participants will include information on health outcomes and demographics, which can be linked to cost data. The registry will also allow researchers to evaluate the long-term effectiveness of CLI, as well as compare the effectiveness of the different CLI programmes to identify the most cost-effective option.

Enhancing equity

The CLI intervention appears to be equitable as far as socio-economic distribution: claims data suggests that the CLI intervention reaches different population groups equally, and the RCT of the Slimmer programme did not show differences by socio-economic groups (Bukman et al., 2017[5]). It will be interesting to see more analysis on this once data from the register becomes available, in particular on the long-term effectiveness in different population groups.

There is however a regional inequality, as some provinces have three-times higher rates of CLI participation in their population than others. The programme relies on the initiative of local actors to develop and offer CLI courses, and there is no mechanism ensuring national coverage. To encourage the development of regional networks of CLI providers, the Dutch organisation for health research and development ZonMW provides subsidies of up to EUR 37 500 over a maximum period of 12 months to develop and expand regional implementation of the CLI. Currently ten such subsidies have been awarded.

It is not clear whether the outcomes differ by region. Once data from the national register becomes available, it would be valuable to conduct an analysis of outcomes by region, to ensure there are no significant differences in the quality of the programmes offered across the country.

Enhancing coverage

As described, there is significant potential to expand the coverage of the intervention. This could be done by increasing the GP referral rate, which is currently estimated at only 1.03%. A study of the Swedish Physical Activity on Prescription intervention, which also relies on health care professionals referring eligible patients to local lifestyle interventions, identified the following factors that can increase referral rates (Gustavsson et al., 2018[16]):

- **Increased knowledge and affirmative attitude among the health care professionals**. This includes knowledge on how to talk about health behaviours in patient consultations, and knowledge of and belief in the CLI programme. Especially the latter issue may be an important factor driving the low referral rate by GPs.

- **Clear and supportive management.** Policies and clinical guidelines need to be developed, shared and approved at all levels, central management of health care organisations needs to show clear support for the intervention and earmark time and resources for CLI referrals.
- **Supporting structures**. This includes a centralised or local support function, such as a central co-ordinator, tailored written routines at health care centres on when and how to do CLI referrals, and the availability of an up-to-date list of CLI providers in the area.

Transferability

This section explores the transferability of the CLI programme from the Netherlands to other OECD and non-OECD EU countries and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring CLI.

Previous transfers

The CLI has not yet been transferred to other countries.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of the CLI programme are listed in Table 5.4. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 5.4. Indicators to assess the transferability of the CLI programme

Indicator	Reasoning	Interpretation
Sector specific context (primary care)		
Health professionals are trained in health-enhancing physical activity	CLI requires health professionals to recognise patients who would benefit from physical activity, and is therefore more likely to be successful if health professionals have been trained on this topic	“Implemented” or “Foreseen” = more transferable
General practitioners density per 1 000 people	General practitioners are one of the main prescribers. If there are few GPs per population, it is less likely they will have time to commit to CLI	↑ value = more transferable
% people who visited a GP in the last 12 months at least once	CLI candidates are identified during routine primary care. The more often people see their GP, the more likely CLI reaches the right people	↑ value = more transferable
Political context		
Programme or scheme to promote counselling on physical activity by health professionals	CLI is more likely to have political support in a country that already supports counselling on physical activity by health professionals	“Implemented” or “Foreseen” = more transferable
Existence of operational strategy/action plan/policy to reduce physical inactivity	CLI is more likely to have political support in a country that explicitly aims to reduce physical inactivity	“Yes” = more transferable

Indicator	Reasoning	Interpretation
Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs	CLI is more likely to have political support in a country that explicitly aims to reduce unhealthy diets	"Yes"= more transferable
Economic context		
Primary health care expenditure as a percentage of current health expenditure	As CLI is a primary care intervention, a country with a larger expenditure on prevention is more likely to be able to cover the cost	↑ value = more transferable

Source: WHO Regional Office for Europe (2021[17]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2021[19]), "OECD Health Statistics 2021", https://doi.org/10.1787/health-data-en.

Results

Findings from the transferability assessment using public data are summarised below, with country level results available in Table 5.5:

- As in the Netherlands, overweight and obesity is a top political priority – this is reflected by the data with the vast majority of countries having developed an operational plan to address unhealthy diets and physical inactivity. Given these are the two risk factors CLI aims to address, the results indicate CLI would likely receive political support among potential transfer countries.
- Among countries with available data, the majority have implemented or foresee implementing physical inactivity counselling programmes delivered by health professionals. This provides further evidence of CLI's transferability given it aligns with existing health priorities.
- Based on available data, CLI is also likely to be affordable given most countries spend proportionally more on primary care – 32% in the Netherlands compared to an average of 44% among remaining countries.
- Although the Netherlands has a relatively high number of GPs per capita (0.9 per 1 000 people in the Netherlands compared to an average of 0.76), the proportion of people who visit a GP is, on average, higher among potential transfer countries. This indicates there would be ample opportunity to refer patients to CLI. In addition, health professionals in potential transfer countries would likely accept CLI given physical activity is part of their health curriculum.

Table 5.5. Transferability assessment by country, CLI (OECD and non-OECD European countries)

A darker shade indicates CLI may be more suitable for transferral in that particular country

	Inclusion of physical activity and health in curriculum of health professionals	General practitioners density per 1 000 people	% people who visited a GP in the last 12 months at least once	Programme to promote counselling on physical activity by health professionals	Existence of operational plan to reduce physical inactivity	Existence of operational plan to reduce unhealthy diet	Primary care expenditure, percentage of total
Netherlands	Implemented	0.9	71	Implemented	Yes	Yes	32
Australia	n/a	1.2	83	n/a	Yes	Yes	37
Austria	Implemented	0.8	84	Implemented	Yes	Yes	37
Belgium	Implemented	1.2	87	Implemented	Yes	Yes	40
Bulgaria	Foreseen	0.6	48	Foreseen	Yes	Yes	47
Canada	n/a	1.3	n/a	n/a	Yes	Yes	48
Chile	n/a	1.3	n/a	n/a	Yes	Yes	n/a
Colombia	n/a	n/a	n/a	n/a	Yes	Yes	n/a
Costa Rica	n/a	n/a	n/a	n/a	Yes	Yes	33
Croatia	Not implemented	0.6	68	Implemented	Yes	Yes	38
Cyprus	Not implemented	n/a	68	Foreseen	No	No	41
Czech Republic	Implemented	0.7	86	Foreseen	Yes	Yes	33
Denmark	Implemented	n/a	86	Foreseen	Yes	Yes	38
Estonia	Implemented	0.7	73	Foreseen	Yes	Yes	44
Finland	Implemented	n/a	68	Implemented	Yes	Yes	46
France	Implemented	0.9	85	Implemented	Yes	Yes	43
Germany	Implemented	0.7	89	Implemented	Yes	Yes	48
Greece	Not implemented	0.3	40	n/a	Yes	No	45
Hungary	Implemented	0.5	71	Implemented	Yes	Yes	40
Iceland		0.6	n/a	n/a	Yes	Yes	35
Ireland	Implemented	0.8	76	Implemented	Yes	Yes	47
Israel	n/a	0.3	n/a	n/a	Yes	Yes	n/a
Italy	Not implemented	0.7	71	Implemented	Yes	Yes	n/a
Japan	n/a	n/a	n/a	n/a	Yes	Yes	52

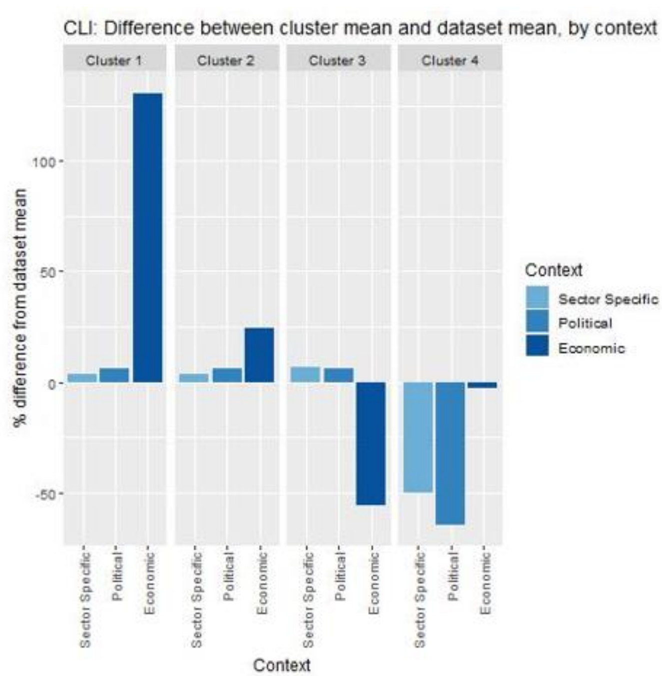
	Inclusion of physical activity and health in curriculum of health professionals	General practitioners density per 1 000 people	% people who visited a GP in the last 12 months at least once	Programme to promote counselling on physical activity by health professionals	Existence of operational plan to reduce physical inactivity	Existence of operational plan to reduce unhealthy diet	Primary care expenditure, percentage of total
Netherlands	Implemented	0.9	71	Implemented	Yes	Yes	32
Latvia	Implemented	0.7	80	Implemented	Yes	Yes	39
Lithuania	Implemented	0.9	76	Implemented	Yes	Yes	48
Luxembourg	Implemented	.. n/a	89	Not implemented	Yes	Yes	38
Malta	Implemented	0.8	83	Foreseen	Yes	Yes	62
Mexico	n/a	0.6	n/a	n/a	Yes	Yes	44
New Zealand	n/a	1.0	n/a	n/a	Yes	No	n/a
Norway	n/a	0.8	79	n/a	Yes	Yes	39
Poland	Implemented	0.2	64	Not implemented	Yes	Yes	47
Portugal	Implemented	2.4	81	Implemented	Yes	Yes	58
Republic of Korea	n/a	0.1	n/a	n/a	Yes	Yes	57
Romania	Implemented	0.6	57	Foreseen	Yes	Yes	35
Slovak Republic	Not implemented	n/a	82	Implemented	Yes	Yes	n/a
Slovenia	Implemented	0.6	76	Implemented	Yes	Yes	43
Spain	Not implemented	0.8	80	Implemented	Yes	Yes	39
Sweden	Implemented	0.6	62	Implemented	Yes	No	n/a
Switzerland	n/a	n/a	n/a	n/a	Yes	Yes	40
Turkey	n/a	0.6	n/a	n/a	Yes	Yes	n/a
United Kingdom	Implemented	0.8	74	Implemented	Yes	Yes	53
United States	n/a	0.3	n/a	n/a	Yes	Yes	n/a

Note: n/a = data was not available. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details).
Source: WHO Regional Office for Europe (2021[17]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2021[19]), "OECD Health Statistics 2021", https://doi.org/10.1787/health-data-en.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of four groups (see Figure 5.11 and Table 5.6). Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

- Countries in cluster one and two have political, economic and sector specific arrangements in place to transfer CLI. For this reason, countries in these two clusters have conditions in place to readily transfer CLI to their local context. Countries in both clusters are similar in terms of indicators reflecting the sector and political contexts, however, in general, countries in cluster one spend relatively more on primary care indicating greater long-term affordability.
- Countries in cluster three have political priorities that align with CLI yet may suffer affordability issues if primary care expenditure remains relatively low. It is important to note that the Netherlands falls within cluster three meaning although relatively high spending on primary care is ideal, it is not a pre-requisite to successfully operate CLI.
- Remaining countries are in cluster four, which would benefit from policies that ensure the sector is ready to implement CLI, as well as implement overarching national policies that support physical activity and healthy diets.

Figure 5.11. Transferability assessment using clustering, CLI



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: WHO Regional Office for Europe (2021[17]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2021[19]), "OECD Health Statistics 2021", https://doi.org/10.1787/health-data-en.

Table 5.6. Countries by cluster, CLI

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Malta	Bulgaria	Australia	Cyprus
Portugal	Canada	Austria	Greece
Republic of Korea	Estonia	Belgium	Sweden
United Kingdom	Finland	Croatia	
	France	Czech Republic	
	Germany	Denmark	
	Ireland	Hungary	
	Italy	Iceland	
	Lithuania	Latvia	
	Mexico	Luxembourg	
	Poland	Netherlands	
	Slovak Republic	Norway	
	Slovenia	Romania	
		Spain	

Note: Due to high levels of missing data, the following countries were omitted from the analysis: Chile, Colombia, Costa Rica, Israel, Japan, New Zealand, Switzerland, Turkey, and the United States.

New indicators to assess transferability

Data from publically available datasets is not sufficient to assess the transferability of CLI. For example, there is no public data on the availability of certified lifestyle coaches. Moreover, there may be other successful local programmes that can be included under the CLI. Therefore, Box 5.3 outlines several new indicators policy makers should consider before transferring CLI.

Box 5.3. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect information on the following questions:

Population context

- Who are the target population groups for this intervention?
- What is the population's attitude towards physical exercise?
- What is the population's attitude towards dietary advice?
- What are the main lifestyle issues, and how can a CLI be developed to address them?

Sector specific context (primary care)

- Are there existing interventions that can be accredited as a CLI?
- Are the enough accredited lifestyle coaches or does a training programme need to be set up?
- Is there an alternative to using lifestyle coaches?
- Which health care professionals should be included in the CLI delivery team?
- How can access to structured physical activity or sporting facilities be enabled?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received financial commitment from key decision-makers?

Economic context

- Is there budget to include the CLI under the basic health coverage?
- How much is the programme expected to cost?
- How will the reimbursement mechanism work?

Conclusion and next steps

CLI in the Netherlands is a national programme to provide dietary advice, physical activity and behavioural counselling to people with high BMI and is covered under the basic health insurance. Different evidence-based programmes have been approved for reimbursement under CLI, all of which last approximately two years with an intervention phase of between seven and 12 months, during which participants receive training and counselling from lifestyle coaches or multidisciplinary teams.

As a result of COVID-19, a number of CLI programmes are evaluating the effectiveness of delivering care digitally rather than in person. If this proves to be successful, it could help lower cost and increase coverage. To further increase coverage the referral rate by GPs should be increased by improving knowledge among the health care professionals of the CLI programme, ensuring supportive management and putting in place the necessary supporting structures.

CLI has not been transferred outside the Netherlands. An assessment of transferability using publically available data indicates potential transfer countries would be able to afford and be supportive of CLI.

Box 5.4 outlines next steps for policy makers and funding agencies regarding CLI.

Box 5.4. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies are listed below:

- Once the registry is up and running, it will be interesting to see the impact of CLI on health and health care utilisation in the longer-term, as well as differences by population groups and regions. Insights from this data should be used to tweak the programme or to target specific groups.
- Similarly, results from the evaluation studies of the digital delivery should be used to potentially make this a permanent element of the CLI – provided it has been proven effective, cost-effective and equitable.
- There is considerable scope to increase the number of participants, and policy makers may want to look at increasing the GP referral rate.

References

Andersen, P. et al. (2019), "Patients' experiences of physical activity on prescription with access to counsellors in routine care: A qualitative study in Sweden", *BMC Public Health*, Vol. 19/1, pp. 1-11, https://doi.org/10.1186/s12889-019-6535-5. [14]

Arsenijevic, J. and W. Groot (2017), "Physical activity on prescription schemes (PARS): Do programme characteristics influence effectiveness? Results of a systematic review and meta-analyses", *BMJ Open*, Vol. 7/2, p. 12156, https://doi.org/10.1136/bmjopen-2016-012156. [10]

Berendsen, B. et al. (2015), "The implementation and sustainability of a combined lifestyle intervention in primary care: mixed method process evaluation", *BMC Family Practice*, Vol. 16/1, https://doi.org/10.1186/s12875-015-0254-5. [15]

Bukman, A. et al. (2017), "Is the success of the SLIMMER diabetes prevention intervention modified by socioeconomic status? A randomised controlled trial", *Diabetes research and clinical practice*, Vol. 129, pp. 160-168, https://doi.org/10.1016/J.DIABRES.2017.05.002. [5]

Duijzer, G. et al. (2019), "Cost-effectiveness of the SLIMMER diabetes prevention intervention in Dutch primary health care: economic evaluation from a randomised controlled trial", *BMC health services research*, Vol. 19/1, https://doi.org/10.1186/S12913-019-4529-8. [22]

Duijzer, G. et al. (2017), "Effect and maintenance of the SLIMMER diabetes prevention lifestyle intervention in Dutch primary healthcare: a randomised controlled trial", *Nutrition & diabetes*, Vol. 7/5, https://doi.org/10.1038/NUTD.2017.21. [2]

Duncan, G. et al. (2005), "Prescribing exercise at varied levels of intensity and frequency: A randomized trial", *Archives of Internal Medicine*, Vol. 165/20, pp. 2362-2369, https://doi.org/10.1001/archinte.165.20.2362. [12]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [7]

Goryakin, Y., L. Suhlrie and M. Cecchini (2018), *Impact of primary care-initiated interventions promoting physical activity on body mass index: systematic review and meta-analysis*, Blackwell Publishing Ltd, https://doi.org/10.1111/obr.12654. [9]

Gustavsson, C. et al. (2018), "What is required to facilitate implementation of Swedish physical activity on prescription? - Interview study with primary healthcare staff and management", *BMC Health Services Research*, Vol. 18/1, https://doi.org/10.1186/s12913-018-3021-1. [16]

Leijon, M. et al. (2011), "Who is not adhering to physical activity referrals, and why?", *Scandinavian Journal of Primary Health Care*, Vol. 29/4, pp. 234-240, https://doi.org/10.3109/02813432.2011.628238. [11]

Nederlandse Zorgautoriteit (2021), *Welke tarieven gelden voor de GLI?*, https://www.nza.nl/documenten/vragen-en-antwoorden/gli-welke-tarieven-gelden-voor-de-gli (accessed on 9 August 2021). [23]

OECD (2021), *OECD Health Statistics 2021*, OECD Publishing, Paris, https://doi.org/10.1787/health-data-en (accessed on 25 August 2021). [19]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [6]

Perri, M. et al. (2002), "Adherence to exercise prescriptions: Effects of prescribing moderate versus higher levels of intensity and frequency", *Health Psychology*, Vol. 21/5, pp. 452-458, https://doi.org/10.1037/0278-6133.21.5.452. [13]

RIVM (2021), *Gecombineerde leefstijlinterventie 2021: verdubbeling aantal deelnemers*, https://www.rivm.nl/sites/default/files/2021-07/factsheet%20GLI%20juni%202021.pdf (accessed on 9 August 2021). [1]

RIVM (2018), "Budget impact analyse van gecombineede leefstijlinterventie (GLI)", https://doi.org/10.21945/RIVM-2018-0092. [3]

Schutte, B., A. Haveman-Nies and L. Preller (2015), "One-Year Results of the BeweegKuur Lifestyle Intervention Implemented in Dutch Primary Healthcare Settings", *BioMed research international*, Vol. 2015, https://doi.org/10.1155/2015/484823. [20]

Vallejo-Torres, L. et al. (2016), "On the Estimation of the Cost-Effectiveness Threshold: Why, What, How?", *Value in Health*, Vol. 19/5, pp. 558-566, https://doi.org/10.1016/j.jval.2016.02.020. [4]

van Rinsum, C. et al. (2018), "The Coaching on Lifestyle (CooL) Intervention for Overweight and Obesity: A Longitudinal Study into Participants' Lifestyle Changes", *International journal of environmental research and public health*, Vol. 15/4, https://doi.org/10.3390/IJERPH15040680. [21]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [18]

WHO Regional Office for Europe (2021), *2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region*, https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf. [17]

Zorgverzekeraars Nederland (2020), *De gecombineerde leefstijlinterventie tijdens de coronacrisis [The combined lifestyle intervention during the corona crisis]*, https://assets.zn.nl/p/32768/files/De%20gecombineerde%20leefstijlinterventie%20tijdens%20de%20coronacrisis.pdf (accessed on 10 August 2021). [8]

Annex 5.A. Modelling assumptions for CLI

Annex Table 5.A.1. Parameters to model the impact of CLI

Model parameters	Combined Lifestyle Intervention model inputs
Effectiveness	BMI:-0.9 kg/m² (95% CI: −1.3 to −0.6) MET min / week: +1 244 (95% CI: -337 to 2 829)
Time to maximum effectiveness	BMI: 12 months, then down to -0.8 (−1.2 to −0.5) at 18 months, and back to 0 at 30 months MET min / week: 12 months, then down to 616 (-1196 to 1 628) at 18 months, and back to 0 at 24 months All increases/decreases modelled linearly
Target population	Adults (18+) with a BMI between 25 and 30 kg/m2, and a comorbidity (hypertension, diabetes, cardiovascular disease); or with a BMI greater than 30 kg/m2
Exposure	1.03% to 2.5% of eligible patients get referred to CLI (note: the 1.03% scenario was modelled only for the Netherlands, while the higher estimate of 2.5% was used to compare the potential impact across countries) Of this group, 84% of people participated in an intake session Of this group, 10% will drop out after the intake Of the 90% starting the CLI, 18.5% will drop out before the end, with 14% dropping out after the first quarter 3.5% dropping out after the second quarter 1% dropping out after the third quarter Eligible persons can participate again in the future
Per capita cost, EUR	Completed programme: EUR 677.00 Drop out after intake: EUR 49.84 Drop out after quarter 1: EUR 143.16 Drop out after quarter 2: EUR 236.47 Drop out after quarter 3: EUR 329.79

Effectiveness

A 2015 before-after study of the BeweegKuur intervention found that weight went down by 2.9 kg (3.0% of baseline) on average after one year, and light-to-moderate physical activity and vigorous physical activity increased by 2.1 (15%) and 1.7 (40%) hours per week, respectively (Schutte, Haveman-Nies and Preller, 2015[20]). A longitudinal study of the Cool intervention showed that participants lost an average of 2.3 kg after completing the intervention (8-10 months), which corresponds to 0.8 BMI points. After 18 months, the average weight loss was still 1.8 kg, compared to the baseline (van Rinsum et al., 2018[21]). They also found positive changes in perceived autonomy, motivation, perceived barriers, lifestyle behaviours and quality of life.

The Slimmer programme was evaluated using a randomised controlled trial (RCT) in 2011 and 2012 (Duijzer et al., 2017[2]). The 316 participants were split into an intervention group, who received the Slimmer programme, and a control group, who received usual health care (yearly monitoring of blood glucose according to guidelines) and written information on the beneficial effects of a healthy diet and increased physical activity. The RCT found that, after 12 months, people in the intervention group saw their BMI decrease by 0.9 points (95% CI: −1.3 to −0.6) more than those in the control group. After 18 months this difference was 0.8 BMI points (−1.2 to −0.5). The intervention group also did 1 244 MET-minutes (-337 to 2 829)1 of physical activity per week more than the control group after 12 months. After 18 months, this difference was 616 MET-minutes per week (-1196 to 1 628).

Since the Slimmer programme was evaluated using an RCT, these effectiveness estimates were used to reflect the effectiveness of the overall CLI programme. It should be noted that it is not clear whether the other three CLI programmes do in fact have the same impact as the Slimmer programme.

Time to maximum effectiveness

The RCT showed that the maximum impact on physical activity was at 12 months (1 244 MET-minutes/week) and decreased to 616 at 18 months. This linear trend was assumed to continue, returning to the baseline physical activity level after 24 months. The increase in the first 12 month was also modelled linearly.

For BMI, the increase was modelled linearly to reach -0.9 by 12 months. At 18 months it was at -0.8, after which it was assumed to return to 0 over another 12 months – similar to the initial increase.

Target population

For the CLI, the inclusion criteria are:

- Adults (18+) with a BMI between 25 and 30 kg/m^2, and a waist circumference of >88cm (women) or >102cm (men)
- Adults (18+) with a BMI between 25 and 30 kg/m^2, and a comorbidity (hypertension, high cholesterol, diabetes, cardiovascular disease, arthrosis or sleep apnoea)
- Adults (18+) with a BMI greater than 30 kg/m^2

As the model does not contain information on waist circumference, cholesterol, arthrosis or sleep apnoea, these criteria could not be included.

Exposure

The Dutch public health institute RIVM estimated that (RIVM, 2018[3]):

- GPs are estimated to refer 1.03% of eligible patients to CLI. For sensitivity analysis, a higher referral rate of 2.5% was used. As the 1.03% referral rate is quite low, this was only modelled for the Netherlands, to reflect the current situation. To understand the potential impact across countries, the higher referral rate of 2.5% was used.
- Of this group, 84% of people participate in an intake session
- Afterwards, 90% of people actually start the CLI
- Of these people, 18.5% will drop out before the end, with
  - 14% dropping out after the first quarter
  - 3.5% dropping out after the second quarter
  - 1% dropping out after the third quarter

Eligible persons can participate again in the future.

Cost of implementation and delivery

A cost-effectiveness study of the Slimmer programme estimated the average cost of the intervention at EUR 677 per participant for the entire programme (see Annex Table 5.A.2) (Duijzer et al., 2019[22]). On the insurer side, a maximum reimbursement tariff has been established for CLIs (see Annex Table 5.A.3). For 2021, the maximum reimbursement for a full two-year CLI is EUR 835.68 – roughly in line with the intervention cost estimated for the Slimmer programme. Since the tariffs reflect an upper limit, the EUR 677 from the Slimmer study was used in the model. For people leaving the intervention early (i.e. after the intake session or during the first three-quarters), cost were adjusted using the proportional distribution of the tariff over the various stages of the intervention (see Annex Table 5.A.4).

Annex Table 5.A.2. Combined Lifestyle Intervention average cost

Average intervention cost per participant over 18 months, EUR

Cost item	Per participant cost
Selection and recruitment by practice nurse	37
Materials	16
Project co-ordinator	133
Individual consultations with dietician	101
Group session with dietician	4
Group-based training sessions with physiotherapist	319
Sports clinics at local sports club	60
Return session with dietician and physiotherapist	6
Total	**677**

Source: Duijzer et al. (2019[22]), "Cost-effectiveness of the SLIMMER diabetes prevention intervention in Dutch primary health care: economic evaluation from a randomised controlled trial", https://doi.org/10.1186/S12913-019-4529-8.

Annex Table 5.A.3. Combined Lifestyle Intervention maximum reimbursement tariff

Maximum reimbursement tariffs per participant, EUR

CLI elements	Maximum tariff 2021
Intake	61.58
Intervention phase per quarter	115.19
Maintenance phase per quarter	78.35

Source: Nederlandse Zorgautoriteit (2021[23]), "Welke tarieven gelden voor de GLI?" https://www.nza.nl/documenten/vragen-en-antwoorden/gli-welke-tarieven-gelden-voor-de-gli.

Annex Table 5.A.4. Adjusted costs for drop-outs

Cost for drop-outs are based on the proportion of the max tariff up until drop out, EUR

	Tariff cost up until drop out	Proportion of max tariff (full two years)	Model cost based on EUR 677 total
Drop out after intake	61.52	7%	49.84
Drop out after quarter 1	176.71	21%	143.16
Drop out after quarter 2	291.90	35%	236.47
Drop out after quarter 3	407.09	49%	329.79

Notes

[1] Using a MET-value of 2 for light physical activity, 4 for moderate and 8 for vigorous.

[1] Using a MET-value of 2 for light physical activity, 4 for moderate and 8 for vigorous.

6 Multimodal Training Intervention

This chapter covers the case study of the Multimodal Training Intervention (MTI), an exercise-based intervention in Iceland targeting individuals aged 65 years and over who live independently at home. The case study includes an assessment of MTI against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Multimodal Training Intervention (MTI): case study overview

Description: MTI is an exercise-based intervention targeting individuals aged 65 years and over who live independently at home. The intervention involves endurance and resistance training under the guidance of a personal training over a period of 24 months. Participants also have access to lectures on topics such as nutrition, physical activity training and sleep. MTI has been transferred to regions in Spain and Lithuania. This case study focuses on MTI in Iceland.

Best practice assessment:

Table 6.1. OECD best practice assessment of MTI

Criteria	Assessment
Effectiveness	Scaling-up MTI across Iceland is expected to lead to 456 life years (LYs) g and 534 disability-adjusted life years (DALYs) gained by 2050 MTI is estimated to prevent 464 chronic diseases cases by 2050, 37% of which are cardiovascular disease cases
Efficiency	MTI is a relatively expensive obesity prevention intervention as it offers participants supervised exercise classes and tailored healthy living lectures for a relatively small number of people
Equity	Priority population groups were considered when designing the intervention
Evidence base	The quality of evidence used for this case study is "strong" in areas related to data collection methods and selection bias Early evaluations of MTI used randomised control trials, which are considered "gold standard" in establishing causality
Extent of coverage	True participation rates are not known Dropout rate was 25%

Enhancement options: to enhance the evidence-base, future evaluations could utilise data from national administrative datasets to obtain data on health care utilisation and costs for participants, as well as data for a control group. To enhance equity, administrators could expand recruitment strategies with a special focus on priority populations. To enhance extent of coverage, several strategies are available to reduce measurement dropout rate, such as education on the importance of measurements and rewards. Further, stakeholder such as local governments could boost uptake by educated the older population on the health, social and economic benefits of exercise.

Transferability: MTI has been successfully transferred to regions in Spain and Lithuania. Based on publically available data, MTI is likely to receive political support given it tackles physical inactivity and unhealthy eating, both of which are high priority issues in the OECD. However, affordability may be an issue if patients are required to pay out-of-pocket for the programme.

Conclusion: MTI has the potential to significantly reduce disease incidence among the older population. Findings from previous cross-country transfers indicate MTI is transferable.

Intervention description

Iceland's population is ageing, which poses several challenges. Since 1980, the proportion of the population aged 65 years and over grew from 10% to 14%, and is expected to increase to 24% by year 2050 (Statistics Iceland, 2019[1]; Statistics Iceland, 2019[2]).[1] Consequently the country has seen a rise in the number of people living with chronic diseases, greater demand for labour-intensive long-term care, and a decline in the proportion of the working age population (OECD, 2019[3]).

In response to these challenges, the Icelandic private company, Janus Health Promotion, developed the Multimodal Training Intervention (MTI), which was created and designed as a continuation of the doctoral project Multimodal Training Intervention – An Approach to Successful Aging (Guðlaugsson, 2014[4]). MTI aims to improve the fitness of participants enabling them to participate for longer in everyday activities, live longer in their own home, work for longer in the labour market, and delay or prevent admission to a nursing home.

MTI is targeted at those aged 65 years and over who are in good health. That is, people who:

- Live independently
- Are able to travel to and from training and seminar groups as part of MTI
- Receive at least 6 out of a total 12 points in the SPPB (Short Physical Performance Battery) test, which is used to assess lower extremity in older, non-disabled adults (a score of 12 indicates the patient does not have any lower mobility limitations) (Guralnik et al., 1994[5]).

The intervention lasts for 24 months with activities broken into four sequential steps (see Table 6.2). These steps include endurance training (ET) (e.g. walking, cycling) and resistance training (RT) for all major muscles groups under the guidance of a professional trainer, as well as lectures on health and nutrition-related topics led by a nutritional counsellor. Physical activity classes are hosted at local indoor fitness centres, which have the necessary gym equipment.[2] The focus on RT aligns with physical activity guidelines proposed by the World Health Organization (WHO), who recommend that those aged 65+ engage in this form of activity two to three times a week or more to "enhance functional capacity and to prevent falls" (World Health Organization, 2020[6]).

Table 6.2. Multimodal Training Intervention activities

Step and timeframe	Activities
Step 1: 1-6 months	Daily-health related exercise (e.g. walking) Training with a health instructor three times a week (1 x ET and 2 x RT) Nutrition information lectures (including cooking) by a nutrition counsellor
Step 2: 7-12 months	See Step 1 + Knowledge, skills and competence training Building skills to undertake independent physical training
Step 3: 13-18 months	See Step 2 (reduced number of sessions with health instructor) + Education sessions focused on the importance of socialising
Step 4: 19-24 months	Focus on independent training and utilising information learnt into everyday life beyond MTI

Note: ET = endurance training & RT = resistance training.
Source: Guðlaugsson, Janusdóttir and Janusson (2019[7]), "Multimodal Training Intervention in Municipalities: An approach to Successful Aging".

A key component of MTI is the collection of participant data every six months over the two-year period. It is the responsibility of employees of Janus Health Promotion (the private company responsible for MTI) to collect patient measurements including anthropometric (e.g. body-mass index (BMI), blood pressure, fat and muscle mass) and several physical activity outcomes (e.g. walking speed and the SPPB). Employees of Janus Health Promotion receive support from specialised surveyors who are trained in taking measurements for older age groups.

MTI includes several digital components. First, participants can track their performance by logging their workouts and diet in a dedicated mobile app. Second, municipalities have access to an online dashboard which displays results from each round of participant measurements. And third, MTI administrators have created a website and Facebook group to provide participants with important administrative information as well as direct contact with professional trainers and nutrition counsellors.

The cost of delivering MTI over a two-year period is approximately EUR 2093 per person or EUR 87 per month. In addition to the costs of providing RT, ET and nutrition and health education sessions, this figure covers promotion, marketing, the digital tools that allow participants to track their performance and stay in contact with MTI administrators, as well as costs associating with taking patient measurements.

To date, around 1 000 people from Iceland have previously or are currently participating in MTI across five municipalities (see Box 6.1 for a description of participant characteristics in Iceland).[3] At any one time, between 80-160 people are enrolled in each municipality. Over the course of two years, around 25% of participants will drop out. As part of the European Commission's Joint Action on Chronic Diseases, MTI was transferred to regions in Spain (Aragón) and Lithuania (Klaipėda).

Box 6.1. MTI participant characteristics

This box describes the characteristics of the MTI participants using available data, as well as information on the ethnic diversity of Iceland's population.

- The average female participating in MTI is 72.2 years compared to 74.1 years for males.
- Over half (60%) of MTI participants are female compared to 40% who are male.
- The vast majority (86%) of people living in Iceland are born in Iceland and have Icelandic citizenship. The next largest ethnic group are from Poland (6%). The remaining 8% of the population comprise a relatively small number of people across an additional 181 countries (Statistics Iceland, 2020[8])).

OECD Best Practices Framework assessment

This section analyses MTI against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 6.2 for a high-level assessment of MTI). Further details on the OECD Framework can be found in Annex A.

Box 6.2. Assessment of Multimodal Training intervention, Iceland

Effectiveness

- Scaling-up MTI across Iceland is estimated to lead to 456 life years (LYs) and 534 disability-adjusted life years (DALYs) gained by 2050
- Across all studied countries, MTI would have the largest gross impact on cardiovascular diseases, and the largest proportional impact on diabetes with 0.71% of new cases avoided

Efficiency

- MTI is a relatively expensive obesity prevention intervention as it offers participants supervised exercise classes and tailored healthy living lectures for a relatively small number of people

Equity

- The needs of priority populations were considered and prioritised when designing the intervention
- The impact of MTI by priority population groups – such as socio-economic status – is not available, therefore it is unclear if MTI reduces existing health inequalities

Evidence base

- Longitudinal panel data from an intervention group was used to evaluate the effectiveness and efficiency of MTI. The quality of evidence "strong" in areas related to the data collection methods and selection bias
- Previous evaluations of MTI used randomised-controlled trials, which are considered "gold standard" in attributing causality

Extent of coverage

- Given the number of MTI places were capped, the real participation rate (i.e. the proportion of eligible population who agree to participate) is not known
- The dropout rate over a two-year period was 25%.

Effectiveness

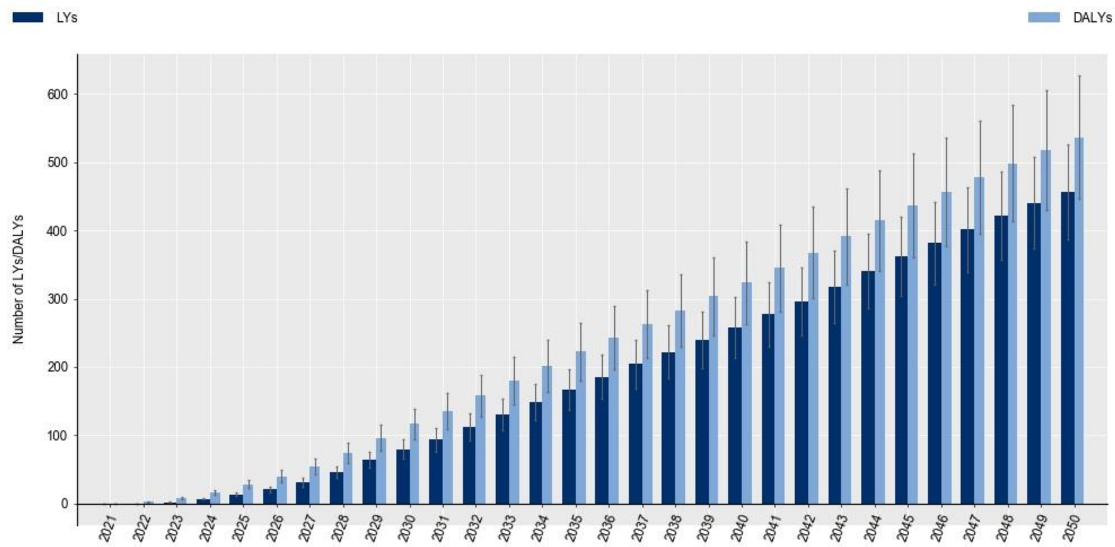
OECD's Strategic Public Health Planning for non-communicable diseases (NCDs) microsimulation model (SPHeP-NCDs model) was used to estimate the health and economic impact of expanding MTI across Iceland. Details on the model are in Annex A, while the list of model assumptions and limitations specific to the MTI analysis are in 0 of this document.

This section presents results for Iceland followed by remaining OECD and non-OECD European countries.

Iceland

Expanding MTI to the whole of Iceland is estimated to lead to 7.08 life years (LY) and 8.17 disability-adjusted life years (DALYs) gained per 100 000 people, on average, per year over the period 2021-50. These figures translate into a cumulative gain of 456 LYs gained and 534 DALYs by 2050 (Figure 6.1).

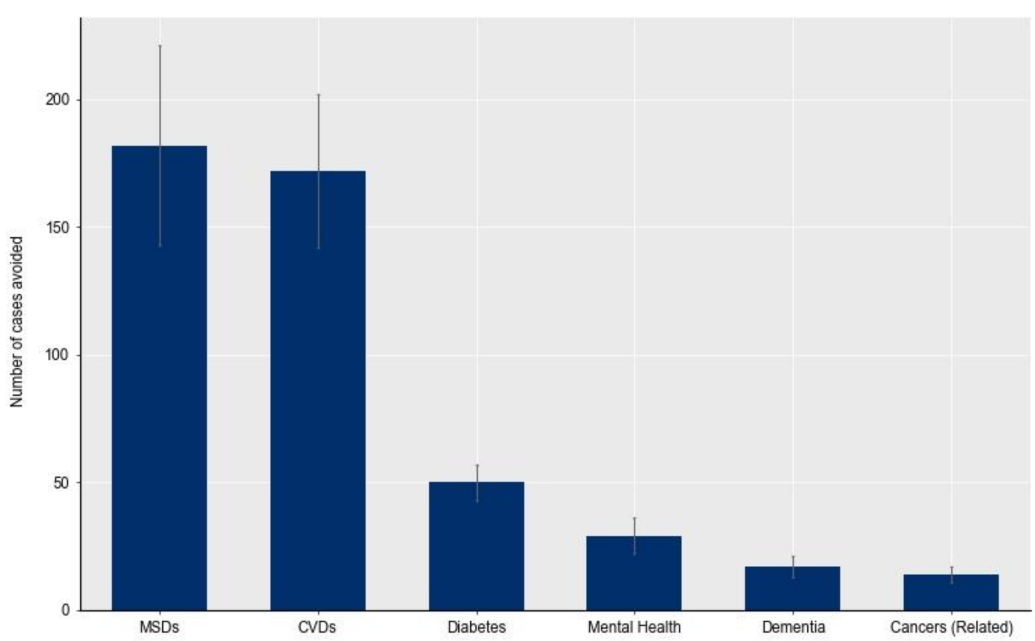
Figure 6.1. Cumulative number of LYs and DALYs gained (2021-50) – MTI, Iceland



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, MTI is expected to have the greatest impact on musculoskeletal disorders (MSDs) and cardiovascular diseases (CVDs) (Figure 6.2). Between 2021 and 2050, the number of MSDs and CVD cases is estimated to fall by 182 and 172 cases, respectively. Other diseases affected include mental health, diabetes, dementia and several cancers.

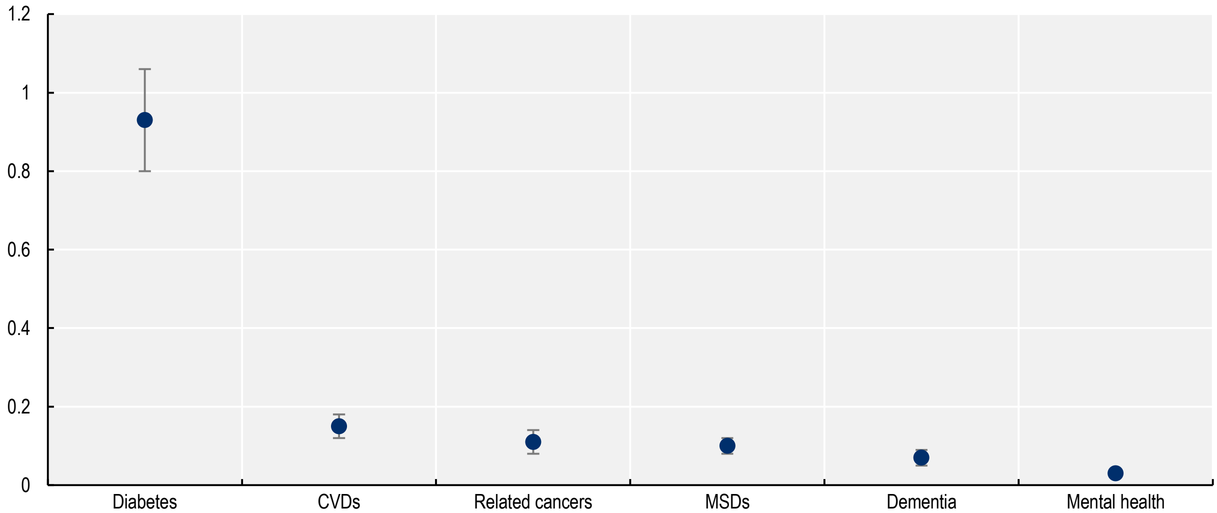
Figure 6.2. Cumulative number of disease cases avoided by 2050 – MTI, Iceland



Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In proportional terms, MTI has the largest impact on diabetes (Figure 6.3). The number of diabetes cases averted as a proportion of total new diabetes cases for those aged 65+ (i.e. the target population) is estimated at 0.93%. The proportion of other diseases averted is lower, ranging from 0.03% for mental health to 0.15% for CVDs.

Figure 6.3. Proportion of disease cases avoided for the 65+ population by 2050 – MTI, Iceland

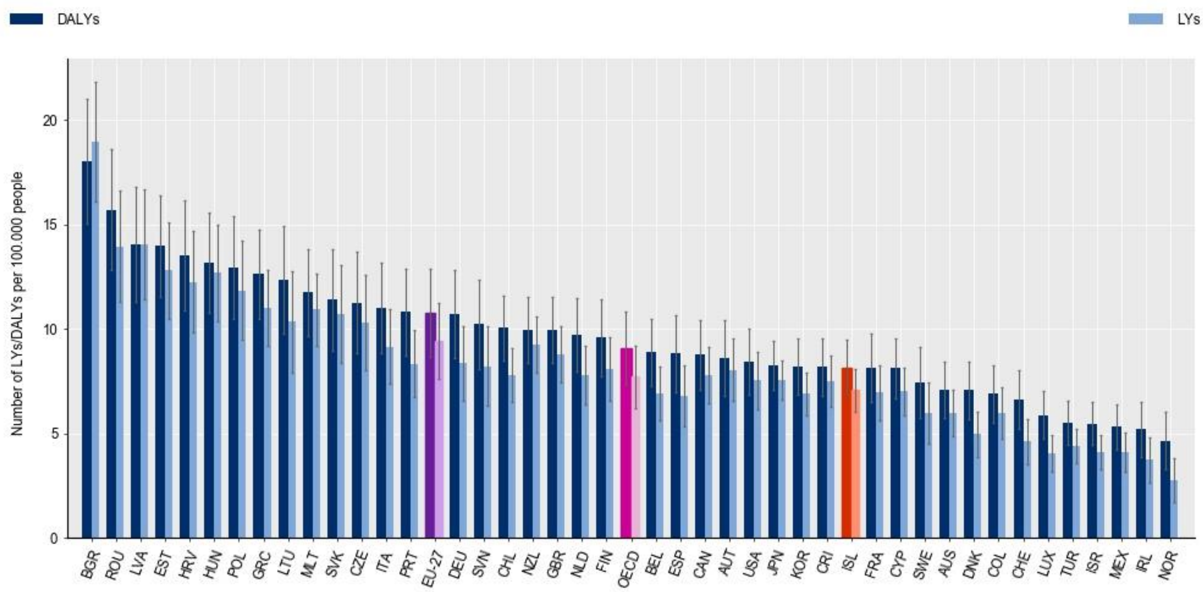


Note: Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Transferring MTI to all OECD and EU27 countries is estimated to result in 7.7 and 9.4 LYs gained per 100 000 people (ranging from 2.8 in Norway to 18.9 in Bulgaria), respectively, on average, per year between 2021-50 (Figure 6.4). Regarding DALYs, the figure is even higher at 9.1 for OECD and 10.8 for EU27 countries.

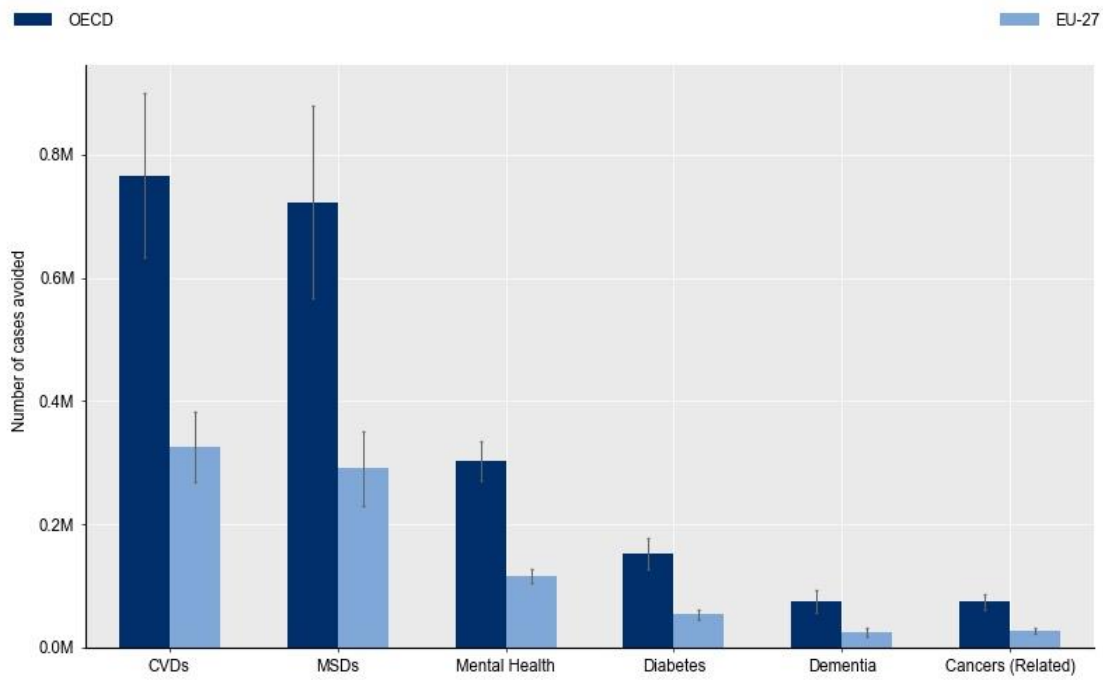
Figure 6.4. LYs and DALYs gained annually per 100 000 people, 2021-50 – MTI, all countries



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

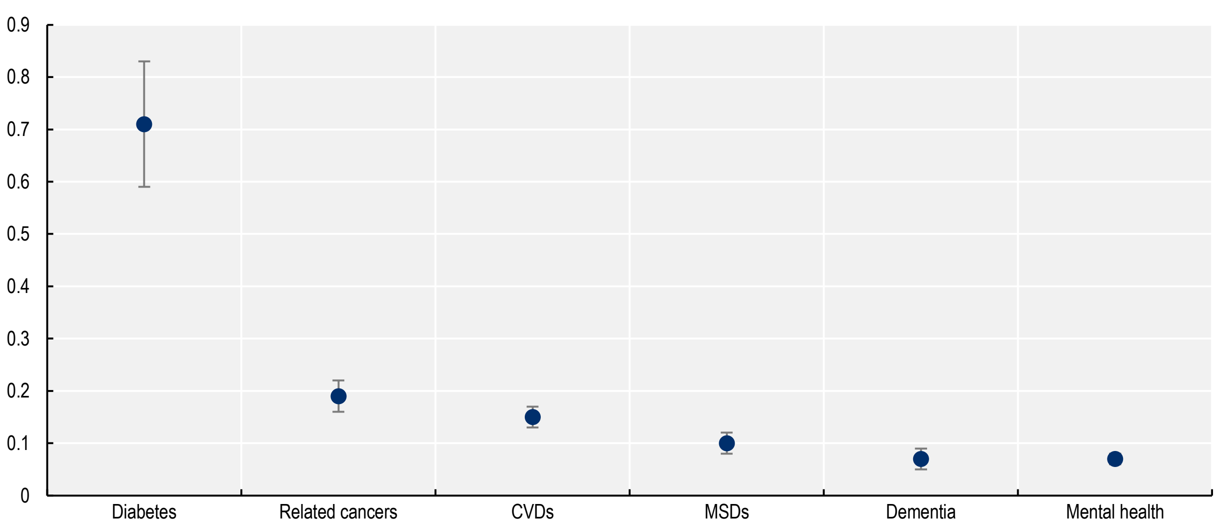
In gross terms, MTI would have the greatest impact on CVDs with the intervention estimated to reduce the number of cases by 0.77 and 0.33 million in OECD and EU27 countries, respectively, between 2021-50 (Figure 6.5). This is followed closely by MSDs with cases estimated to decline by over 1.1 million across all countries. In proportional terms, MTI would have the greatest impact on diabetes and related cancers, with 0.71% and 0.19% of new cases avoided amongst the 65+ population, respectively (Figure 6.6).

Figure 6.5. Total disease cases avoided, 2021-50 – MTI, OECD and EU27 countries



Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Figure 6.6. Proportion of disease cases avoided for the 65+ population by 2050 – MTI, all countries



Note: MSDs = musculoskeletal disorders, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer. The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

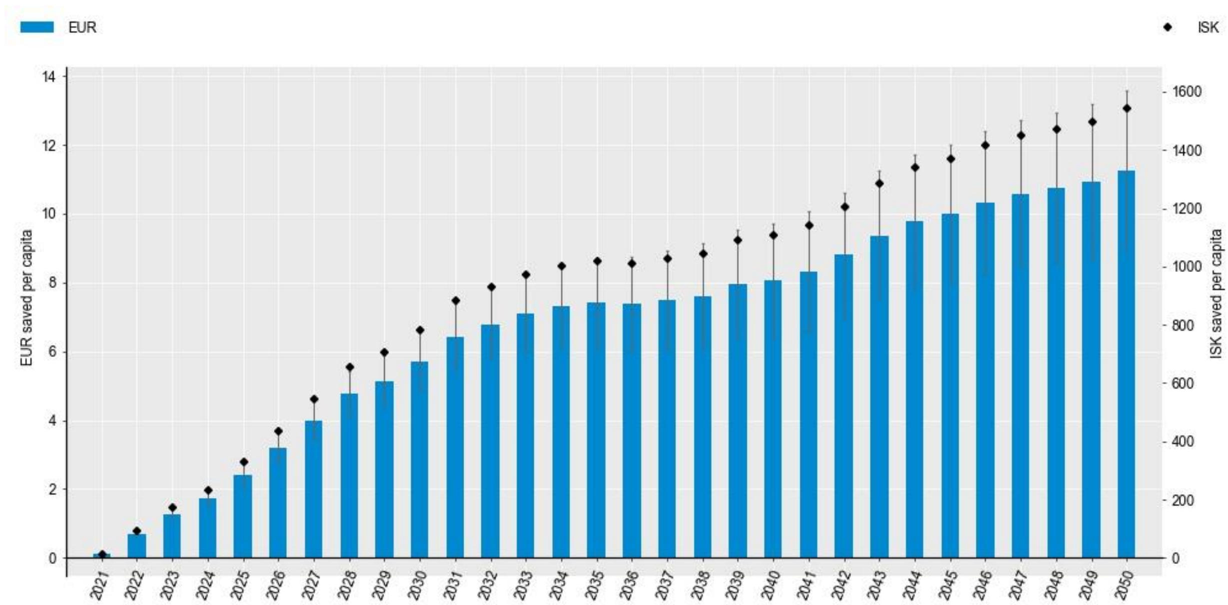
Efficiency

Similar to "Effectiveness", this section presents results for Iceland followed by remaining OECD and non-OECD European countries.

Iceland

By reducing rates of obesity, MTI can reduce health care costs. Over the modelled period of 2021-50, the OECD-SPHeP NCD model estimates MTI would lead to cumulative health expenditure savings of EUR 11.3 per person by 2050 (Figure 6.7) or EUR 0.57 per person, per year. Cost savings however are offset by intervention operating costs (see Table 6.3). This is common for obesity interventions with the exception of those that target large segments of the population, such as mass media campaigns, given costs are spread over a large number of people (OECD, 2019[9]).

Figure 6.7. Cumulative health expenditure savings per person, EUR, 2021-50 – MTI, Iceland

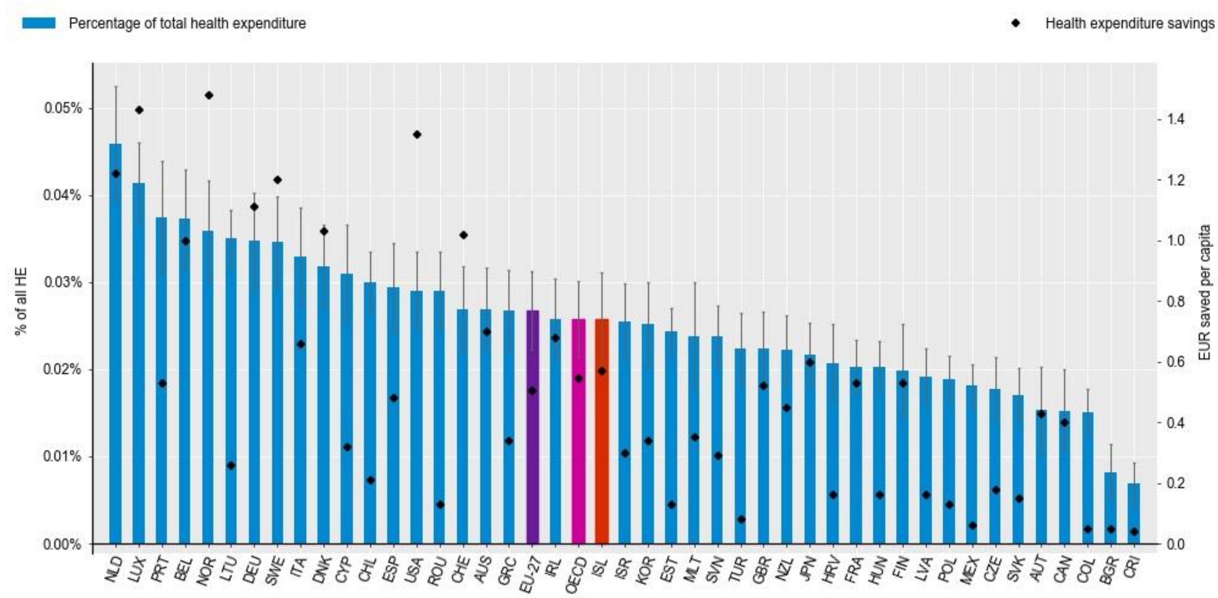


Note: The black lines represent 95% confidence intervals for figures in EUR (i.e. left-hand vertical axis). The left=hand vertical axis presents results in EUR and the right-hand vertical axis in local currency, ISK. Savings are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Average annual health expenditure (HE) savings as a proportion of total HE is 0.026% for both OECD and EU27 countries (Figure 6.8). On a per capita basis, this translates into average annual savings of EUR 0.55 and EUR 0.51 for OECD and EU27 countries, respectively.

Figure 6.8. Health expenditure (HE) savings as a percentage of total HE and per capita (EUR), average 2021-50 – MTI, all countries



Note: The black lines represent 95% confidence intervals.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Table 6.3 provides information on intervention costs, total health expenditure savings and the cost per DALY gained in local currency for all OECD and non-OECD European countries. Results from the analysis show MTI leads to large health expenditure savings, however, these savings are offset by high intervention costs. The results are not surprising given the intensity (e.g. small fitness classes led by personal trainers) and therefore the relatively high cost of operating MTI.

Table 6.3. Cost effectiveness figures in local currency – MTI, all countries

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained
Australia	AUD	31.36	33 080 848	426 645
Austria	EUR	20.19	3 823 898	229 234
Belgium	EUR	17.99	12 071 649	190 948
Bulgaria	BGN	18.24	564 583	100 629
Canada	CAD	30.35	24 524 192	339 089
Chile	CLF	8419.03	3 177 314 655	82 041 307
Colombia	COP	23076.06	8 952 314 156	331 783 089
Costa Rica	CRC	6506.69	127 702 689	79 208 590
Croatia	HRK	85.16	4 588 326	621 657
Cyprus	EUR	13.24	426 666	158 880
Czech Republic	CZK	320.38	48 307 197	2 802 243
Denmark	DKK	155.92	46 392 968	2 095 104
Estonia	EUR	13.53	154 022	95 820
Finland	EUR	20.85	3 035 653	211 855
France	EUR	18.21	36 649 566	217 213
Germany	EUR	21.19	88 204 784	187 628
Greece	EUR	15.7	3 535 640	121 587

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained
Hungary	HUF	3466.93	468 812 594	25 927 169
Iceland	ISK	2984.07	29 192 692	35 581 332
Ireland	EUR	17.24	3 571 129	318 001
Israel	ILS	58.11	13 087 911	1 036 656
Italy	EUR	19.61	38 615 340	172 208
Japan	JPY	3192.48	8 412 367 277	37 810 500
Korea	KRW	21898.2	22 950 994 375	261 255 804
Latvia	EUR	12.03	294 846	84 344
Lithuania	EUR	10.7	686 375	84 522
Luxembourg	EUR	17.33	990 200	269 966
Malta	EUR	15.42	147 467	128 206
Mexico	MXN	135.29	201 903 313	2 518 597
Netherlands	EUR	19.64	21 589 089	188 864
New Zealand	NZD	32.63	4 016 782	319 361
Norway	NOK	213.46	88 264 888	4 275 361
Poland	PLN	44.2	19 659 567	337 210
Portugal	EUR	16.19	5 109 029	144 640
Romania	RON	43.69	10 533 165	274 109
Slovak Republic	EUR	12.43	789 364	107 744
Slovenia	EUR	15.07	583 810	144 456
Spain	EUR	17.95	22 226 208	197 664
Sweden	SEK	198.66	139 070 339	2 497 308
Switzerland	CHE	28.62	10 643 685	413 831
Turkey	TRY	29.2	44 039 365	520 039
United Kingdom	GBP	15.75	32 528 195	153 380
United States	USD	20.98	553 675 091	230 027

Note: Cost per DALY gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Equity

Eligible individuals with a low socio-economic status (i.e. priority group) were considered in the design of the intervention. Specifically, by heavily subsidising participation fees.

The impact of MTI on different priority population groups – such as by socio-economic status and ethnicity – are not available. Therefore, at present, it is unclear if MTI reduces existing health inequalities.

Evidence base

Longitudinal panel from an intervention group only was used to model the effectiveness and efficiency of MTI. Participant data was collected at the start of the intervention and at 6, 12, 18 and 24 months. The data explicitly controlled for age, location and gender, in addition, the study controlled for time-invariant confounders by using a fixed-effects regression model (e.g. race). A large number of outcome indicators were measured, which relied upon internationally recognised data collection methods and tools (e.g. the SPPB, 6-minute walking test, BMI, waist circumference) (see 0 for a full list of indicators).

The *Quality Assessment Tool for Quantitative Studies* rates the study as “strong” in two areas – reducing selection bias and using reliable and validated data collection methods (Effective Public Health Practice Project, 1998[10]). Conversely, in line with many public health studies, neither researchers nor participants were blinded from the study, which is the key feature to rank a study in the highest quality group. In addition, the proportion of participants who had all measurements taken was less than 60% – reasons for dropout and characteristics of those who did not complete the full two years were not explored. Details of the assessment are in Table 6.4.

Table 6.4. Evidence-based assessment, MTI

Assessment category	Question	Rating
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Somewhat likely
	What percentage of selected individuals agreed to participate?	80-100%
Selection bias score: Strong		
Study design	Indicate the study design	Cohort (one group pre + post)
	Was the study described as randomised?	No
Study design score: Moderate		
Confounders	Were there important differences between groups prior to the intervention?	N/A as there was only an intervention group
	What percentage of potential confounders were controlled for?	Most (80-100%)
Confounders score: Moderate		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	Less than 60% (i.e. 43%*)
Withdrawals and dropouts score: Weak		

* 75% of people completed MTI from start to finish, however, 43% had their measurements collected across all measurement periods.
Source: Effective Public Health Practice Project (1998[10]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

A previous evaluation by Guðlaugsson (2014[4]) used a randomised control, crossover design study to determine the impact of MTI over an 18-month period. Findings from the RCT were positive with the intervention group recording statistically significant improvements in physical performance using the SPPB score, the 8-foot up and go test (a test for dynamic balance) and the six-minute walking test. Anthropometric measurements also improved with BMI falling by 1.6 and 1.8 points for men and women, respectively. Conversely, only men in the control group recorded a statistically significant increase in their SPPB score.

Extent of coverage

MTI operates in five of the 72 municipalities in Iceland and has enrolled around 1 000 people (mixture of participants who have completed, in the middle or at the start of the programme).

MTI places are capped in each municipality therefore the real participation rate cannot be calculated as there aren't enough places for all eligible people who want to participate.

Dropout rates from MTI are recorded every six months. Data from Janus Health Promotion in years 2017-18 indicate dropout is consistent over the 24-month period:

- 0-6 months: 6.25% (from 160 to 150 participations)
- 7-12 months: 6.67% (from 150 to 140 participants)
- 13-18 months: 7.14% (from 140 to 130 participants)
- 19-24 months: 7.69% (from 130 to 120 participants).

Participation and dropout rates by different population groups are not available. However, dropout shouldn't necessarily be seen in negative terms, as participants may leave if they feel they have become self-sufficient, which is the ultimate objective of MTI.

Policy options to enhance performance

This section summarises policy options available to policy makers and MTI administrators in settings where MTI is implemented (or being transferred) to further enhance the performance of this intervention.

Enhancing effectiveness

MTI performs highly against the effectiveness criterion, therefore, no additional policies have been listed for MTI to enhance effectiveness.

Enhancing efficiency

Policies to enhance efficiency have not been identified for MTI.

Enhancing equity

A country health profile of Iceland in 2019 highlighted social inequalities within the population. For example, the gap in life expectancy at 30 between those with the highest and lowest level of education is 3.6 and 5 years for women and men, respectively. This gap is in part due to differences in risk factors such as obesity (OECD and WHO, 2019[11]).

Rising inequalities in health indicate MTI would benefit from focusing on recruiting participants from priority population groups. A study on effective strategies to recruit participants from lower socio-economic groups into a community-based lifestyle intervention included (Stuber et al., 2020[12]):

- Multiple recruitment strategies to enhance familiarity with the intervention
- Partnering with existing organisations that have close ties with the target group (e.g. social services and charities)
- Involving trusted community members during the recruitment stage
- Shortening the time period between recruitment and participation.

Enhancing the evidence-base

To extend the evidence-base of MTI, future evaluations would benefit from obtaining health care administrative data for participants and a comparable population group (from before participants receive MTI until it concludes and for a period thereafter). This information would allow researchers to develop a more in-depth understanding on the impact of MTI on disease incidence and health care costs, as well as analyse the impact on health care utilisation measures (e.g. hospital admissions for falls). More robust data and analysis will help secure political support to scale-up MTI across Iceland as well as transfer to other countries.

MTI administrators currently collect data for a wide range of internationally recognised indicators (see 0 for a full list of indicators). Consideration could be given to expanding data collection to include commonly used diet-related outcomes, including fruit and vegetable consumption (at least once a day or the national recommended level). Other commonly used indicators are listed below, however, these are more administratively burdensome to collect and may not be appropriate:

- Sugar intake (less than 10% of total calorie intake)
- Salt consumption (less than 5 grammes per day)
- Saturated fatty acid intake (less than 10% of total calorie intake)
- Average number of calories consumed per day
- Wholegrain consumption in grammes per day.

In addition, where possible, it is recommended administrators collect data on a wider range of confounding variables including ethnicity, marital status and socio-economic status. This information could also be used to assess the impact of MTI across different priority population groups, and therefore determine whether MTI reduces existing health inequalities.

Enhancing extent of coverage

A significant barrier cited by MTI officials in Iceland is the difficulty in ensuring participants have their measurements taken every six months over a two-year period (Stegeman et al., 2020[13]). Using latest available data (2017-19), 43% of people who participated from the start to the end of MTI had all their measurements taken. This is problematic if measurement dropout (and therefore missing data) is not random as evaluation results may not reflect the participating population. For example, if participants with lower levels of motivation are less likely to be measured, the impact of MTI may be overestimated. Commonly employed techniques to reduce dropout between measurement rounds include:

- Offering participants incentives for participating in measurements
- Identifying characteristics of participants who are less likely to have their measurements taken and understand why and therefore potential solutions
- Educating participants on the importance of having their data collected, not only at the individual level (to measure their own progress), but at the wider intervention level, for example, to secure future funding. For example, a seminar could be dedicated to teaching participants how to interpret their data and how it will be used and stored.
- Providing participants with regular reminders in the lead up to measurements, and, if possible, increasing flexibility of when data can be collected (e.g. longer opening hours)
- Minimising patient time spent having their measurements taken, including any waiting time
- Focusing on individuals who experience greater difficulty attending measurement sessions such as those who do not live close by. For example, in Lithuania where MTI was transferred, administrators noted it was difficult to motivate participations from the rural Klaipėda district who had to travel long distances to attend monitoring activities (Stegeman et al., 2020[13]).

If significant levels of dropout between measurement periods continue, researchers could consider several techniques for dealing with missing data, other than complete case analysis (e.g. multiple imputation). The right technique will depend on the nature of the missing data.

Better knowledge on the benefits of exercising in old age may boost uptake in MTI. Feedback from Janus Health Promotion highlighted the important role stakeholders such as local government have in educating the older population on the health, social and economic benefits of exercising in older age – e.g. living independently for longer, working for longer and prolonging life. Improved health literacy may in turn boost motivation levels to exercise and therefore enrolment in MTI.

Finally, feedback from Janus Health Promotion highlighted the importance of educating the older population on the benefits of exercising.

Transferability

This section explores the transferability of MTI and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring MTI.

Previous transfers of MTI

As part of the Joint Action on Chronic Diseases (JA Chrodis Plus), MTI was transferred to two locations outside Iceland: Utebo in Aragón, Spain, and the Klaipėda district and city municipalities in Lithuania. In both locations, MTI was implemented in its original form.

To ensure a smooth transfer, representatives from Spain and Lithuania visited Iceland to learn "how everything works" such as taking patient measurements, running lectures, working with data and communicating with patients. A second visit was made by MTI good practice owners in Iceland to Spain and Lithuania to help them get started and to make any necessary corrections, particularly in regard to strength training requirements (Stegeman et al., 2020[13]). The two visits were seen as critical to a successful transfer.

Findings from JA Chrodis Plus evaluation reports indicate the transfer was successful, for example, in Lithuania, MTI improved participant physical activity levels, flexibility, endurance and vigour, which led the Ministry of Health to roll-out MTI across the country (Stegeman et al., 2020[13]). The success MTI in other locations is based on the same outcomes indicators used by MTI Iceland (see 0), such as the 6-minute walking test, blood pressure and SPPB scores. However, the two sites in Lithuania and Spain did not use all the questionnaire available to avoid over complication at the beginning.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of MTI are listed in Table 6.5. These cover indicators related to the population, political and economic contexts. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 6.5. Indicators to assess the transferability of MTI

Indicator	Reasoning	Interpretation
Population context		
% 65+ population receiving institutional long-term care (LTC)*	Individuals receiving long-term care are not eligible for MTI (as you need to be living independently at home). Therefore, MTI would have a lower reach in countries with high levels of people aged 65+ in LTC	↓ value = more transferable
Self-reported use of home care services (severe) for those aged 65+ (%)	As above	↓ value = more transferable
% of 55-74 years olds using the Internet in the last 3 months	MTI utilises digital tools to engage with participants, for example, individuals can track their progress using a dedicated mobile app	↑ value = more transferable
Political context		
Operational strategy/action plan/policy to reduce physical inactivity	MTI is more likely to have political support in a country that explicitly aims to reduce physical inactivity	"Yes" = more transferable
Operational strategy/action plan/policy to reduce unhealthy eating	MTI is more likely to have political support in a country that explicitly aims to reduce unhealthy eating	"Yes" = more transferable
Economic context		
Gross national income per capita (purchasing power parity, international dollars)	One-quarter of MTI costs are collected from participants, therefore, MTI will have a greater reach in wealthier countries	↑ value = more transferable

Source: OECD (2019[14]), "Long-term recipients in institutions (other than hospitals) – total recipients over 65, percentage of total population aged 65+", https://stats.oecd.org/index.aspx?queryid=30143; Eurostat (2019[15]), "Self-reported use of home care services by sex, age and level of activity limitation", https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_ehis_am7d&lang=en; OECD (2020[16]), "C5B: Individuals using the Internet – last 3 m (%)", https://stats.oecd.org/index.aspx?queryid=72702; World Bank (2017[17]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho.

Results

Results from the transferability assessment are summarised below showing mixed results. For country level-results, see Table 6.6:

- Across OECD and non-OECD European countries, a similar proportion of the population aged 65 years and over would be eligible for the intervention (as measured by the proportion of people accessing long-term and severe home-care services) indicating a similar extent of coverage.
- MTI is likely to receive political support given most (90%) countries have an unhealthy eating and physical inactivity national action plan.
- Higher levels of wealth in Iceland indicate users in other countries may experience greater financial barriers to accessing MTI if they incur out-of-pocket expenses – Iceland's GNI (gross national income) per capita is USD 54 095 (PPP (purchasing power parity) international dollars) compared to an average of USD 42 103 in other OECD and non-OECD European countries).
- Relatively low levels of internet users among the older population compared to Iceland may make it difficult to interact with participants and therefore keep motivation levels high over the two-year period.

Although not reported in the transferability assessment below, differences in population ethnicity may affect transferability. For example, the vast majority of citizens living in Iceland are white and born locally, which is different for example, from the United States, where over one in ten people are Black or African American (United States Census Bureau, 2019[19]).

Table 6.6. Transferability assessment by country, MTI (OECD and non-OECD European countries)

A darker shade indicates MTI is more transferable for that particular country

	% 65+ receiving LTC	% 65+ self-reported use of home care (severe)	% 55-74 year-olds who use the internet	National plan for physical inactivity	National plan for unhealthy eating	GNI per capita (PPP Int $)
Iceland	**6.0**	**34.2**	**97.5**	**Yes**	**Yes**	**54 095**
Australia	7.0	n/a	76.6	Yes	Yes	48 007
Austria	n/a	18.0	69.7	Yes	Yes	56 304
Belgium	6.7	45.1	78.0	Yes	Yes	52 562
Bulgaria	n/a	22.3	n/a	Yes	Yes	22 883
Canada	4.0	n/a	88.0	Yes	Yes	48 384
Chile	n/a	n/a	52.1	Yes	Yes	24 131
Colombia	n/a	n/a	n/a	Yes	Yes	14 163
Costa Rica	n/a	n/a	64.8	Yes	Yes	19 094
Croatia	n/a	16.4	n/a	Yes	Yes	28 388
Cyprus	n/a	23.5	n/a	No	No	38 207
Czech Republic	n/a	23.0	66.8	Yes	Yes	38 326
Denmark	4.6	51.4	93.4	Yes	Yes	57 449
Estonia	2.1	12.7	73.2	Yes	Yes	36 123
Finland	4.9	43.6	87.8	Yes	Yes	49 050
France	4.3	56.5	76.3	Yes	Yes	47 065
Germany	3.8	27.6	82.0	Yes	Yes	54 878
Greece	n/a	20.6	46.1	Yes	No	29 708
Hungary	3.0	24.8	54.8	Yes	Yes	31 771
Ireland	3.9	51.9	74.0	Yes	Yes	65 698
Israel	2.3	n/a	73.6	Yes	Yes	39 946
Italy	n/a	35.4	56.0	Yes	Yes	42 784
Japan	2.8	n/a	n/a	Yes	Yes	42 808
Latvia	0.5	15.7	65.9	Yes	Yes	30 528
Lithuania	6.0	18.3	57.7	Yes	Yes	35 989
Luxembourg	5.4	24.4	88.1	Yes	Yes	72 376
Malta	n/a	42.5	n/a	Yes	Yes	40 372
Mexico	n/a	n/a	40.5	Yes	Yes	19 189
Netherlands	6.6	59.2	92.9	Yes	Yes	57 072
New Zealand	5.2	n/a	n/a	No	No	41 672
Norway	5.6	27.2	95.2	Yes	Yes	67 563
Poland	0.9	20.8	52.1	Yes	Yes	31 913
Portugal	0.9	17.4	45.8	Yes	Yes	34 154
Republic of Korea	n/a	n/a	87.4	Yes	Yes	43 240
Romania	n/a	16.9	n/a	Yes	Yes	29 549
Slovak Republic	3.3	18.3	54.8	Yes	Yes	29 622
Slovenia	n/a	24.7	59.9	Yes	Yes	38 411
Spain	1.5	39.8	76.7	Yes	Yes	41 046
Sweden	5.4	22.3	92.5	Yes	No	53 928
Switzerland	6.2	n/a	90.7	Yes	Yes	65 821
Turkey	n/a	2.9	34.1	Yes	Yes	27 814
United Kingdom	n/a	27.5	87.3	Yes	Yes	45 851
United States	3.3	n/a	78.4	Yes	Yes	62 513

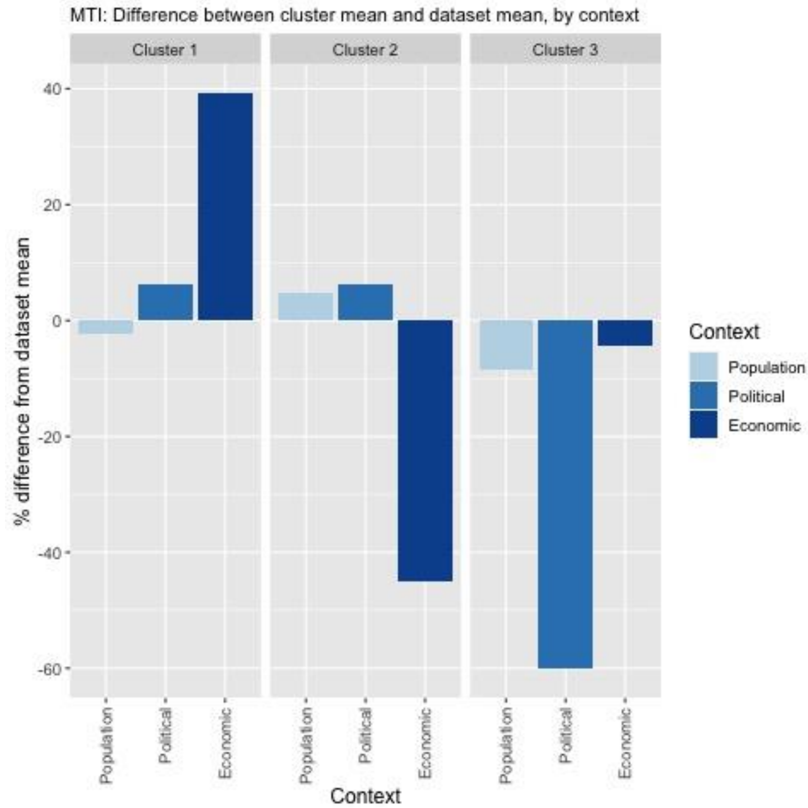
Note: LTC = long-term care; n/a = missing data; GNI = gross national income; PPP = purchasing power parity. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details).
Source: OECD (2019[14]), "Long-term recipients in institutions (other than hospitals) – total recipients over 65, percentage of total population aged 65+", https://stats.oecd.org/index.aspx?queryid=30143; Eurostat (2019[15]), "Self-reported use of home care services by sex, age and level of activity limitation", https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_ehis_am7d&lang=en; OECD (2020[16]), "C5B: Individuals using the Internet – last 3 m (%)", https://stats.oecd.org/index.aspx?queryid=72702; World Bank (2017[17]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 6.5. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 6.9 and Table 6.7:

- Countries in cluster one, which includes Iceland, have political and economic arrangements in place to support MTI and therefore have conditions in place to readily transfer MTI to their local context.
- Countries in cluster two, before transferring MTI, may want to undertake further analysis to assess whether the intervention is affordable among older populations who would need to pay out-of-pocket. It is important to note that Lithuania, which transferred MTI and recorded positive outcomes, falls under this cluster indicating the intervention can operate successfully in countries with lower levels of individual wealth.
- Remaining countries are in cluster three, which may want to ensure MTI aligns with overarching political priorities before transferring the intervention.

Figure 6.9. Transferability assessment using clustering, MTI



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD (2019[14]), "Long-term recipients in institutions (other than hospitals) – total recipients over 65, percentage of total population aged 65+", https://stats.oecd.org/index.aspx?queryid=30143; Eurostat (2019[15]), "Self-reported use of home care services by sex, age and level of activity limitation", https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_ehis_am7d&lang=en; OECD (2020[16]), "C5B: Individuals using the Internet – last 3 m (%)", https://stats.oecd.org/index.aspx?queryid=72702; World Bank (2017[17]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho.

Table 6.7. Countries by cluster, MTI

Cluster 1	Cluster 2	Cluster 3
Australia	Bulgaria	Cyprus
Austria	Chile	Greece
Belgium	Colombia	New Zealand
Canada	Costa Rica	Sweden
Denmark	Croatia	
Finland	Czech Republic	
France	Estonia	
Germany	Hungary	
Iceland	Israel	
Ireland	atvia	
Italy	Lithuania	
Japan	Mexico	
Luxembourg	Poland	
Malta	Portugal	
Netherlands	omania	
orway	Slovak Republic	
Republic of Korea	Slovenia	

Cluster 1	Cluster 2	Cluster 3
Spain Switzerland United Kingdom United States	Turkey	

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of MTI. For example, there is no international data on gym space and equipment, which is key to delivering MTI. Therefore, Box 6.3 outlines several new indicators policy makers should consider before transferring this intervention.

Box 6.3. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators:

Population context

- What are the healthy literacy rates amongst the 65+ age group?
- What is the geographical structure of the 65+ population?*
- What is the population's attitude towards healthy eating and physical exercise?

Sector specific context (prevention for the elderly)

- What, if any, compatible interventions exist? (e.g. healthy lifestyle programs for the elderly)
- What, if any, competing interventions exist?
- Is there a sufficient number of personal trainers/nutritionists to deliver the intervention?
- Do personal trainers and nutritionists have specific knowledge to meet the needs of the 65+ age group?
- What type of infrastructure/equipment/facilities are available to deliver the intervention? (e.g. gym space, meeting rooms for lectures)
- Is there support from health authorities as well as the health profession (e.g. doctors and physiotherapists) who play a role in MTI?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target setting?

* This may be important if a large proportion of the 65+ age group are located in regional/rural areas and therefore unable to readily access gym facilities and lectures.

Conclusion and next steps

MTI has been shown to significantly improve a range of key health indicators including BMI, blood pressure and physical activity levels. Using OECD's SPHeP-NCD model, it is estimated that scaling-up MTI across Iceland would lead to 7.08 life years (LY) and 8.17 disability-adjusted life years (DALYs) gained per 100 000 people, on average, per year over the period 2021-50. By reducing disease incidence across Iceland, MTI is expected to lead to cumulative health expenditure savings of EUR 11.3 per person by 2050. However, intervention costs outweigh health expenditure savings, which is common for obesity interventions.

As part of the European Commission's JA Chrodis Plus, MTI has been successfully transferred to regions in two other European countries – Spain and Lithuania. Using publically available data to assess transferability to other OECD and non-OECD European countries, however, shows mixed results. For example, MTI is likely to receive political support as it addresses key government priorities (e.g. unhealthy eating), nevertheless, affordability may be an issue if participants are required to pay for MTI out-of-pocket. Based on feedback from owners of the intervention, there are two key factors behind the successful transfer of this intervention: first, a close relationship between the owner and transferring country, and second, implementation that is as close as possible to MTI's original form.

Box 6.4 outlines next steps for policy makers and funding agencies regarding MTI.

Box 6.4. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance MTI are listed below:

- Support efforts by MTI administrators to obtain national administrative data that can be linked with data from MTI participants in order to enhance the evidence base
- Promote health literacy with a specific focus on the benefits associated with exercise in old age
- Ensure funding for future scale-up and transfer efforts
- Promote findings from the MTI case study to better understand what countries/regions are interested in transferring the intervention
- Promote "lessons learnt" from regions that have transferred MTI to their local setting.

References

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [10]

Eurostat (2019), *Self-reported use of home care services by sex, age and level of activity limitation*. [15]

Guðlaugsson, J. (2014), *Multimodal Training Intervention: An Approach to Successful Aging*, University of Iceland, https://www.janusheilsuefling.is/wp-content/uploads/2019/06/Doktorsritger%C3%B0-Janusar-Gu%C3%B0laugssonar-12-9-14-III.pdf. [4]

Guðlaugsson, J., L. Janusdóttir and D. Janusson (2019), *Multimodal Training Intervention in Municipalities: An approach to Successful Aging*, Janus Health Promotion. [7]

Guralnik, J. et al. (1994), "A Short Physical Performance Battery Assessing Lower Extremity Function: Association With Self-Reported Disability and Prediction of Mortality and Nursing Home Admission", *Journal of Gerontology*, Vol. 49/2, pp. M85-M94, https://doi.org/10.1093/geronj/49.2.m85. [5]

Hajek, A. and H. König (2018), "Are changes in body-mass-iandex associated with changes in depressive symptoms? Findings of a population-based longitudinal study among older Germans", *BMC Psychiatry*, Vol. 18/1, https://doi.org/10.1186/s12888-018-1748-1. [20]

OECD (2020), *C5B: Individuals using the Internet - last 3 m (%)*, OECD, Paris. [16]

OECD (2019), *Health at a Glance 2019: OECD Indicators*, OECD Publishing, Paris, https://doi.org/10.1787/4dd50c09-en. [3]

OECD (2019), *Long-term recipients in institutions (other than hospitals) - total recipients over 65, % of total population aged 65+*, OECD, Paris. [14]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [9]

OECD and WHO (2019), *State of Health in EU - Iceland: Country Health Profiles 2019*, European Commission, https://ec.europa.eu/health/sites/health/files/state/docs/2019_chp_is_english.pdf. [11]

Statistics Iceland (2020), *Population by country of birth, sex and age 1 January 1998-2020*. [8]

Statistics Iceland (2019), *Population by sex and age 1841-2019*. [2]

Statistics Iceland (2019), *Population projection by age and sex 2019-2068*. [1]

Stegeman, I. et al. (2020), *D5.3 Recommendations for the implementation of health promotion good practices: Building on what works: transferring and implementing good practice to strengthen health promotion and disease prevention in Europe*, EuroHealthNet & Finnish Institute for Health and Welfare. [13]

Stuber, J. et al. (2020), "Successfully Recruiting Adults with a Low Socioeconomic Position into Community-Based Lifestyle Programs: A Qualitative Study on Expert Opinions", *International Journal of Environmental Research and Public Health*, Vol. 17/8, p. 2764, https://doi.org/10.3390/ijerph17082764. [12]

Torres-Reyna, O. (2010), *Getting Started in Fixed/Random Effects Model using R*, Princeton University, http://www.princeton.edu/~otorres/Panel101R.pdf. [21]

United States Census Bureau (2019), *Population estimates*. [19]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [18]

World Bank (2017), *GNI per capita, PPP (constant 2017 international $)*. [17]

World Health Organization (2020), *Physical activity*, https://www.who.int/news-room/fact-sheets/detail/physical-activity (accessed on 29 January 2021). [6]

Annex 6.A. Modelling assumptions for MTI

Annex Table 6.A.1. Parameters to model the impact of MTI

Model parameters	Multimodal Training Intervention model inputs
Effectiveness	BMI (men):-0.69 kg/m^2 BMI (women): -0.50 kg/m^2 Systolic blood pressure (men): -7.11 Systolic blood pressure (women):-9.31 MET min / week (men): +502.86 MET min / week (women): +481.31 *The effect was modelled as a linear decrease/increase over a two-year period*
Time to maximum effectiveness	60% of individuals will participate in two rounds of MTI
Target age	65 years and over (both genders)
Exposure	Overall participation rate = 24.7% Dropout rate: 0-6 months: 6.25% 6-12 months: 6.57% 13-18 months: 7.14% 19-24 months: 7.69%
Per participant and per capita cost, ISK and EUR	ISK 166 800 per participant (2019) (EUR 1 1 113) ISK 2 984 per capita (average 2021-50) (EUR 20)

Effectiveness

The effectiveness of MTI was first assessed using data provided by Janus Health Promotion. The data consisted of 57 variables (excluding self-reported survey results) which covered age, gender, a unique participant identifier, location as well as a range of outcome (e.g. BMI, systolic blood pressure and physical activity). Data for each of these variables was collected for 894 participants over five points in time covering two years (i.e. five measurement points collected six months apart, with the first measurement taken at the start of the intervention). On average, data for each participant was collected between 3-4 times.

To estimate the change in primary outcome measures (i.e. BMI, systolic blood pressure and physical activity[4]), a fixed effects regression method was used. A fixed effects regression was deemed suitable for the following reasons (Hajek and König, 2018[20]; Torres-Reyna, 2010[21]):

1. The data provided was longitudinal form using information from the same individuals
2. The dataset does not capture all relevant variables for explaining differences in risk factors (e.g. income, education, ethnicity, motivation levels and genetic disposition), that is, there are omitted variables
3. The omitted variables are unlikely to change over time, further, their effect on individuals is also time-invariant (i.e. the impact of income on BMI is the same at measurement 1 and measurement 5).

Fixed effects regressions were undertaken for each risk factor as the dependent variable – BMI, systolic blood pressure and MET min/week – with the following controls: age and measurement period. As outlined above, unobservable independent variables that are time-invariant are also taken into account with fixed effects, for example, as income, race and education). Regressions were run for men and women separately, therefore results also take into account MTI's impact by gender.

Results from each fixed effects regression model found statistically significant improvements in all risk factors across all measurement periods. For example, BMI declined, on average, by 0.50 ($p < 0.05$) over the 24-month period for women and by 0.69 for men ($p < 0.05$).

The impact of MTI on BMI, systolic blood pressure and MET min / week was modelled as a linear increase/decrease over the 24-month period.

Please note, the analysis below is focused on BMI, systolic blood pressure and physical activity (in MET min/week) given these risk factors are present within OECD's Strategic Public Health Planning for NCDs (SPHeP-NCD) model. Results for other outcome measures and previous MTI analyses are in 0.

There are limitations to the methodology used to model effectiveness. First, the change in outcome measures were calculated using measurements collected for participant data only (i.e. there was no control group). For this reason, the change in outcome variables caused by MTI may be over- or under-estimated. Second, survey weights were not available, therefore, changes in outcome variables may be over- or under-represent certain groups in the population. Third, not all participants had measurements taken and it is not clear whether these data are missing at random or not.

Time to maximum effectiveness

Based on feedback from Janus Health Promotion, the model assumes 60%[5] of those who participate in the 24-month programme will participate in a second round. However, the intensity of each subsequent round will decline (e.g. lower number of training sessions and education seminars), thereby reducing impact on outcome indicators of interest. To take this into account, the model assumes for the second round of MTI, the proportion of services accessed declines by 42%[6] with a proportional reduction in the impact on outcome measures (e.g. BMI). Users can participate in a maximum of two rounds of MTI.

Target age

The target age is men and women aged 65 years and over.

Exposure

Exposure was calculated using the following three inputs:

- **26%** of the target age apply to be part of MTI (given the number of places in MTI were capped, the actual figure from MTI could not be calculated, therefore, the figure used represents findings from a previous analysis regarding update of prescription physical activity programs) (see Table 6.1 in OECD's Heavy Burden of Obesity report (2019[9])).
- **96%** of those who apply are considered eligible to participate (figure provided by Janus Health Promotion)[7]
- **99%** who apply and are eligible end up participating in MTI (figure provided by Janus Health Promotion)
- **Overall participation rate** = 0.26 * 0.96 * 0.99 = 24.7%

Dropout rates were provided by Janus Health Promotion.

Cost of implementation and delivery

The cost per participant per year is ISK 166 800 (using data provided by Janus Health Promotion). The costs of the programme cover:

- **Promotion and presentation of MTI**: promoting MTI to eligible participants and other interested parties.
- **Website and Facebook group**: providing regular updates regard the progress of the project, and connecting participants and trainers and each other.
- **Measurement collection**: collecting data at baseline and throughout the intervention (five different time points).
- **Training costs**: organised training sessions under the supervision of one or more trainers.
- **Education lectures**: between 6-10 live educations run per year which include experts in various fields.
- **Mobile app**: app for participants which allows them to log their workouts, view workout plans as well as populate their food diary and other statistics.
- **Online dashboard**: municipalities have access to an online dashboard to view MTI's progress – e.g. measurement results.
- **Information updates**: detailed updates provided to municipalities every six months within a report format.
- **Meetings and "other"**: meetings and other items that occur during the intervention.

Annex 6.B. Impact of MTI on other outcome measures and previous analyses

Impact of MTI on other outcome measures

The impact of MTI on a selection of other outcome measures of interest are listed in Annex Table 6.B.1 (for men and women combined). Outcome measures include: resting heart rate (heart beat per minute); waist-to-hip ratio (cm/m); 30-second chair stand (number of repetitions); short physical performance battery (total score); hand grip strength (both hands); six minute walking test (in metres); life quality (EQ-5D-5L scores); muscle mass (kg); body fat mass (kg); and body fat percentage (%). Overall the results are positive and statistically significant.

Annex Table 6.B.1. Impact of MTI on other outcome measures of interest

	Outcome measures									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Age	0.78	0.01**	-0.50***	-0.16***	-0.67	-0.93	0.84	0.15*	-0.02	0.01
	(0.62)	(0.003)	(0.17)	(0.05)	(0.41)	(2.61)	(0.69)	(0.08)	(0.17)	(0.17)
Time (ref. 0 months)										
6 months	-2.81***	-0.01***	2.52***	0.22***	1.06***	18.58***	6.48***	0.05	-0.91***	-0.74***
	(0.47)	(0.002)	(0.13)	(0.04)	(0.31)	(1.96)	(0.56)	(0.06)	(0.13)	(0.13)
12 months	-3.86***	-0.02***	3.36***	0.31***	3.51***	21.29***	9.44***	-0.29***	-0.88***	-0.59***
	(0.78)	(0.003)	(0.21)	(0.06)	(0.52)	(3.27)	(0.88)	(0.10)	(0.21)	(0.21)
18 months	-5.49***	-0.03***	4.04***	0.47***	7.08***	28.96***	11.96***	-0.48***	-1.20***	-0.74**
	(1.10)	(0.005)	(0.30)	(0.09)	(0.73)	(4.60)	(1.23)	(0.14)	(0.30)	(0.30)
24 months	-5.62***	-0.05***	5.21***	0.53***	8.05***	19.47***	14.37***	-0.56***	-1.33***	-0.98***
	(1.33)	(0.01)	(0.36)	(0.10)	(0.88)	(5.58)	(1.48)	(0.16)	(0.36)	(0.36)
Observations	2 395	2 401	2 384	2 393	2 391	2 364	2 244	2 382	2 383	2 383
R2	0.05	0.12	0.37	0.03	0.20	0.11	0.33	0.03	0.07	0.04
Adjusted R2	-0.51	-0.39	-0.003	-0.54	-0.27	-0.42	-0.08	-0.54	-0.48	-0.53
F Statistic	16.39***	42.06***	176.12***	10.86***	74.75***	36.76***	115.00***	7.43***	18.17***	9.23***

* p<0.1; **p<0.05; ***p<0.01.
(1) Resting heart rate; (2) waist-to-hip ratio (cm/m); (3) 30-second chair stand (repetitions); (4) short physical performance battery total score; (5) hand grip (both hands); (6) six minute walking test (in metres); (7) life quality as measured by the EQ-5D-5L; (8) muscle mass (kg); (9) body fat mass (kg); (10) body fat percentage.

Previous analyses of MTI

The impact of the multi-modal (MTI) training programme on key physical and mental outcome measures were first analysed and reported in a study by Guðlaugsson (2014[4]). Specifically, the study reported outcome measures for two groups, by gender, over an 18-month period:

- Group 1 (immediate): accessed the MTI programme for the first six months only
- Group 2 (delayed): accessed the MTI programme during the six and 12-month period only.

Changes in outcome measures for groups 1 and 2 (G1 and G2, respectively) are summarised in Annex Table 6.B.2 with results presented at percentage changes. Key findings include:

- a statistically significant reduction in BMI for men and women in both groups
- a statistically significant improvement in the 8 foot up-and-go test for men and women in both groups
- a statistically significant increase in physical activity for G2 only, particularly for women.

Measurements were also recorded at the 18-month period with results for G1 and G2 combined (i.e. baseline to 18-months). The results indicate the MTI programme has a positive, lasting impact for men and women with statistically significant improvements in several outcomes measures (e.g. BMI and the short physical performance battery test) (Guðlaugsson, 2014[4]).

Annex Table 6.B.2. Changes in key outcome measures for groups 1 and 2

Outcome measure	Male (G1) (n=25) Percentage change	Female (G1) (n=31) Percentage change	Male (G2) (n=25) Percentage change	Female (G2) (n=25) Percentage change
BMI	-1.6%**	-1.8%**	-1.6%**	-1.7%**
SPPB points[a]	5.8%	5.8%*	3.4%	7.9%**
8 foot up-and-go[b]	-10.1%***	-9.3%***	-10%***	-10%***
Strength of thigh	5.3%	13.8%***	11.1%***	11.6%***
6 metres walking	9.6%***	6.3%***	1.4%	5.7%**
Physical activity (cpm)[c]	15.7%	15%	51.1%***	68.1%***

Note: G1 = group 1 (immediate group), results recorded at the 6-month period. G2 = group 2 (delayed group), results recorded at 12 months, six-months after the programme was initiated. [a] SPPB = short physical performance battery test. [b] This is a test of balance, agility and speed. [c] counts per minute. * p<0.05; ** p<0.01; *** p <0.001.
Source: Guðlaugsson (2014[4]), "Multimodal Training Intervention: An Approach to Successful Aging", https://www.janusheilsuefling.is/wp-content/uploads/2019/06/DoktorsritgerpercentageC3%B0-Janusar-GupercentageC3%B0laugssonar-12-9-14-III.pdf.

Changes in key outcome measures are also available for years 2017-19, however, results have not been tested for statistical significant (Annex Table 6.B.3). Between June 2017 and June 2019, MTI participants experienced improvements in all outcome measures, in particular, the number of strength training sessions per week (+83%) and daily activity (e.g. walking) (+58%) (Guðlaugsson, Janusdóttir and Janusson, 2019[7]).

Annex Table 6.B.3. Changes in key outcome measures 2017-19

Outcome measure	First measurement (2017)	Last measurement (2019)	% change
Daily activity (e.g. walking)[a]	13.98 minutes/day	32.93 minutes/day	58%
Strength training[b]	0.34 times/week	2.05 times/week	83%
Walking speed (4 metres)	3.37 seconds	2.81 seconds	-20%
Blood pressure (SBP mm Hg)[c]	147.9	136.3	-9%
Rising from a chair speed x 5	9.55 seconds	7.31 seconds	-31%
Resting heart rate	73.2 beats per minute	67.3 beats per minute	-9%
Fat mass	29.78kg	27.32kg	-9%
Muscle mass	28.05kg	29.46kg	5%
EQ-5D-5L[d]	65[e]	85.3[e]	18%
Metabolic syndrome (MS)	33.3% with a MS	22.4% with a MS[f]	-49%

Note: [a] Daily recommended amount = 30 minutes. [b] Weekly recommended times per week = 2. [c] SBP = Systolic blood pressure. [d] A subjective measure of health and quality of life (0 = worst possible health, 100 = best possible health). [e] Value for one municipality only – Reykjansbaer. [f] Figure relates to six-month post initiation of programme, not two years.
Source: Guðlaugsson, Janusdóttir and Janusson (2019[7]), "Multimodal Training Intervention in Municipalities: An approach to Successful Aging".

Notes

[1] Population projections are based on the “medium” trajectory estimated by Statistics Iceland (Statistics Iceland, 2019[1]).

[2] Types of gym equipment include treadmills, stationary bikes, rowing machines, and weight machines.

[3] Three new municipalities in Iceland will join MTI once COVID-19 restrictions have been lifted.

[4] Physical activity was transformed into MET min / week based on the assumption that recorded activity represented “moderate activity” (50-60% of max heart rate) and therefore equivalent to a MET of 3.5.

[5] Based on feedback from Janus Health Promotion, in Hafnarfjörður, approximately 70% of participants requested to participate in a second round compared to 50% in Reykjanesbaer,

[6] This figure is based on feedback from Janus Health Promotion whereby the number of sessions declines by between 33-50% (average of 42%) for subsequent rounds.

[7] This figure aligns with findings from OECD’s *Measuring Social Care Protection for Long-Term Care in Old Age* questionnaire for Iceland (2019), which found approximately 7% of those aged 65 years and over receive social home care and/or home nursing care services.

7 Young People at a Healthy Weight

This chapter covers the case study of Young People at a Healthy Weight (JOGG), healthy lifestyle community-based programme targeting children 0 to 19 years in the Netherlands. The case study includes an assessment of JOGG against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Young People at a Healthy Weight (JOGG): Case study overview

Description: The JOGG approach is a community-based programme targeting children 0 to 19 years. The approach targets young people's health by reshaping the environment to promote healthy lifestyles with a focus on tackling excess weight and obesity. Although the JOGG approach is specifically implemented in the Netherlands, several European and North American countries have adopted a similar whole system approach. The EPODE methodology served as the basis for the JOGG approach's way of operations. In 2020 the Epode International Network (EIN) transitioned in a new community, namely Youth Health Community, which is co-ordinated by the Dutch JOGG organisation.

Best practice assessment:

Table 7.1. OECD best practice assessment of the JOGG approach

Criteria	Assessment
Effectiveness	Over 95 000 life years (LYs) and 13 089 disability-adjusted life years (DALYs) are expected to be gained by scaling up JOGG across the Netherland by 2050. By reducing rates of overweight and obesity, JOGG can prevent several forms of chronic disease cases, the majority of which would be musculoskeletal disorders or cardiovascular diseases.
Efficiency	JOGG is not only cost effective, but also cost saving across the majority of OECD and EU27 countries
Equity	JOGG is designed to reduce health and social inequalities by reaching low socio-economic status (SES) groups, as it aimed to address the lack of access to healthy food options and make outdoor environment friendlier for physical activity for children living in low SES neighbourhoods.
Evidence-base	The quality of evidence used for this case study is "strong to moderate" in areas related to data collection methods and selection bias for two studies used as effectiveness sources Typical to most public health studies, the design of the intervention does not allow blinding and measurement
Extent of coverage	JOGG reaches approximately 30% of children aged 0-19 years of age in the Netherlands.

Enhancement options: to *enhance the effectiveness*, policy makers could incorporate at the national level changes to the educational curricula of both teachers and students to increase health literacy levels in the population. To *enhance the evidence-base*, health policy makers could advocate for expansion of utilisation of electronic health records for recording BMI for future evaluations to obtain accurate data on weight status of children throughout time. To *enhance equity*, administrators could utilise targeted communication techniques that incorporate in its messaging the values and cultural sensibilities that are specific to groups being addressed. To *enhance extent of coverage*, several strategies are available for the administrators, such as continuously framing JOGG activities in a way that reduces the stigma around obesity prevention.

Transferability: the JOGG approach targets risk factors prevalent in all OECD countries, therefore the intervention is likely to receive strong political support, which is necessary when considering which interventions to transfer. Further, the origin of JOGG comes from the EPODE approach, which has been transferred to many countries such as Australia, Spain and France.

Conclusion: the JOGG approach has the potential to significantly reduce non-communicable disease incidence when scaled-up across the Netherlands and transferred to other OECD and non-OECD European countries.

Intervention description

The Netherlands has experienced a progressive increase in rates of obesity for both adults and children, with current self-reported prevalence at 14.1% across the whole population (OECD, 2019[1]). It is a well-established that overweight and obesity in children and adults contributes to worse health outcomes such as cardiovascular disease, diabetes and cancer, as well as emotional and mental health problems due to low self-esteem (OECD, 2019[2]).

There are variety of factors that contribute to the expanding waistlines of young Dutch citizens, including environmental settings – such as, food environments (which includes large portion size, and sugary drinks availability), lack of physical activity among children, and sedentary behaviour (Seidell and Halberstadt, 2020[3]). In response, in 2010, the National Jongeren op Gezond Gewicht (JOGG) Project Bureau with the support from the Dutch Ministry of Health, Welfare and Sport initiated the JOGG approach in the Netherlands, which targets children aged 0-19 years. Currently, the JOGG-approach is carried out in 183 municipalities (more than 50% of all municipalities) in The Netherlands.

JOGG focuses on this age group given the promotion of a healthy lifestyle and prevention of obesity in childhood reduces rates of obesity in adulthood, which is associated with more complex health issues. In addition, obesity and overweight are health conditions associated with high levels of stigma, particularly among children: OECD analyses show that Dutch girls with obesity are 2.85 times more likely to be bullied than their healthy-weight counterparts (this is a slightly lower than the OECD26 average of 3.11 times more likelihood of bullying among girls) (OECD, 2019[2]). Difference in bullying among Dutch boys follows the OECD trend with an increase, where boys with obesity are 2.12 times more likely to be bullied than boys with healthy-weight (comparative to the OECD26 average of 1.78 times more likelihood) (OECD, 2019[2]). Bullying can come from peers, friends, and even family (WHO, 2017[4]). Such a harmful social environment can lead to feelings of shame, low self-esteem, poor body image, depressive moods, and even suicide (WHO, 2017[4]).

At local level JOGG municipalities work towards a healthy environment for their youth using six key principles:

Principle 1: Create structural, political, and governmental support

In order to achieve wide reaching effects, obesity interventions must have political, structural, and government support. Under JOGG, municipal executives and councillors act as ambassadors to ensure healthy environments and lifestyles are integrated and articulated in policies across sectors, predominately: health care, spatial planning, sports and economic affairs. The diversity of policy spheres allows JOGG to exert influence on various domains that affect weight related outcomes – for example, advocacy for more green spaces and outdoor play areas, increase in availability of sport facilities, changes in local food stores for healthier alternatives (Collard et al., 2019[5]).

Principle 2: Co-operation between the public and the private sectors

Healthy environments that allow for healthy childhoods are only achievable through joint efforts from public and private parties. The private sector has a major impact on the living environment, therefore partnerships are key to structural changes. Furthermore, engagement of both private and public sector promotes the collective understanding that healthy childhood is a shared social responsibility.

Principle 3: Work with the principles of shared ownership

The “shared ownership” principle promotes the direct involvement of entire community in their well-being. It does so by asking what people want to change in their daily lives when it comes to creating a healthy environment. Individuals in communities hold the best knowledge on the barriers and opportunities within their families, districts, villages or cities to lead a healthier life. Shared ownership assumes positive collaboration between diverse professionals, local residents and parents/caretakers for healthier childhoods.

Principle 4: Monitor and evaluate the effect and process continuously

The JOGG approach is a tailor-made approach in which every step yields new knowledge. Health needs of each municipality are unique due to differences in context and environment. Thus, JOGG provides tailored solutions based on knowledge gained from previous transfers for best results. In order to expand the variety of practices and solutions, it is essential that JOGG municipalities conduct monitoring and evaluations. Findings from these evaluations allow participating municipalities to share valuable insights for collective benefit, which then inform programme adjustments.

Principle 5: Interlink preventive care and local health care structures

Principle 5 is about co-operation between professionals and organisations from the various prevention levels (i.e. from collective to the individual). JOGG aims to create a healthy environment for all children, but it also focuses on providing proper care and support for children who are living with overweight/obesity. Specifically, kids living with overweight/obesity receive tailored care from one central provider.

Principle 6: Communication

Communication is essential for JOGG municipalities as it makes the activities of JOGG teams visible and transparent, ensures more support and contributes to achieving goals.

Further information on specific activities carried as part of JOGG are summarised in Box 7.1.

Box 7.1. Activities carried out as part of JOGG

This box outlines examples of tangible activities carried out as part of the JOGG approach:

- Just under 2000 canteens are affiliated with the Team: Fit initiative (present in sport facilities and venues), which is committed to providing visitors with a healthier environment (e.g. offering healthier sandwiches, smoke free environment, and restrictions on alcohol when young people are present).
- Over 500 schools covering close to 52 000 children participate in "The Daily Mile" which encourages kids to move for 15 minutes every day during schools hours, equivalent to walking one mile.
- Approximately 750 schools have adopted healthy canteens under the Healthy Nutrition in Schools Agreement (e.g. substituting a puff pastry snack for a whole-wheat sandwich or panini).
- Over 1 200 companies and organisations have signed up to the healthy workplace initiative, which encourages companies to implement initiatives such as healthy work canteens and facilitates to promote active modes of transport (e.g. necessary facilities and utilities). This activity is designed for young adults (18-19) who may begin working directly out of school.

Source: JOGG (2021[6]), "Jongeren Op Gezond Gewicht", https://jogg.nl/jogg-aanpak.

OECD Best Practices Framework assessment

This section analyses the JOGG approach against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 7.2 for a high-level assessment of JOGG). Further details on the OECD Framework can be found in Annex A.

Box 7.2. Best practice assessment overview: JOGG approach

Effectiveness

- JOGG has been shown to reduce the prevalence of overweight and obesity in children aged 0-19 years
- According to OECD simulations, JOGG would lead to 95 032 life years and 112 838 disability-adjusted life years (DALYs) gained by 2050 if expanded across the whole of the Netherlands
- Across all OECD and EU27 countries, JOGG would have the largest gross impact on musculo-skeletal diseases, followed by cardiovascular diseases, diabetes, dementia and finally obesity related cancers

Efficiency

- When expanded across the whole of the Netherlands it is estimated JOGG will accumulate health expenditure savings of EUR 51.94 per person by 2050
- When transferred to all OECD and EU27 countries, savings equivalent to 0.06% of total health expenditure per year are expected
- For the majority of OECD and EU27 countries, JOGG is not only cost effective, but also cost saving

Equity

- JOGG has a process in place to adapt activities to suit the needs of priority populations – e.g. children with a low socio-economic status
- Evaluations of JOGG show the intervention has a greater impact in low SES communities

Evidence base

- Two recent studies evaluated the impact of JOGG, both of which support the hypothesis that JOGG reduces rates of childhood obesity
- Both studies used randomised cluster trials to evaluate the impact of JOGG, however, neither study was randomised

Extent of coverage

- JOGG reaches approximately 30% of children aged 0-19 years of age in the Netherlands.

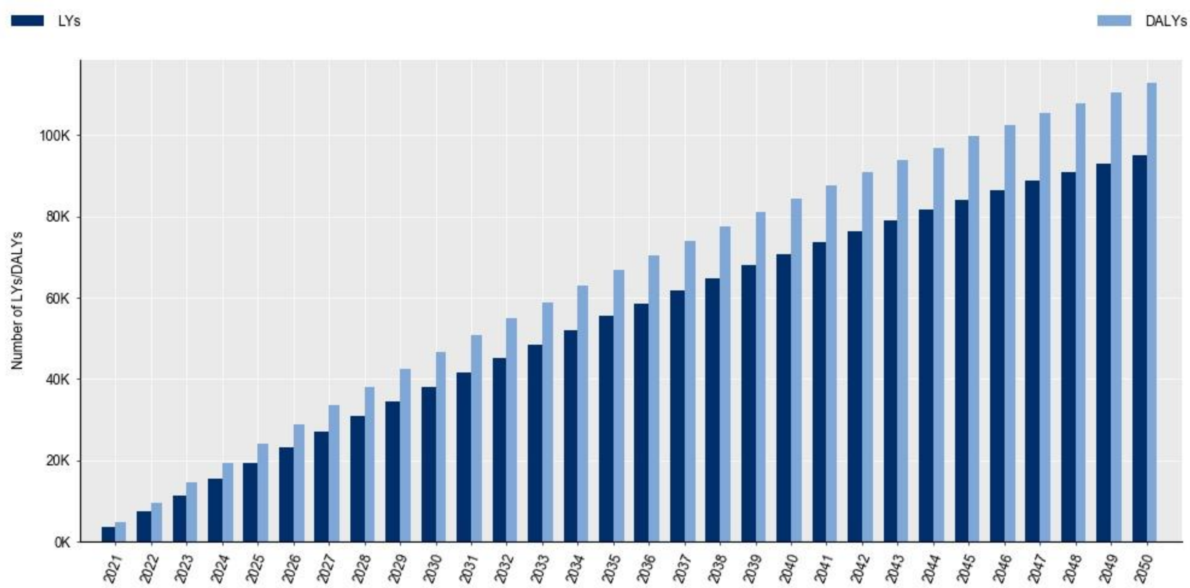
Effectiveness

This section presents results for the Netherlands followed by remaining OECD and non-OECD European countries (see 0 for modelling assumptions specific to JOGG).

Netherlands

OECD's SPHeP-NCDs model estimates that implementing JOGG across all municipalities in the Netherlands would lead to 16 life years (LY) and 19 disability-adjusted life years (DALYs) gained per 100 000 people, on average, per year over the period 2021-50. These figures translate into cumulative gain of 95 032 LYs and 112 838 DALYs by 2050 (Figure 7.1).

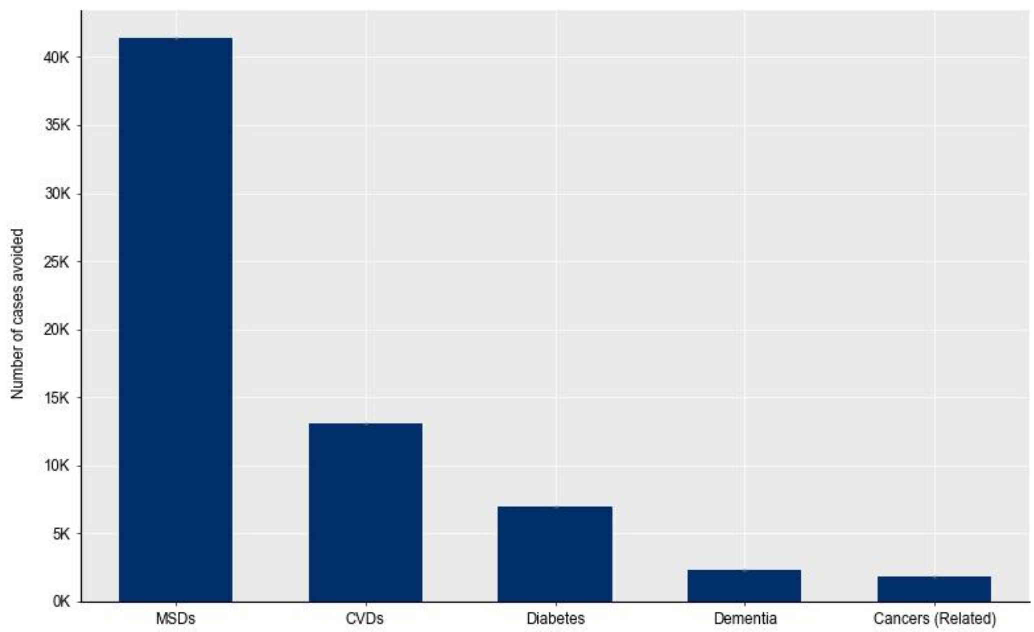
Figure 7.1. Cumulative number of LYs and DALYs gained (2021-50) – JOGG, The Netherlands



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

In gross terms, JOGG is expected to have the greatest impact on reducing cases of musculoskeletal (MSDs) and cardiovascular (CVDs) disease (Figure 7.2). Between 2021 and 2050, the number of MSD and CVD cases is estimated to fall by 41 360 and 13 089, respectively. Other diseases affected include diabetes, dementia and specific cancers.

Figure 7.2. Cumulative number of disease cases avoided by 2050 - JOGG, The Netherlands

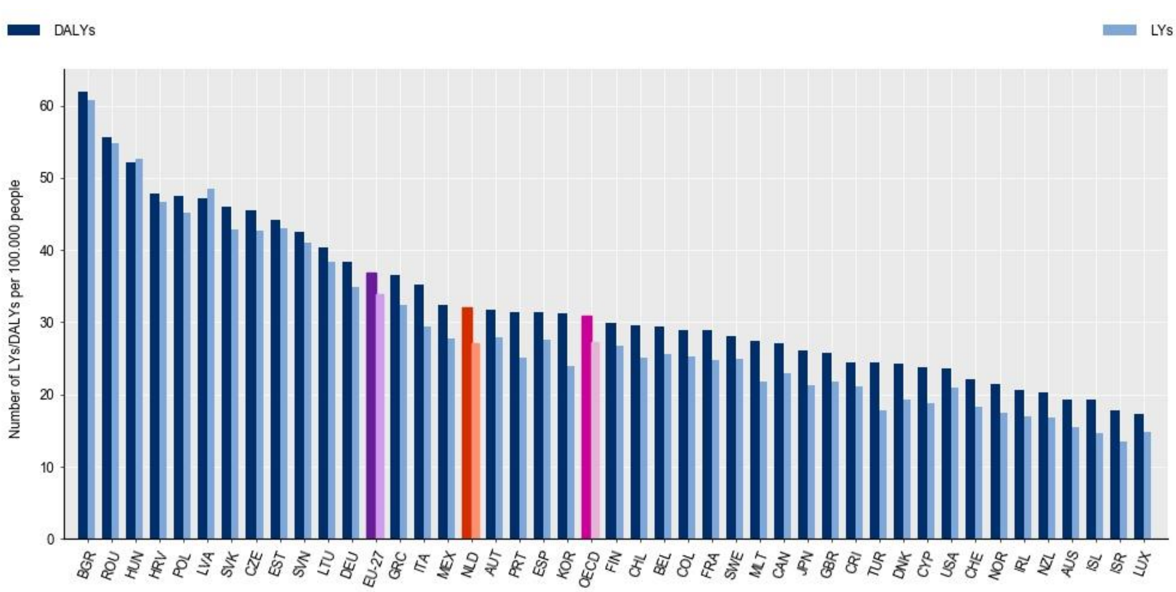


Note: Musculoskeletal disorders = MSDs, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Transferring JOGG to all OECD and EU27 countries is estimated to result in 27.3 and 33.9 LYs gained per 100 000 (ranging from 13.5 in Israel to 60.7 in Bulgaria) (Figure 7.3). For DALYs, the figures are even higher at 30.9 for OECD and 36.9 for EU27 countries.

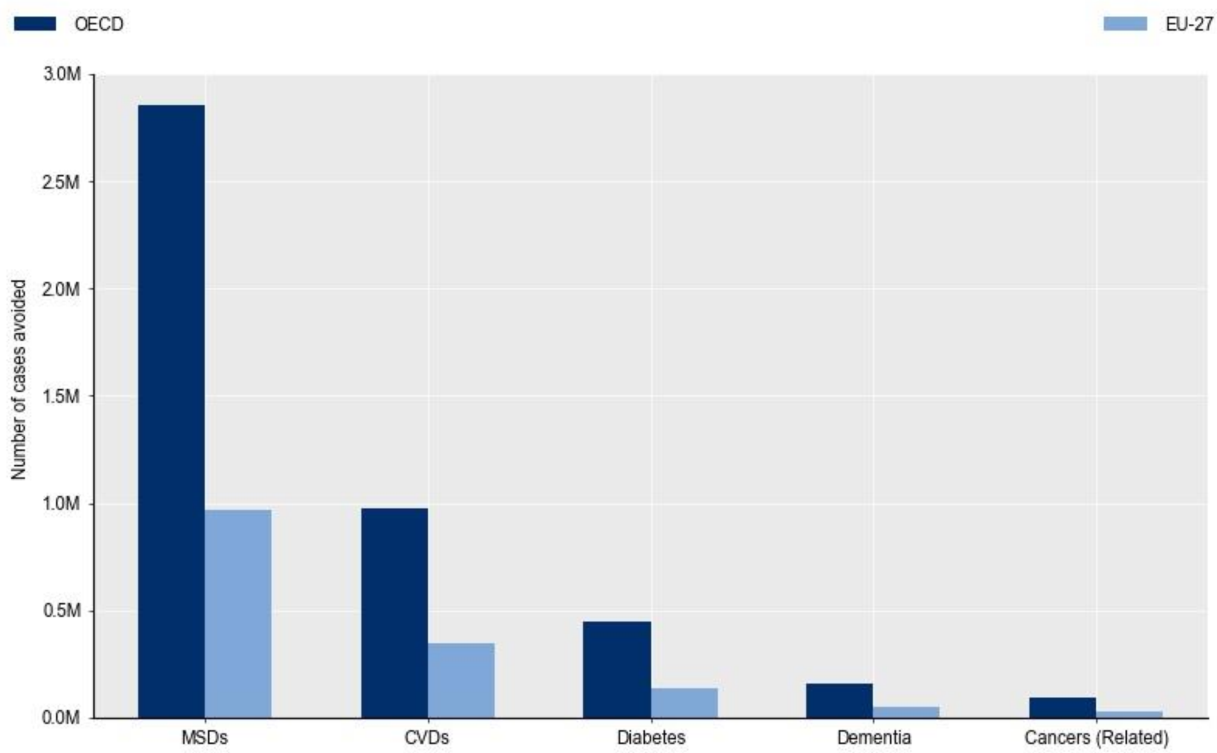
Figure 7.3. LYs and DALYs gained annually per 100 000 people, 2021-50 – JOGG, all countries



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Broadly, JOGG would have the biggest impact on MSDs with the approach leading to an estimated reduction of 2.86 million and 0.96 million cases among OECD and EU27 countries, respectively, between 2021 and 2050 (Figure 7.4). Across all countries, JOGG is also estimated to reduce the number of CVDs cases by 1.32 million, and diabetes cases by 0.58 million, dementia cases by 0.20 million, and obesity related cancer cases by 0.12 million.

Figure 7.4. Total disease cases avoided, between 2021 and 2050 – JOGG, all countries



Note: Musculoskeletal disorders =MSDs, CVDs = cardiovascular diseases. Related cancers include colorectal, breast, oesophageal and liver cancer.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

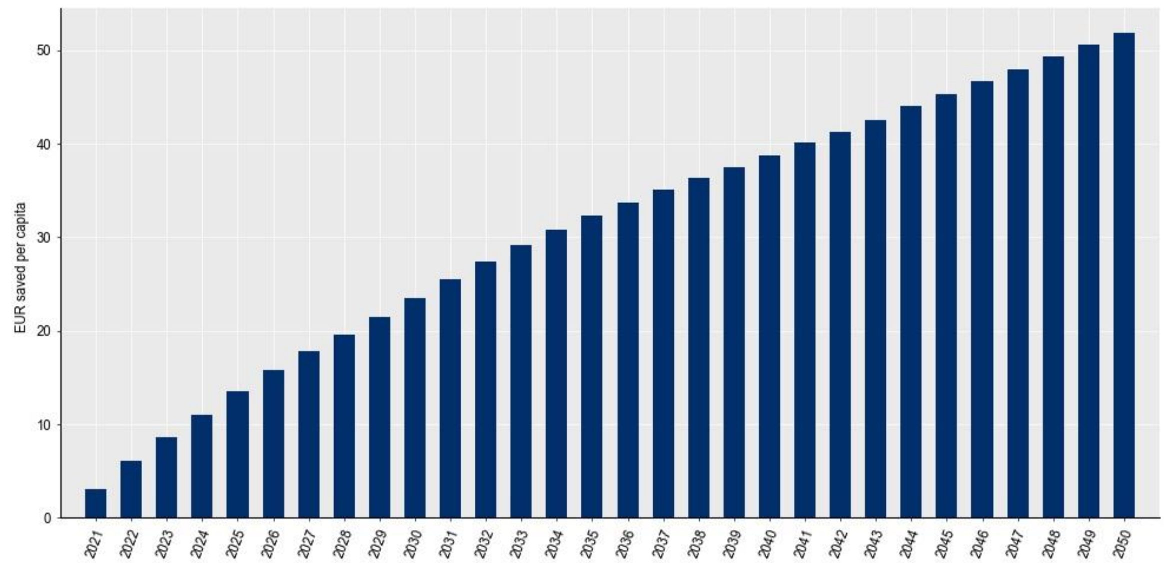
Efficiency

Similar to "Effectiveness", this section presents results for the Netherlands followed by remaining OECD and non-OECD European countries.

Netherlands

By reducing rates of obesity, the JOGG approach can reduce health care costs. Over the modelled period of 2021-50, the OECD-SPHeP NCD model estimates the JOGG intervention would lead to cumulative health expenditure savings of EUR 51.94 per person by 2050 (Figure 7.5) or by EUR 2.72 per person, per year. Cost savings, however, are to an extent offset by intervention operating costs (see Table 7.2).

Figure 7.5. Cumulative health expenditure savings per person, EUR, 2021-50 – JOGG, The Netherlands

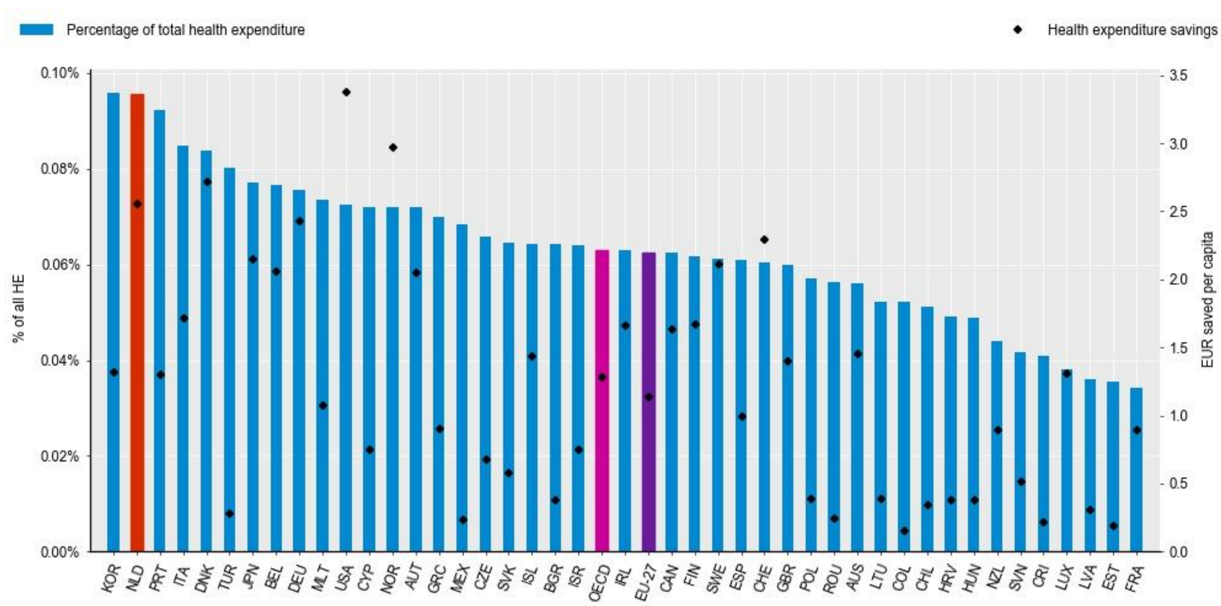


Note: Savings are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

OECD and non-OECD European countries

Average annual health expenditure (HE) savings as a proportion of total HE is 0.06% for both OECD and EU27 countries (Figure 7.6). On a per capita basis, this translates into average annual savings of EUR 1.28 and EUR 1.14 for OECD and EU27 countries, respectively.

Figure 7.6. Health expenditure (HE) savings as a percentage of total HE and per capita (EUR), average 2021-50 – JOGG, all countries



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Table 7.2 provides information on intervention costs, total health expenditure savings and the cost per DALY gained in local currency for all OECD and non-OECD European countries. Results from the analysis show JOGG is cost saving for the majority of countries, including the Netherlands. For countries with a positive cost per DALY gained, JOGG is not cost saving, however, it is still highly cost-effective based on international thresholds used to define a country's willingness to pay for one year of life in good health (this threshold typically ranges between EUR 22 000-80 000 (Vallejo-Torres et al., 2016[7])).

Table 7.2. Cost effectiveness figures in local currency – JOGG, all countries

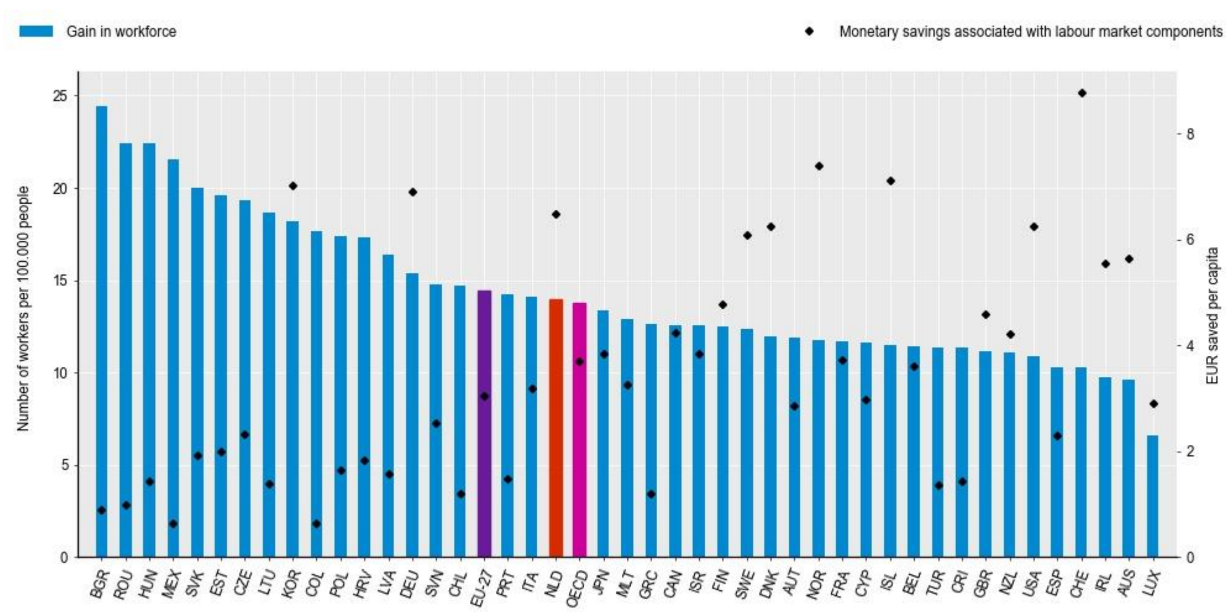
Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Australia	AUD	1.32	69 400 920	Cost saving
Austria	EUR	0.53	18 056 828	Cost saving
Belgium	EUR	0.61	24 944 851	Cost saving
Bulgaria	BGN	0.48	4 436 222	Cost saving
Canada	CAD	0.92	100 793 621	Cost saving
Chile	CLF	321.67	5 460 483 907	150 546
Colombia	COP	1221.92	31 201 249 641	2 203 655
Costa Rica	CRC	292.52	770 759 764	616 730
Croatia	HRK	2.21	10 900 127	Cost saving
Cyprus	EUR	0.44	998 528	Cost saving
Czech Republic	CZK	8.82	179 715 658	Cost saving
Denmark	DKK	5.4	122 987 975	Cost saving
Estonia	EUR	0.41	224 142	498
Finland	EUR	0.66	9 465 079	Cost saving
France	EUR	0.61	61 993 219	Cost saving
Germany	EUR	0.47	192 174 323	Cost saving
Greece	EUR	0.33	9 277 875	Cost saving
Hungary	HUF	98.27	1 128 272 312	Cost saving
Iceland	ISK	118.62	73 382 371	Cost saving
Ireland	EUR	0.71	8 779 193	Cost saving
Israel	ILS	4.37	33 132 481	7 598
Italy	EUR	0.42	99 893 353	Cost saving
Japan	JPY	63.11	29 995 146 236	Cost saving
Korea	KRW	556.92	88 198 018 447	Cost saving
Latvia	EUR	0.36	552 166	110
Lithuania	EUR	0.35	1 022 511	Cost saving
Luxembourg	EUR	0.7	916 886	Cost saving
Malta	EUR	0.4	456 064	Cost saving
Mexico	MXN	9.64	770 289 375	13 924
Netherlands	EUR	0.6	45 227 494	Cost saving
New Zealand	NZD	1.25	8 035 001	Cost saving
Norway	NOK	8.41	177 677 732	Cost saving
Poland	PLN	1.13	59 810 107	Cost saving
Portugal	EUR	0.33	12 633 405	Cost saving
Romania	RON	1.17	20 410 502	Cost saving
Slovak Republic	EUR	0.37	3 008 828	Cost saving
Slovenia	EUR	0.4	1 026 045	Cost saving
Spain	EUR	0.39	46 248 733	Cost saving
Sweden	SEK	7.65	246 752 013	Cost saving
Switzerland	CHE	0.85	24 014 021	Cost saving

Country	Local currency	Intervention costs per capita, average per year	Total health expenditure savings, 2021-50	Cost per DALY gained*
Turkey	TRY	1.83	159 086 184	228
United Kingdom	GBP	0.57	87 742 280	Cost saving
United States	USD	0.88	1 387 644 034	Cost saving

* Cost per DALY gained is measured using total intervention costs less total health expenditure savings divided by total DALYs gained over the period 2021-50. Cost and benefits are discounted at a rate of 3%.
Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

The reduction in chronic diseases resulting from the JOGG approach has, in turn, an impact on labour market participation and productivity. By reducing obesity related disease incidence, JOGG is estimated to increase employment and reduce absenteeism, presenteeism, and early retirement. Converting these labour market outputs into full-time equivalent (FTE) workers, it is estimated that OECD and EU27 countries will gain 13.8 and 14.4 FTE per 100 000 working age people per year between 2021 and 2050, respectively. In monetary terms, this translates into average per capita labour market production of EUR 3.7 for OECD and EUR 3.0 for EU27 countries (Figure 7.7).

Figure 7.7. Labour market impacts, average per year, 2021-50 – JOGG, all countries



Source: OECD analyses based on the OECD SPHeP-NCDs model, 2021.

Equity

The JOGG approach targets priority population groups in particular those in vulnerable environments. At the local level, the needs of priority population groups are defined – for example, by speaking with teachers, principals, welfare professionals, sport foundations and private enterprises, such as supermarkets. Subsequently, JOGG activities are adapted to suit the needs of different groups such as children from a low socio-economic status (SES) or different ethnic background to Dutch (Middelbeek, 2017[8]).

The impact of JOGG according to SES is available, which shows positive results. A study by Groningen University found JOGG led to greater reductions in overweight prevalence in low SES JOGG municipalities compared to middle/high SES municipalities (Kobes, Kretschmer and Timmerman, 2021[9]):

- Low-SES municipalities: decline in overweight prevalence from 25.17% to 21.16% between 2013 and 2018, which was statistically significant.
- Middle/high-SES municipalities: increase in overweight prevalence from 10.79% to 11.78% between 2014 and 2018, which were not statistically significant.

Evidence-base

The findings from the University of Groningen pre-print study were used for modelling the effectiveness of JOGG, which was imputed into the SPHeP-NCD model (Kobes, Kretschmer and Timmerman, 2021[9]). Findings from the University of Groningen report align with a previous evaluation by the Dutch National Institute for Public Health and Environment (RIVM) (Blokstra et al., 2020[10]). Specifically, both studies estimated that JOGG reduced the prevalence of overweight and obesity in children by about 9 percentage points.

In the study conducted by the researchers from University of Groningen, the prevalence of overweight was obtained from the measurements collected at school (by a school nurse) for children aged 9-11, which were later communicated to the local public health centres, these centres in turn pooled the data at the Dutch Centre for Youth Health. The evaluation was conducted for each subsequent year for six-year period, from 2013-18, where a control community that did not benefit from JOGG approach was followed in parallel for comparison (Kobes, Kretschmer and Timmerman, 2021[9]).

The RIVM evaluation report collected overweight prevalence data a year before the introduction of the JOGG approach from the Health Interview Survey of Children aged 2-19 (self-reported outcomes). Subsequent evaluations were conducted in year 1, 2, 3 and 4 after the implementation of JOGG approach in participating municipalities (Blokstra et al., 2020[10]).

The *Quality Assessment Tool for Quantitative Studies* rates the RIVM "strong" in reducing selection bias, while the University of Groningen was rated as strong in terms of and using reliable and validated data collection tools (Table 7.3):

- The RIVM evaluation report explicitly controlled and matched each individual by neighbourhood, age, sex, origin (Dutch, Western, non-Western), household income.
- The University of Groningen study had methodical approach in their collection methods and tools of the data (BMI, indicators of SES).

Table 7.3. Evidence-based assessment, JOGG

Assessment category	Question	University of Groningen study rating	RIVM Report study rating
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Somewhat likely	Very likely
	What percentage of selected individuals agreed to participate?	80-100%	Not applicable (The data was gathered from an annual CBS National Youth Health survey)
Selection bias score:		*Moderate*	*Moderate*
Study design	Indicate the study design	Non-randomised cluster trial with interrupted time series	Non-randomised cluster trial
	Was the study described as randomised?	No	No

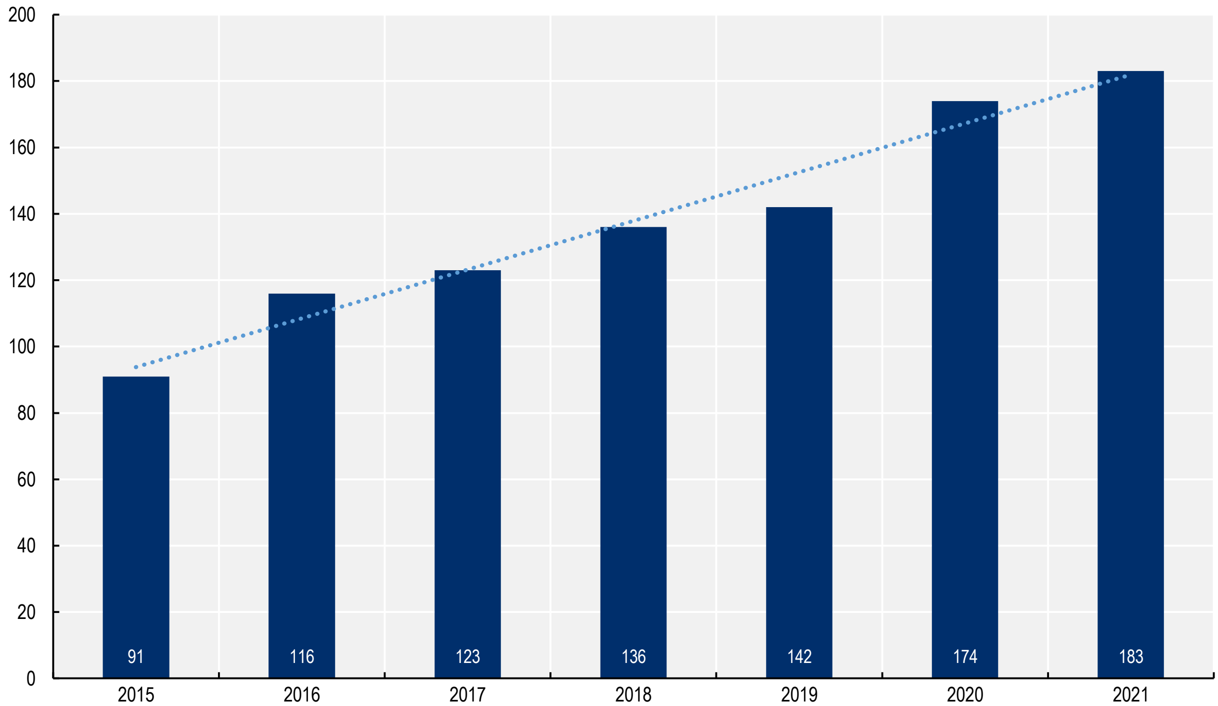
Assessment category	Question	University of Groningen study rating	RIVM Report study rating
Study design score:		*Moderate*	*Moderate*
Confounders	Were there important differences between groups prior to the intervention?	Yes	No
	What percentage of potential confounders were controlled for?	Less than 60% (SES was controlled for)	80% – 100% Matching by age, sex, origin (Dutch vs non-Dutch), household income
Confounders score:		*Moderate*	*Strong*
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes	Yes
	Were the study participants aware of the research question?	No	No
Blinding score:		*Moderate*	*Moderate*
Data collection methods	Were data collection tools shown to be valid?	Yes	Yes
	Were data collection tools shown to be reliable?	Yes	No
Data collection methods score:		*Strong*	*Moderate*
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes	No
	Indicate the percentage of participants who completed the study?	80-100%	Can't tell
Withdrawals and dropouts score:		*Moderate*	*Not applicable* *(Data was collected an annual CBS Youth Health survey hence participants were not followed up)*

Source: Effective Public Health Practice Project (1998[11]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

During the period from 2015-21, the JOGG approach expanded from 91 to 183 of the 352 municipalities across the Netherlands (Figure 7.8), which equates to 30% of all children aged 0-19 years living in the country.[1]

Figure 7.8. Number of JOGG municipalities – 2015-19



Source: Reijgersberg et al. (2016[12]), "Monitor Jongeren Op Gezond Gewicht 2015", https://www.mulierinstituut.nl/publicaties/17292/monitor-jongeren-op-gezond-gewicht-2015/; Collard et al. (2017[13]), "Monitor Jongeren Op Gezond Gewicht", https://www.mulierinstituut.nl/publicaties/21837/monitor-jongeren-op-gezond-gewicht-2016/; Collard et al. (2018[14]), "Monitor Jongeren Op Gezond Gewicht", https://www.mulierinstituut.nl/publicaties/23512/monitor-jongeren-op-gezond-gewicht-2017/; Collard et al. (2019[5]), "Monitor Jongeren Op Gezond Gewicht", https://www.mulierinstituut.nl/publicaties/24468/monitor-jongeren-op-gezond-gewicht-2018/; JOGG (2021[6]), "Jongeren Op Gezond Gewicht", https://jogg.nl/jogg-aanpak.

Policy options to enhance performance

This section summarises policy options to enhance the performance of JOGG in areas where the intervention currently operates. The policy options are also useful for policy makers in the process of, or interested in, implementing JOGG (e.g. to shape what activities are included in JOGG).

Enhancing effectiveness

The JOGG approach targets children aged 0-19, with many of its activities undertaken in the school environment. For this reason, it is important that teachers are health literate, as well as parents to ensure good behaviours continue at home.

Continue to improve health literacy among teachers

Obesity is a complex and sensitive subject; therefore, it is important teachers receive appropriate training in order to feel confident delivering nutrition/physical activity interventions in the classroom. For example, as part of professional development programs for teachers, or, at a wider, systematic level, obesity prevention topics could be continuously explored in the curriculum for becoming a teacher.

This policy aligns with WHO's Nutrition-Friendly Schools Initiative (NFSI), which promotes continuous "school staff training in nutrition and health related issues" (WHO, 2021[15]). The evidence behind NFSI found that investing in ongoing training, support and communication of educators has a positive effect on the health outcomes such as BMI, physical activity levels and diet (WHO, 2021[15]).

Improving health literacy among parents

To ensure healthy behaviours taught in the school environment continue in the home, it is also important to promote health literacy among parents. JOGG municipalities should therefore continue engaging parents through activities such as school information sessions, joint child-school-parent activities, school-led cooking workshops, and family activity nights (Lloyd et al., 2018[16]; Waters et al., 2011[17]). Where possible, activities should be direct (i.e. face-to-face) given these are typically more effective than engaging indirectly (e.g. newsletters) (WHO, 2021[15]).

Gamification

Gamification incorporates elements of game design into non-game contexts, such as health promotion activities. The idea behind gamification in health promotion is to capture components of games that make them addictive (Cugelman, 2013[18]).

In a community based setting, gamification can encourage behaviour change in a fun and engaging way (OECD, 2019[19]). By doing so, activities to encourage healthy behaviours are not framed negatively – i.e. obesity prevention – but positively, which can reduce stigma associated with participation. Example activities may include:

- Daily step challenges, where participants share their step count with friends. Alternatively participants may be placed into groups. Prizes for number of steps taken (or milestones reached – e.g. one week of walking 10 000 steps a day) can act as incentives to increase physical activity.
- Digital "exergames" using consoles focused on activities such as fitness, dancing and cycling. A recent systematic review by Goodyear et al. (2021[20]) concluded there is convincing evidence to support the use of online interventions incorporating elements of gamification to support children and young people's engagement in physical activity.

At present, the JOGG approach promotes active play both in and outside the home, which aligns well with gamification practices to change children's behaviours.

Healthy food labels

The JOGG approach promotes healthier food environments by collaborating with food industry partners to provide healthy food options to children. This is especially important for families living in lower SES neighbourhoods who typically have less access to healthy foods and therefore more likely to have diets comprised of foods associated with weight gain (e.g. processed foods) (RIVM, 2016[21]).

JOGG should continue efforts to promote healthy foods in local retailers and schools. For example, JOGG could consider working with food industry partners to distribute food products with healthy food labels, in addition, to fruit and vegetables. Food labels are more effective when placed at the front of the product and are easily interpretable – e.g. see case studies for Nutri-Score and the Danish Whole Grain Partnership in Chapters 3 and 9, respectively. However, at present, neither mandatory nor voluntary front-of-pack food labels exist in the Netherlands.

Anti-bullying and de-stigmatisation policies for children with obesity

Negative stigma associate with overweight and obesity is well documented. Recently, the WHO's report on Weight Bias and Obesity Stigma highlighted pervasive negative attitudes towards persons with obesity and how this affects social and health capital of future generations (WHO Europe, 2017[22]). Further, individuals who seek medical care for weight loss purposes are less likely to be successfully if they perceive themselves as being judged on the basis of their weight (Gudzune et al., 2014[23]).

Some recommended actions that the JOGG approach could continue incorporating so as to reduce weight bias and stigma towards children living with obesity include (WHO Europe, 2017[22]):

- Monitoring the impact of weight-based bullying among children and young people (e.g. through anti-bullying programmes and training of educational and health professionals)
- Assessment of unintended consequences of prevention initiatives on children with obesity – e.g. is stigmatising language being used in activities?
- Continuing the use of children's voices to promote health approaches that builds up their resilience
- Adoption of people-first language in all forms of institutions, especially in educational and health systems
- Creating new standards that represent individuals with obesity in the media, by moving away from using imagery and language that show people with obesity in a negative light.

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore, policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

As outlined under "Equity", JOGG had a greater impact on reducing rates of overweight and obesity in low compared to middle and high-SES areas. JOGG's success in reducing health inequalities can be attributed to several factors such as encouraging municipalities to adapt the programme to align with their local cultural needs in the community as well as collaborating with community stakeholders (Feel4Diabetes-study group, 2020[24]).

Nevertheless, there exist opportunities for JOGG to further enhance this best practice criterion, in particular targeting public health messages regarding JOGG.

Targeted communication

There is evidence that shows disadvantaged groups in the population (i.e. those with a low-SES and a lower education level) display more anxious and suspicious attitudes to prevention messaging from public health authorities (Peretti-Watel et al., 2009[25]). Therefore, traditional communication campaigns to promote health messaging may indirectly exclude disadvantaged groups.

JOGG's use of targeted communication messages should continue, and if not already, incorporate the following effective strategies for equitable messages (Borys et al., 2016[26]; Beacom and Newman, 2010[27]):

- An assessment of existing attitudes around obesity in low-SES groups, with findings used to frame public health messaging
- Use of community health workers for interpersonal communication to disseminate information regarding available services at no cost to the individual
- Partnering with existing organisations that have close ties with the target group (e.g. social services, charities, and migrant centres) to help promote JOGG activities
- Using educational entertainment for reaching non-seekers and avoiders of health information (e.g. animation, health information included in fictional already popularised TV media, health multi-media narratives).

Enhancing the evidence-base

Study designs used to measure the impact of JOGG on obesity prevalence are associated with several limitations (see "Evidence-base"). This is common for community-based obesity prevention interventions given their complexity.

To strengthen future evaluations of JOGG, it is necessary to enhance the evaluation study design based on recommendations listed below.

Collect panel data

To evaluate the long-term impact of JOGG on rates of obesity, data collected frequently using the same measures and the same individuals is ideal (i.e. panel data). Longitudinal panel data is the "gold standard" as it reduces bias by considering differences across individuals.

Collecting panel data can be difficult and expensive to implement. One possible solution is to collect data on BMI within national electronic health records (EHRs). Data from digital EHRs are considered high quality, further, information from EHRs is often accessible to academic researchers.

Based on an observational study looking at EHR use in primary care, approximately one in four people have BMI recorded in their EHR. However, this study only considered individuals who self-reported as overweight and is therefore not representative of the whole population (Verberne et al., 2018[28]).

Randomisation

Randomised control trials (RCTs) are the most scientifically rigorous method for evaluating the impact of intervention. However, they are not always feasible for economic, political or ethical reasons. Other study designs are available that mimic RCT characteristics and may be more suitable for community-based obesity interventions such as JOGG – for example, propensity score matching and regression discontinuity design with a treatment and control group.

Stratify data

To better understand the impact of JOGG across different groups of children, a breakdown of evaluation results by priority population groups is encouraged. Previous studies have done this by presenting results by SES status (Kobes, Kretschmer and Timmerman, 2021[9]), however, it is also important to understand how JOGG affects children from different ethnic backgrounds as well as by location (e.g. rural versus urban school and home settings, if possible). A breakdown of results by ethnicity, for example, would be an important contributor to the wider literature on community-based obesity interventions given the current paucity of available studies (Amini et al., 2015[29]).

Measure obesity risk factors and the obesogenic environment

One of JOGG's main objectives is to reduce obesity prevalence. Since changes in rates of overweight and obesity can be difficult to measure and take many years to achieve, data should also be collected for related indicators – i.e. intermediate outcome indicators, which are directly related to weight. For example:

- Percentage of children who consume fruits at least once per day
- Percentage of children who consume vegetables at least once per day
- percentage of children who consume sugary drinks
- Percentage children and adolescents (5-17 years) reported doing at least 60min or moderate to vigorous intensity physical activity daily.

Given JOGG's whole approach is to change the obesogenic environment, structural indicators that measure the built environment may also be of interest. A non-exhaustive list of indicators are summarised below (Schäfer Elinder and Jansson, 2008[30]):

- Availability of sports facilities
- Green space
- Access to fast-food restaurants
- Share of foods with a recognised health symbol
- Nutrition quality of meals in restaurants and schools
- Share of schools with a ban on the sale of soft drinks
- Presence of nutrition guidelines for school meals and the proportion of schools that comply.

Enhancing the extent of coverage

As discussed under "Extent of coverage", the number of municipalities participating in JOGG has grown significantly since its inception – i.e. from 91 to 183 of the 352 municipalities in the Netherlands between 2015 and 2021.

JOGG administrators are encouraged to continue using existing methods to increase coverage as well as new methods. For example:

- By framing JOGG activities as health promoting as opposed to obesity prevention in order to reduce stigma (see "Enhancing effectiveness" for further details)
- Drawing upon support from government agencies to further legitimise the JOGG approach, while taking into account that certain groups may be less responsive to this type of messaging (discussed under "Enhancing equity").

Transferability

This section explores the transferability of JOGG and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring JOGG.

Previous transfers

JOGG has been transferred across municipalities in the Netherlands as well as internationally.

Within country transfers

As outlined in Figure 7.8, since 2015, the JOGG approach has successfully expanded to a large number of municipalities in the Netherlands – specifically from 91 to 183 (out of 352) between 2015 and 2021.

To assist municipalities transfer JOGG, regional co-ordinators and professionals knowledgeable about the local context work with the JOGG director at the municipality level. During the first six months, regional co-ordinators receive training from JOGG coaches to implement the six principles (see "Intervention description"). Example training activities include:

- Drafting a strategy plan to implement the JOGG approach
- Engaging with local organisations to shape and progress JOGG in their specific area.

Support for JOGG municipalities does not end once implemented – specifically, participating municipalities receive ongoing support, for example, to develop public-private contracts.

International transfers

The JOGG approach has strong roots in the international EPODE2 methodology and is currently part of the health network called Young Health Community. This network beings together key findings and lessons learnt from implementations of the EPODE community-based approach to obesity prevention across Europe, the United States and the Middle East.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability are in Annex A. Indicators from publically available datasets to assess the transferability of JOGG are listed in Table 7.4. These cover indicators related to the population, political and economic contexts. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 7.4. Indicators to assess the transferability of JOGG

Indicator	Reasoning	Interpretation
Population context		
Teacher motivation	The perception that teachers hold on their ability to influence the development of children reflects on their motivation to engage enthusiastically with kids and school-based interventions (such as Daily Mile and DrinkWater campaigns)	↑ value = more transferable
Sector specific context (community)		
Green Spaces	Academic literature reveals that there is a connection between availability of green and recreational spaces within 10-minute walk for the improvement of BMI status among children (Xiao, Y., et al. 2020)	↑ value = more transferable
Nutrition labelling	JOGG is more transferable to countries that have existing structures in place to support FOP or BOP nutrition labels (e.g. regulatory frameworks). JOGG aims at changing food environment at the vendors level by promoting and highlighting healthier options	↑ value = more transferable
Political context		
Childhood obesity strategy	JOGG will be more transferable to countries that prioritise childhood obesity	"Yes" = more transferable
Economic context		
Prevention expenditure as a percentage of current health expenditure (CHE)	The JOGG is a prevention intervention, therefore, it is more transferable to countries that allocate a higher proportion of health spending to prevention	↑ value = more transferable
Spending on recreation and sporting services	JOGG aims to boost physical activity throughout the community – therefore it is more transferable to countries which spend more on improving recreational and sporting services.	↑ value = more transferable
Spending on early childhood education and primary and secondary schools (% GDP)	Many of JOGG's activities are carried out in schools given the intervention targets children. Therefore JOGG is more transferable to countries who spend more on education for those aged 0-19 years	↑ value = more transferable

Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[31]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2019[2]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en; OECD/FAO (2021[32]), *OECD-FAO Agricultural Outlook 2021-2030*, https://dx.doi.org/10.1787/19428846-en; Inchley et al. (2020[33]), "Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings", https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf; Eurostat (2019[34]), "General government spending on recreational and sporting services (% GDP)", https://ec.europa.eu/eurostat; OECD (2021[35]), "Education spending", https://dx.doi.org/10.1787/ca274bac-en.

Results

Results from the transferability assessment using publically available data are summarised below, which show mixed results (see Table 7.5 for results at the country level):

- In the Netherlands, a greater proportion of the population has access to green spaces in which to be active compared to potential transfer countries – 97% compared to 92%, on average, among remaining countries.
- A large proportion of teachers (86%) in the Netherlands report being motivated to influence the education of their students, compared to 93% among potential transfer countries. Given a large number of JOGG activities are undertaken in the classroom, these results indicate teachers are likely to be accepting of JOGG.
- The vast majority (86%) of countries have a childhood obesity strategy, indicating JOGG would like receive political support among potential transfer countries.
- Most OECD and non-OECD European countries have some sort of nutritional labelling scheme in place, which allows health messaging to be implemented as part of private public partnerships pillar of JOGG.
- Spending on prevention across OECD and non-OECD countries is typically lower than in the Netherlands (i.e. only 7 of the 43 countries analysed spent the same or more on prevention than in the Netherlands). Given JOGG is a preventative intervention, this results indicate a potential affordability issue. Similarly, the Netherlands spends more on recreation and sporting services compared to other OECD and EU countries (0.5% of GDP versus an average of 0.43% among countries with available data). Nevertheless, the Netherland spends less, albeit marginally, on schools than the OECD average.

Table 7.5. Transferability assessment by country, JOGG (OECD and non-OECD European countries)

A darker shade indicates the JOGG approach is more suitable for transferral in that particular country

	Teacher Motivation (%)	Access to green Spaces (%)	Nutrition Labelling	Childhood obesity strategy	Prevention expenditure percentage (****CHE)	Spending on recreation and sporting services	Teacher Motivation (%)
Netherlands	**86**	**97**	**M BOP** + V FOP**	**Yes**	**3.26**	**0.50**	**3.86**
Australia	96	90*	BOP + V FOP	No**	1.93	n/a	4.50
Austria	96	98	M BOP	Yes	2.11	0.30	3.62
Belgium	95	95	BOP + V FOP	Yes	1.65	0.40	4.13
Bulgaria	95	n/a	BOP + V FOP	Yes	2.83	0.10	n/a
Canada	99	n/a	M BOP	Yes	5.96	n/a	3.54
Chile	97	n/a	BOP + M FOP	Yes	n/a	n/a	5.51
Colombia	98	n/a	M BOP	Yes	2.05	n/a	4.44
Costa Rica	n/a	n/a	M BOP	No	0.60	n/a	n/a
Croatia	95	n/a	BOP + V FOP	No	3.16	0.30	n/a
Cyprus	n/a	n/a	M BOP	Yes	1.26	0.40	n/a
Czech Republic	93	98	BOP + V FOP	Yes	2.65	0.50	3.47
Denmark	94	89	BOP + V FOP	Yes	2.44	0.40	4.76
Estonia	88	97	M BOP	Yes	3.30	0.60	4.25
Finland	83	100	BOP + M FOP	Yes	3.98	0.60	4.78
France	92	93	BOP + V FOP	No	1.80	0.60	4.43
Germany	n/a	96	M BOP + V FOP	Yes	3.20	0.30	3.77
Greece	n/a	94	M BOP	No	1.27	0.40	2.86
Hungary	93	91	M BOP	Yes	3.04	1.10	3.30
Iceland	79	61	BOP + V FOP	Yes	2.68	1.50	6.29
Ireland	n/a	94	BOP + V FOP	Yes	2.60	0.10	2.43
Israel	97	n/a	BOP + M FOP	Yes	0.37	n/a	6.09
Italy	79	88	M BOP	Yes	4.41	0.30	3.77
Japan	89	n/a	M BOP	Yes	2.86	n/a	2.77
Latvia	93	95	M BOP	Yes	2.58	0.20	3.60

	Teacher Motivation (%)	Access to green Spaces (%)	Nutrition Labelling	Childhood obesity strategy	Prevention expenditure percentage (****CHE)	Spending on recreation and sporting services	Teacher Motivation (%)
Netherlands	**86**	**97**	**M BOP** + V FOP**	**Yes**	**3.26**	**0.50**	**3.86**
Lithuania	91	95	BOP + V FOP	Yes	2.17	0.30	3.21
Luxembourg	n/a	99	M BOP + V FOP	Yes	2.18	0.50	3.42
Malta	96	n/a	M BOP	Yes	1.30	0.20	n/a
Mexico	99	n/a	BOP + M FOP	Yes	2.92	n/a	3.75
New Zealand	96	n/a	BOP + V FOP	Yes	n/a	n/a	5.13
Norway	89	95	BOP + V FOP	Yes	2.45	0.50	6.57
Poland	n/a	93	BOP + V FOP	Yes	2.28	0.40	4.01
Portugal	94	83	BOP + V FOP	No	1.68	0.30	3.82
Republic of Korea	n/a	n/a	BOP + V FOP	Yes	3.48	n/a	3.53
Romania	98	n/a	M BOP	Yes	1.42	0.30	n/a
Slovak Republic	93	96	M BOP	Yes	0.77	n/a	3.37
Slovenia	89	94	BOP + V FOP	Yes	3.13	0.30	n/a
Spain	89	93	BOP + V FOP	Yes	2.13	0.40	3.76
Sweden	94	99	BOP + V FOP	Yes	3.27	0.60	5.78
Switzerland	n/a	97	V BOP + V FOP	Yes	2.63	0.30	1.56
Turkey	98	n/a	V BOP	Yes	n/a	n/a	3.37
United Kingdom	n/a	91	BOP + V FOP	Yes	5.08	0.20	4.53
United States	99	n/a	M BOP	Yes	2.91	n/a	3.47

* The figure for Australia represent the average cross each major city and refer to access to green space within 400m. **BOP = back of pack; FOP = front-of-pack; M = mandatory; V = voluntary. ***There are a number of strategies focusing on children and young people within the proposed National Obesity Prevention Strategy (2022-2032). ****CHE = current health expenditure. *****Includes spending on early childhood education, primary school and secondary school. The following countries do not have data for early childhood education spending: Belgium, Canada, Greece, Korea, Turkey and the United States. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). n/a = no available data.

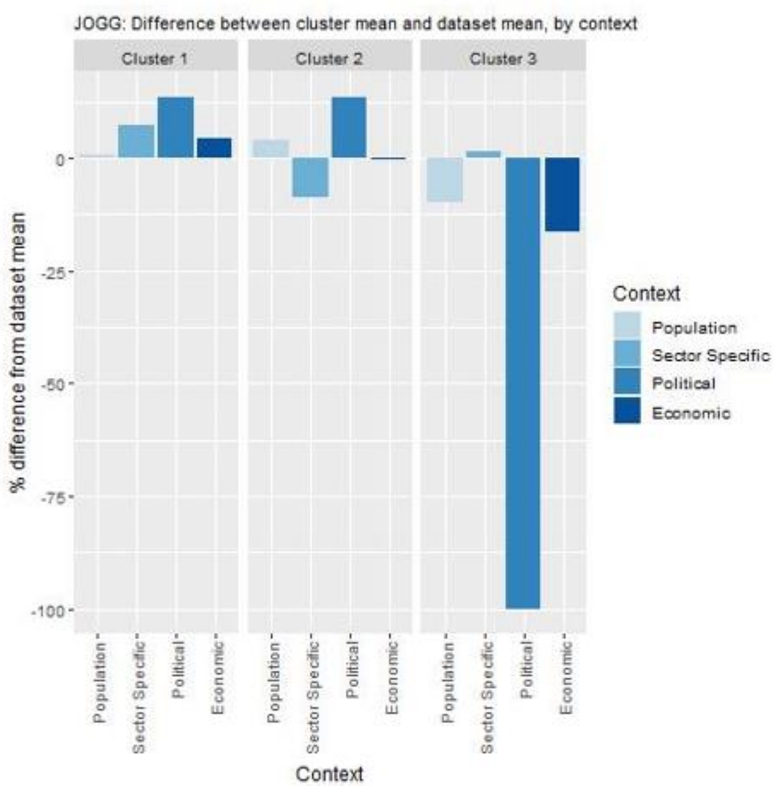
Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[31]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2019[2]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en; OECD/FAO (2021[32]), *OECD-FAO Agricultural Outlook 2021-2030*, https://dx.doi.org/10.1787/19428846-en; Inchley et al. (2020[33]), "Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings", https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf; Eurostat (2019[34]), "General government spending on recreational and sporting services (% GDP)", https://ec.europa.eu/eurostat; OECD (2021[35]), "Education spending", https://dx.doi.org/10.1787/ca274bac-en.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups based on indicators reported in Table 7.4. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 7.9 and Table 7.6:

- Countries in cluster one have sector specific, political and economic arrangements in place to transfer JOGG and are therefore less likely to experience difficulty implementing and operating JOGG. This cluster includes the Netherlands, the owner country of this intervention, and Iceland, which previously transferred elements of JOGG.
- Countries in cluster two have political and economic arrangements in place that support the transfer of JOGG but could consider further analysis to ensure sectors in which JOGG operates support the intervention.
- Countries in cluster three should consider a number of factors before transferring JOGG such as ensuring JOGG aligns with overall political priorities and is affordable (based on funding for preventative care, schools, and recreation and sporting services).

Figure 7.9. Transferability assessment using clustering, JOGG



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[31]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2019[2]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en; OECD/FAO (2021[32]), *OECD-FAO Agricultural Outlook 2021-2030*, https://dx.doi.org/10.1787/19428846-en; Inchley et al. (2020[33]), "Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings", https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf; Eurostat (2019[34]), "General government spending on recreational and sporting services (% GDP)", https://ec.europa.eu/eurostat; OECD (2021[35]), "Education spending", https://dx.doi.org/10.1787/ca274bac-en.

Table 7.6. Countries by cluster, JOGG

Cluster 1	Cluster 2	Cluster 3
Belgium	Austria	Australia
Bulgaria	Canada	Croatia
Czech Republic	Chile	France
Denmark	Colombia	Greece
Finland	Cyprus	Portugal
Germany	Estonia	
Iceland	Hungary	
Ireland	Israel	
Lithuania	Italy	
Luxembourg	Japan	
Netherlands	Latvia	
New Zealand	Malta	
Norway	Mexico	
Poland	Romania	
Republic of Korea	Slovak Republic	
Slovenia	Turkey	
Spain	United States	
Sweden		
Switzerland		
United Kingdom		

Note: Due to high levels of missing data, Costa Rica was omitted from the analysis.

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of the JOGG approach. Therefore, Box 7.3 outlines several new indicators policy makers should consider before transferring this intervention.

Box 7.3. New indicators to assess transferability

In addition to the publically available data within the transferability assessment, policy makers are encouraged to collect data for the following indicators in addition to indicators outlined within the WHO's "Making every school a health promoting school" report (WHO, 2021[15]).

Population context

- What is the ethnicity and cultural diversity of the target population?
- What is the level of health literacy among parents? (e.g. knowledge regarding what constitutes health eating, and the impact of healthy eating and exercise on overall health and well-being).
- What is the level of parental/guardian engagement with schools and teachers?
- What is the level of health literacy in the population at large?

Sector specific context (community)

- What is the level of acceptability of the JOGG approach among community stakeholders?
- What is the level of health literacy among teachers?
- Are schools and other community-based organisations involved in existing healthy lifestyle behaviour activities?

- What infrastructure is available in the community, including schools, to encourage physical activity?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target setting?

Conclusion and next steps

The JOGG approach is a community-based childhood obesity intervention targeting children 0 to 19 years. The approach aims to alter both energy-related behaviours as well as physical and social environments that have a large influence on the weight status of children. Although the JOGG specific approach operates primarily from the Netherlands, several European and North American countries have adopted the EPODE approach, which serves as the basis for the JOGG approach's methodology of operations.

Estimates indicate scaling-up JOGG across the Netherlands would lead to significant health and economic gains. Scaling-up JOGG across the whole of the Netherlands would lead to 16.0 LYs and 19.0 DALYs gained per 100 000 on average per year between 2021 and 2050. In terms of diseases, JOGG would have the greatest impact on reducing the incidence of musculoskeletal conditions, cardiovascular disease and diabetes. A decrease in the incidence of NCDs would result in a reduction in health care spending of EUR 2.72 per person, per year.

JOGG has the potential to narrow health inequalities, especially among population groups with a lower SES. JOGG focuses on municipalities with the highest burden of obesity, which are typically populated by people with a low SES. Further, each JOGG municipality tailors it activities to suit the needs of its local population. It is therefore not surprising that JOGG has the greatest impact among disadvantaged municipalities.

The number of participating JOGG municipalities has increased markedly since the interventions' inception. Between 2015 and 2019, the number of participating municipalities in the Netherlands grew from 91 to 183. JOGG therefore reaches over 1 million children or 30% of the population aged 0-19 years (i.e. the target population).

JOGG has a positive impact on many best practice criteria, however, further enhancements are possible. For example, policy makers could promote complementary policies such as changes to educational curricula for both teachers and students on the topic of health literacy. Further, to understand the long-term impact of JOGG on health outcomes, future studies could increase follow up times, for example, by drawing upon BMI data within patient electronic health records.

Community-based obesity prevention interventions similar to JOGG exist across multiple OECD countries indicating it is a transferable intervention. JOGG was developed based on the EPODE approach, which is a community-based framework for addressing childhood obesity. Other obesity prevention interventions in countries such as France, the United States, Australia, Canada and Spain also use the EPODE approach, indicating JOGG is a transferable intervention. The transferability of JOGG was also assessed using publically available data, which found mixed results – for example, JOGG would likely receive political support in most countries given childhood obesity is a top political priority, however spending on prevention is relatively low when compared to the Netherlands.

Box 7.4 outlines next steps for policy makers and funding agencies regarding JOGG.

Box 7.4. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance the JOGG approach are listed below:

- Support policy efforts to provide teachers with appropriate training to deliver nutrition and physical activity lessons, for example, by including these topics in the curriculum to become a school teacher or guidance counsellor
- Support policy efforts to boost population health literacy in order to motivate both parental and child's involvement community-based obesity programs
- Ensure funding for future scale-up and transfer efforts
- Enhance support for policies and strategies that aim at improvement of lived environment, especially in low-SES areas (e.g. green spaces, equitable access to healthy food options)
- Promote "lessons learnt" from regions that have transferred JOGG approach to their local setting.

References

Amini, M. et al. (2015), *Effect of school-based interventions to control childhood obesity: A review of reviews*, Isfahan University of Medical Sciences(IUMS), https://doi.org/10.4103/2008-7802.162059. [29]

Beacom, A. and S. Newman (2010), "Communicating Health Information to Disadvantaged Populations", *Family & Community Health*, Vol. 33/2, pp. 152-162, https://doi.org/10.1097/fch.0b013e3181d59344. [27]

Blokstra, A. et al. (2020), *Werkt de JOGG-aanpak? Veranderingen in overgewicht en beweeggedrag bij kinderen en jongeren*, RIVM, https://www.rivm.nl/documenten/factsheet-werkt-jogg-aanpak. [10]

Borys, J. et al. (2016), "Tackling Health Inequities and Reducing Obesity Prevalence: The EPODE Community-Based Approach", *Annals of Nutrition and Metabolism*, Vol. 68/Suppl. 2, pp. 35-38, https://doi.org/10.1159/000446223. [26]

Collard, D. et al. (2017), *Monitor Jongeren Op Gezond Gewicht*, Mulier Institute, https://www.mulierinstituut.nl/publicaties/21837/monitor-jongeren-op-gezond-gewicht-2016/. [13]

Collard, D. et al. (2018), *Monitor Jongeren Op Gezond Gewicht*, Mulier Institute, https://www.mulierinstituut.nl/publicaties/23512/monitor-jongeren-op-gezond-gewicht-2017/. [14]

Collard, D. et al. (2019), *Monitor Jongeren Op Gezond Gewicht 2018*, Mulier Instituut, https://www.mulierinstituut.nl/publicaties/24468/monitor-jongeren-op-gezond-gewicht-2018/. [5]

Cugelman, B. (2013), “Gamification: What It Is and Why It Matters to Digital Health Behavior Change Developers”, *JMIR Serious Games*, Vol. 1/1, p. e3, https://doi.org/10.2196/games.3139. [18]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [11]

Eurostat (2019), “General government spending on recreational and sporting services (% GDP)”. [34]

Feel4Diabetes-study group (2020), “Effective strategies for childhood obesity prevention via school based, family involved interventions: a critical review for the development of the Feel4Diabetes-study school based component”, *BMC Endocrine Disorders*, Vol. 20/S2, https://doi.org/10.1186/s12902-020-0526-5. [24]

Goodyear, V. et al. (2021), “The influence of online physical activity interventions on children and young people’s engagement with physical activity: a systematic review”, *Physical Education and Sport Pedagogy*, pp. 1-15, https://doi.org/10.1080/17408989.2021.1953459. [20]

Gudzune, K. et al. (2014), “Perceived judgment about weight can negatively influence weight loss: A cross-sectional study of overweight and obese patients”, *Preventive Medicine*, Vol. 62, pp. 103-107, https://doi.org/10.1016/j.ypmed.2014.02.001. [23]

Inchley, J. et al. (2020), *Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings*, https://apps.who.int/iris/bitstream/handle/10665/332091/9789289055000-eng.pdf. [33]

JOGG (2021), *Jongeren Op Gezond Gewicht*, https://jogg.nl/jogg-aanpak (accessed on 9 August 2021). [6]

Kobes, A., T. Kretschmer and G. Timmerman (2021), *Prevalence of overweight among Dutch primary school children living in JOGG and non-JOGG areas*, Center for Open Science, https://doi.org/10.31219/osf.io/u7b9q. [9]

Lloyd, J. et al. (2018), “Effectiveness of the Healthy Lifestyles Programme (HeLP) to prevent obesity in UK primary-school children: a cluster randomised controlled trial”, *The Lancet Child and Adolescent Health*, Vol. 2/1, pp. 35-45, https://doi.org/10.1016/S2352-4642(17)30151-7. [16]

Middelbeek, L. (2017), *Jongeren op Gezond Gewicht (“Young People at Healthy Weight”)*, http://chrodis.eu/good-practice/young-people-healthy-weight-jogg-netherlands/. [8]

OECD (2021), *Education spending* (indicator), https://doi.org/10.1787/ca274bac-en (accessed on 28 October 2021). [35]

OECD (2019), *Obese population, self reported % total population*, OECD, Paris. [1]

OECD (2019), *OECD Reviews of Public Health: Chile: A Healthier Tomorrow*, OECD Reviews of Public Health, OECD Publishing, Paris, https://doi.org/10.1787/9789264309593-en. [19]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [2]

OECD/FAO (2021), *OECD-FAO Agricultural Outlook 2021-2030*, OECD Publishing, Paris, https://doi.org/10.1787/19428846-en. [32]

Peretti-Watel, P. et al. (2009), *La Prévention en Question: Attitudes à l'Egard de la Santé, Perceptions des Messages Préventifs et Impact des Campagnes*, INPES. [25]

Reijgersberg, N., Pulles, I., Breedveld, K., de Hollander, E. (2016), *Monitor Jongeren Op Gezond Gewicht 2015*, Mulier Institute, https://www.mulierinstituut.nl/publicaties/17292/monitor-jongeren-op-gezond-gewicht-2015/. [12]

RIVM (2016), *Food consumption in the Netherlands and its determinants: Background report to 'What's on our plate? Safe, healthy and sustainable diets in the Netherlands'*, https://www.rivm.nl/bibliotheek/rapporten/2016-0195.pdf. [21]

Schäfer Elinder, L. and M. Jansson (2008), "Obesogenic environments – aspects on measurement and indicators", *Public Health Nutrition*, p. 1, https://doi.org/10.1017/s1368980008002450. [30]

Seidell, J. and J. Halberstadt (2020), "National and Local Strategies in the Netherlands for Obesity Prevention and Management in Children and Adolescents", *Obesity Facts*, Vol. 13/4, pp. 418-429, https://doi.org/10.1159/000509588. [3]

Vallejo-Torres, L. et al. (2016), "On the Estimation of the Cost-Effectiveness Threshold: Why, What, How?", *Value in Health*, Vol. 19/5, pp. 558-566, https://doi.org/10.1016/j.jval.2016.02.020. [7]

Verberne, L. et al. (2018), "Recording of weight in electronic health records: an observational study in general practice", *BMC Family Practice*, Vol. 19/1, https://doi.org/10.1186/s12875-018-0863-x. [28]

Waters, E. et al. (2011), *Interventions for preventing obesity in children*, John Wiley and Sons Ltd, https://doi.org/10.1002/14651858.CD001871.pub3. [17]

WHO (2021), *Nutrition action in schools: a review of evidence related to the nutrition-friendly schools initiative*, https://www.who.int/publications/i/item/9789241516969. [15]

WHO (2017), *Weight bias and obesity stigma: considerations for the WHO European Region*, https://www.euro.who.int/en/health-topics/noncommunicable-diseases/obesity/publications/2017/weight-bias-and-obesity-stigma-considerations-for-the-who-european-region-2017 (accessed on 9 August 2021). [4]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [31]

WHO Europe (2017), *Weight bias and obesity stigma: considerations for the WHO European Region*, https://www.euro.who.int/__data/assets/pdf_file/0017/351026/WeightBias.pdf. [22]

Annex 7.A. Modelling assumptions for JOGG

Annex Table 7.A.1. Parameters to model the impact of JOGG

Model parameters	JOGG model inputs
Effectiveness	BMI drop = -0.37* Evidence: Compared overweight (OW) prevalence between JOGG and non-JOGG low-SES communities only (repeated cross-sections, not longitudinal data) JOGG communities: OW fell from 25.17% to 21.15% Non-JOGG communities: OW fell from 18.11% to 15.72% Difference-in-difference**: (21.15 – 25.17) – (15.72 – 18.11) = 1.63 percentage points Real impact: OW in JOGG communities fell from 25.17% to 23.54% (25.17 – 1.63) or -6.48% A -6.48% in prevalence = -0.37 decline in BMI points (Kobes, Kretschmer and Timmerman, 2021[9]). To understand the long-term impact and full potential of JOGG, the intervention was implemented in a way that gave children time to age and therefore develop or not develop diseases related to overweight and obesity (i.e. the intervention was assumed to be implemented starting from year 1950).
Time to maximum effectiveness	There is a linear reduction in BMI within a year of the programme's implementation until the individual's BMI drops by 0.37 kg/m2 after which it stays constant on the lower parallel trajectory until the child turns 18. Specifically, it is assumed that after children turn 18, there is a linear decrease of the programme's effectiveness by 50% over one year parallel to their baseline BMI trajectory, and then it stays at this level for the rest of the individual's life (OECD, 2019[2])
Target age	0 to 19 years (both genders)
Exposure	At present, JOGG covers 30% of children within the eligible age bracket (based on feedback from JOGG administrators). Based on (Kobes, Kretschmer and Timmerman, 2021[9]), it is assumed that JOGG only has a statistically significant impact in areas with a low SES (i.e. communities who fell within the bottom 25% of the SES rank). [This aligns with the intervention's objective which is to target low SES groups/areas]. Scaling up JOGG to the whole of the Netherlands is therefore assumed to have a health impact on 25% of the eligible population. Limitations to the model meant it was not possible to apply the drop in BMI specifically to low SES children.
Per capita and participant cost, EUR	Estimation where made from one specific municipality (Zaanstad) that provided costs for year 2020 Cost per year for Zaanstad – JOGG: EUR 380 000 *Breakdown of cost per year for Zaanstad:* JOGG – directors (65 hours/week:): EUR 140 000 JOGG – director in Zaanstad municipality (28 hours/week): EUR 65 000 Activities (workshops, interventions, e-learnings, inspiration-meetings): EUR 60 000 Youth nurse/obesity specialist: EUR 115 000 Cost per year for Central JOGG operations per municipality: EUR 52 000 Total cost for Zaanstad municipality per year EUR 432 000 Number of kids aged 0-18 in Zaanstand's JOGG neighbourhoods: 33 304 Cost per participant, per year (2020): EUR 12.97 Cost per participant, per year (2019): EUR 12.81 Based on feedback from JOGG administrators, the costs in Zaanstad are considered "average" and can therefore represent the cost per participant across all participating municipalities. Cost per capita average (2021-50) EUR 0.6 Source: Figure provided by municipal and national programme administrators

Notes

[1] Figure provided by JOGG administrators.

[2] EPODE = Ensemble Prévenons l'Obésité des Enfants (Together preventing childhood obesity).

8 ToyBox

This chapter covers the case study of ToyBox, a school-based healthy lifestyle intervention operating in several European countries targeting children aged 3-4 years of age. The case study includes an assessment of ToyBox against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

ToyBox: Case study overview

Description: ToyBox is an intervention delivered in schools to children aged 3-4 years of age (i.e. in Kindergarten) with the aim of promoting health lifestyles to prevent obesity. It is a 24-week, multi-component intervention targeting four key behaviours namely: drinking water when thirsty; consuming healthy snacks; increasing physical activity; and prolong periods of sedentary behaviour.

Selected kindergartens in European countries including Belgium, Bulgaria, Greece, Germany, Malta, Poland and Spain have implemented ToyBox.

Best practice assessment:

Table 8.1. OECD best practice assessment, ToyBox

Criteria	Assessment
Effectiveness	ToyBox has been shown to reduce sedentary behaviour, increase physical activity and improve eating behaviours, however, evaluation results are not conclusive.
Efficiency	Available economic evaluations indicate ToyBox is cost-effective, however, results are limited in scope
Equity	ToyBox aims to address inequalities by addressing a health issue that disproportionality affects children with a low socio-economic status (SES) Evidence on impact indicate ToyBox is more effective for children attending high-SES kindergartens
Evidence-base	Evidence to evaluate ToyBox is strong in many areas including study design and the data collection methods used However, as in many public health studies, neither researchers nor participants were blinded.
Extent of coverage	In kindergartens offering ToyBox, between 63-74% of children participate

Enhancement options: to *enhance effectiveness*, ToyBox administrators could enhance interactive engagement with parents and the community, as well as extend the duration of the intervention beyond 24 weeks. To ensure staff have the appropriate skills to deliver the intervention, additional support for teachers as well as integrating obesity prevention topics into formal qualifications required to become a kindergarten teacher could prove beneficial. To *enhance the evidence-base*, reporting the impact of ToyBox on BMI in addition to secondary outcome measures (e.g. physical activity) is needed. To the extent possible, authors are encouraged to report results by different population groups with a particular focus on those who are disadvantaged. To *enhance the extent of coverage*, a multi-pronged approach to recruit parents (and therefore their children) may prove beneficial in boosting participation rates, for example, by promoting ToyBox with support from government organisations to enhance trust.

Transferability: ToyBox operates in several European and non-European countries indicating it is a transferable intervention. In countries where it does not operate, publically available data indicate that ToyBox is likely to receive political support, a key pillar of transferability, as it targets a prominent public health issue – childhood obesity.

Conclusion: a review of ToyBox across several European countries found the intervention performed well against most criteria within the OECD Best Practices Framework and is transferable. For example, ToyBox reduces sedentary behaviour and improves eating habits, and has been shown to be cost-effective. However, results indicate it is more effective among high socio-economic status kindergartens, which is a key limitation. To improve the performance of ToyBox, policy makers could increase parental and community engagement as well as extend the duration of the programme beyond 24 weeks.

Intervention description

Overweight and obesity amongst young children is a key concern across many developed and developing countries. In the EU, for example, approximately one in eight children (12%) aged 7-8 are obese with this figure increasing to 17% for children in Malta (OECD/European Union, 2018[1]; WHO, 2018[2]). Childhood obesity is particularly concerning given its link to psychosocial problems including low self-esteem, bullying, underachievement in schools, and depression (OECD/European Union, 2018[1]). Further, it is a key determinant of obesity in adulthood, which is associated with various health issues including higher probability of developing diabetes, certain cancers and cardiovascular diseases (CVDs) (OECD, 2019[3]).

To reduce the rate of overweight and obesity amongst young schoolchildren, seven EU countries have implemented the ToyBox intervention.[1] ToyBox is a Kindergarten-based intervention (i.e. for children aged between 3-4 years) aimed at promoting healthy lifestyles to prevent overweight and obesity rates among children. The intervention is run by teachers over a 24-week period, which concentrates on the four main energy balance-related behaviours (EBRBs) among young children (Manios et al., 2014[4]; ToyBox, 2020[5]):[2]

- Water consumption (encouraging children to drink water when thirsty)
- Healthy snacking
- Physical activity
- Sedentary behaviour (breaking up periods of sitting).[3]

Teachers are encouraged to introduce each of the EBRBs to students in a fun, interactive environment for example through interactive stories, experiments and games.

Countries such as Germany, Greece and Spain implemented ToyBox 2012-13 (ToyBox, 2020[5]), while Malta implemented the intervention in 2019. Teachers who deliver ToyBox receive a once-off 1.5 hour training session (with follow-up at six months), in addition, teachers receive a guidebook and classroom activity guides to help structure lessons.

To encourage children to maintain healthy behaviours in the home environment, the intervention also aims to engage parents. Specifically, parents are provided newsletters, tip cards (e.g. tips on how to motivate your child to move and decrease screen time) and posters on how good EBRBs learnt in school can be transferred into the home (Manios et al., 2014[4]; ToyBox, 2020[5]).

OECD Best Practices Framework assessment

This section analyses ToyBox against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 8.1 for a high-level assessment of ToyBox). Further details on the OECD Framework can be found in Annex A.

Box 8.1. Assessment of ToyBox

Effectiveness

- ToyBox is an effective intervention for reducing sedentary behaviour, increasing physical activity and improving diet. However, results were not statistically significant across the total sample for the majority of indicators.
- There is no evidence to support the direct impact of ToyBox on childhood rates of overweight and obesity, however, previous studies indicate interventions combining nutrition and physical activity can reduce BMI amongst children aged 0-5 years.

Efficiency

- There is limited information on the cost-effectiveness of the ToyBox intervention with only publically available results for the intervention's impact through changes in sedentary behaviour
- The estimated incremental cost-effectiveness ratio (ICER) (cost per QALY gained) of ToyBox is estimated between EUR 1 703 and EUR 28 080 depending on gender and country

Equity

- ToyBox targets obesity which disproportionately affects children from lower socio-economic status (SES) families, however, it is unclear whether specific efforts were made to address the needs of priority population groups.
- In Belgium, ToyBox was more effective at changing the behaviours of children from high-SES kindergartens, which is a key limitation of this intervention.
- School-based interventions are generally considered to decrease inequalities when attendance is compulsory.

Evidence-base

- Randomised trials were used to assess the impact of ToyBox on outcomes such as sedentary behaviour, physical activity and eating behaviours
- The evidence to support ToyBox is particularly strong in regards to the study design and the data collection methods used, however, like many public health studies, researchers and participants were not blinded

Extent of coverage

- Participation by children ranges between 63-74% amongst eligible kindergartens in European sites
- Data on dropout rates is not available, however, this is expected to be low to none given the intervention is delivered within schools

Effectiveness

ToyBox has been shown to reduce sedentary behaviour, increase physical activity and improve eating behaviours, however, evaluation results are not conclusive

Several peer-reviewed studies evaluating the impact of ToyBox on several EBRBs are available. These include studies on:[4]

- **Sedentary behaviours**:
  - Latomme et al. (2017[6]) found across six European countries, participation in ToyBox led to a statistically significant smaller increase in daily use of computer/video games. Specifically, children in the intervention group, on average, increased computer/video games use on weekdays by +5.48 min/day (versus +8.89 min/day in the control Group) and on weekends by +9.47 min/day (versus 15.43 min/day).
  - De Craemer et al. (2016[7]) analysed results in Belgium and concludes participation in ToyBox did not lead to statistically significant reductions in sedentary behaviour when examining the total sample. However, statistically significantly results for certain student groups:
    - Children in the intervention group among high SES kindergartens reduced sedentary behaviour on weekdays by 0.42% compared to an increase of 3.24% for the control group ($p = 0.03$). The same intervention group also recorded a reduction in sedentary behaviour during schools hours by -2%, whereas in the control group it increased by +0.47% ($p = 0.04$).
    - Among low SES kindergartens, children in the intervention group recorded a smaller increase in computer time during the weekend compared to the control group (+6.06min/day versus +12.49min/day, respectively) ($p = 0.03$).
- **Physical activity:**
  - De Craemer et al. (2014[8]) measured the impact of ToyBox on objectively collected measures of physical activity in Belgium. Results from the study found children in the intervention group increased their moderate to vigorous and vigorous only levels of physical activity during after school hours while the opposite occurred for those in the control group (with results being statistically significant). When stratified for SES and gender, results found ToyBox was more effective in improving physical activity for boys and children in high SES kindergartens. For example, among low SES kindergartens, the intervention group only saw a small increase in vigorous physical activity after school hours compared to the intervention group in high SES kindergartens, which recorded improvements in light and moderate physical activity as well as total physical activity across the whole week.
  - De Craemer et al. (2017[9]) analysed the impact of ToyBox on physical activity levels across six European countries, which found no statistically significant differences in the intervention and control group across the whole sample. When analysed at the country level, the authors found average steps per day increased in the intervention group for children in Bulgaria (+542 steps/day versus -634 steps/day) ($p = 0.03$).
- **Eating behaviours**:
  - Pinket et al. (2016[10]) found across six European countries studied that children in the intervention group experienced a statistically significant reduction in pre-packed fruit juice when compared to the control group. Specifically, consumption of pre-packaged juice fell by -33ml compared to -10ml for the control group ($p < 0.001$). However, results for other beverages such as water, soft drinks, sugared and chocolate milk were not statistically significant.
  - Lambrinou et al. (2019[11]) found ToyBox did not have a statistically significant impact on unhealthy snack consumption, however, it was shown to have a positive impact on parental rules and knowledge regarding snacking (e.g. restriction while watching television).

The impact of ToyBox on BMI is not available, however, a systematic review of the wider literature concluded that interventions targeting diet and physical activity "can reduce the risk of obesity in young children aged 0 to 5 years" (Brown et al., 2019[12]).

The long-term impact of ToyBox is not known given it was first implemented in 2012. Previous analysis by OECD, however, can shed light on the potential health and economic impact of school-based obesity prevention schemes (OECD, 2019[3]). Specifically, OECD estimated that school-based obesity prevention programs will reduce the number of cardiovascular disease (CVD) and diabetes cases by 48 154 and 136 586 each year, respectively, between 2020 and 2050 for the 36 countries analysed (which includes all ToyBox country sites) (OECD, 2019[3]).

Finally, in addition to the evidence outlined above, the WHO within its “Best Buys” guidelines for tackling NCDs recommended school-based programme to reduce unhealthy diets as well as increase physical activity (WHO, 2017[13]).

Efficiency

> *Available economic evaluations indicate ToyBox is cost-effective, however, publically available results are limited in their scope*

Publically available studies regarding the efficiency of ToyBox focus on the impact of changes to sedentary behaviour. To calculate the effect, sedentary behaviour data was used to estimate the probability of a child being obese or not (i.e. the relative risk (RR) of being obese is 1.86 when a child engages in more than 1 hour of computer games / weekday) (Annemans and Pil, n.d.[14]). Second, to calculate obesity into adulthood, RRs were used which differ based on gender (overweight girls are at 5 times greater risk of being obese in adulthood compared to 4.4. times at risk for boys). Thirdly, the RR of developing certain NCDs (e.g. diabetes, certain cancers and stroke) for obese adults was estimated used RRs. Finally, results from step 3 were transformed into QALYs using EQ-5D results from the published literature (Annemans and Pil, n.d.[14]).

Costs for the intervention covered several inputs including materials, training and transport with final figures estimating the cost between EUR 5 248 (USD PPP 7 672) (Poland) and EUR 28 840 (USD PPP 42 161) (Germany) per 1 000 children, depending on the country (Annemans and Pil, n.d.[14]).

Results of the cost-effectiveness analysis (CEA) are publically available for Greece and Poland. For Greece, the incremental cost-effectiveness ratio (ICER) (cost per QALY gained) was estimated at EUR 14 587 for men and EUR 28 080 for women (USD PPP 21 324 and USD PPP 41 050), assuming investment every five years (i.e. it costs between EUR 14 587 and EUR 28 080 to gain one year in full health). In Poland these figures are markedly less at EUR 3 149 and EUR 1 703 (USD PPP 4 603 and 2 490), respectively (Annemans and Pil, n.d.[14]).

Equity

> *ToyBox targets overweight and obesity, which disproportionately affects children from low-SES backgrounds*

The literature on childhood and adult obesity indicate those from lower socio-economic status (SES) groups are more likely to be overweight or obese. For example, an analysis of preschool-aged children in countries where ToyBox has been implemented found 17.8% of children whose mothers have a low level of education were overweight or obese compared to 12.1% for mothers with a medium/high level of education (Manios et al., 2018[15]). OECD analysis of HBSC (Heath Behaviour in School-Aged Children) data support these findings by estimating that across 26 European countries, overweight and obesity rates are 8 percentage points higher for children in the lowest income quintile compared to those in the highest income quintile (25% versus 17%) (OECD/European Union, 2018[1]).

Previous OECD analyses on the impact of obesity interventions indicate those delivered at schools are effective at tackling socio-economic inequalities, particularly when attendance is compulsory. School-based interventions are particularly effective amongst OECD countries given high attendance levels amongst children with a low-SES.

By addressing a health issue that disproportionally affects children from lower-SES groups, ToyBox aims to reduce health inequalities. However, it is unclear whether specific efforts were made to address other disadvantaged groups such as children from different ethnic backgrounds and/or who live in remote/regional areas.

Finally, results from (De Craemer et al., 2016[7]) and (De Craemer et al., 2014[8]) indicate the intervention (as implemented in Belgium) has been more successful in changing the behaviours of children from high SES kindergartens (see "Effectiveness" results for further details). This is a key limitation of the intervention.

Evidence-base

The quality of evidence to evaluate the intervention is strong in many areas

Several studies evaluating ToyBox are available, most of which use RCTs to assess impact. For the purpose of this case study, the study undertaken by Latomme et al. (2017[6]) has been used to assess the evidence-base. This study was chosen given: it includes data from six European countries; it recorded statistically significant results; and the outcome of interest (i.e. sedentary behaviour) was used to evaluate efficiency.

Latomme et al. (2017[6]) utilised a randomised cluster (pre-test/post-test) design to evaluate the impact of ToyBox on sedentary behaviours across six countries. Kindergartens were randomised using a sophisticated approach to ensure equal representation of pre-schoolers across different socio-economic contexts. Sedentary behaviour was measured using the Primary Caregivers' Questionnaire (PCQ), which included questions such as "How much time does your child spend on TV-viewing?" PCQ is a valid and reliable tool for measuring sedentary behaviour in children.

Using the *Quality Assessment Tool for Quantitative Studies* from the Effective Public Health Practice Project, the quality of Latomme et al.'s (2017[6]) study is rated as "strong" in two areas (study design and data collection methods); "moderate" in three areas (selection bias, confounders, and withdrawals and dropouts); and "weak" in one area (blinding) (Effective Public Health Practice Project, 1998[16]). Details of the assessment are in Table 8.2.

Table 8.2. Evidence-based assessment, ToyBox

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	Can't tell
Selection bias score: Moderate		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	Yes
	Was the method of randomisation described?	Yes
	Was the method of randomisation appropriate?	Yes
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	Can't tell

Assessment category	Question	Score
	What percentage of potential confounders were controlled for?	Most (80-100%)
Confounders score: Moderate		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	60-70%
Withdrawals and dropouts score: Moderate		

Source: Effective Public Health Practice Project (1998[16]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

In kindergartens offering ToyBox, between 63-74% of children participate

Participation rates in ToyBox differ depending on the country. In Malta, of the 37 schools who were invited to participate, 27 (14 who were independents and 13 church schools) chose to participate (organisation participation rate of 73%). Of the 991 children eligible to participate in these schools, 733 parents gave consent for their children to participate (individual level participation rate of 74%). Comparatively, across the six other European sites (i.e. Belgium, Bulgaria, Germany, Greece, Poland and Spain) the individual participation rate was lower at 63.3% (Manios et al., 2014[4]).

Policy options to enhance performance

Enhancing effectiveness

A review of various school-based childhood obesity interventions identified a range of factors associated with success including parental and community involvement as well as appropriate training and support for teachers (see Box 8.2). Based on a gap analysis comparing these factors against the design of ToyBox, several policy options to enhance effectiveness are outlined below.

Increase parental involvement

The importance of involving parents in school-based nutrition intervention is reflected in WHO's Nutrition-Friendly Schools Initiative (NFSI) (WHO, 2021[17]). Specifically, a review of the available evidence found parental involvement was positively associated with better health outcomes (e.g. BMI and dietary outcomes), particularly for younger age groups. Further, direct methods of involving parents in school-based interventions (e.g. face-to-face as opposed to newsletters) is associated with better health outcomes (WHO, 2021[17]).

At present, ToyBox engages parents through the provision of tip cards and posters to encourage healthy behaviours in the home. To further boost parental involvement, administrators could consider more interactive strategies such as school information sessions with parents; joint child-school-parent activities; school-led family cooking workshops; family activity nights; and child-parent goal setting (Lloyd et al., 2018[18]; Waters et al., 2011[19]; National Cancer Institute, 2020[20]). Given lack of time is a key barrier for parental involvement (e.g. due to work commitments or over-saturation of school activities), other more accessible activities could also be considered, for example, phone and internet-based services and support (Wolfenden et al., 2012[21]). Further, staff could use the opportunity at events with high attendance from parents to further promote the ToyBox intervention (e.g. school carnivals, fetes, and fundraisers) as opposed to relying on attendance at separate information sessions (Jones et al., 2014[22]).

Create an holistic approach involving all key stakeholders

Community involvement in nutrition action in schools is recommended by the WHO – NFSI essential criteria 2.2 ("Activities for families and community, community involvement and outreach in the area of nutrition and health related issue") (WHO, 2021[17]). Example policies to boost community involvement in ToyBox include procuring healthy fruit and vegetables from local suppliers (in line with EU's Farm to Fork Strategy) (European Commission, 2019[23]), and collaborating with community providers with relevant facilities (e.g. kitchens for preparing and cooking healthy meals, edible community gardens, gyms) (Gerritsen, 2016[24]).

Ensure appropriate training for teachers

One of the essential criteria within WHO's NFSI is to ensure "school staff training in nutrition and health related issues" (WHO, 2021[17]). A review of the available evidence found the provision of ongoing training, support and communication positively affects child health outcomes such as BMI, physical activity levels and diet (WHO, 2021[17]).

ToyBox provides teachers with an initial 1.5-hour training session in addition to a guidebook and classroom activity guides to help structure lessons. Given the complexity of obesity, expanding the amount of training teachers receive could improve health outcomes particularly if confidence in delivering nutrition and activity based activities is low amongst teachers. At a wider, systematic level, obesity prevention topics could be added to the curriculum to become a kindergarten teacher (CDC, 2017[25]).

Increase the duration of the intervention

Reviews of school-based obesity interventions found those that last longer than one year were more likely to achieve their objectives (Silveira et al., 2011[26]; Gonzalez-Suarez et al., 2009[27]; WHO, 2021[17]). Extending ToyBox beyond 24 weeks may therefore yield better outcomes.

Box 8.2. Example success factors for school-based obesity interventions

This box lists several success factors related to obesity interventions in schools. The list draws upon the WHO's Nutrition Friendly Schools Initiative, however, it is not exhaustive. For further details on WHO's Nutrition Friendly Schools Initiative, see: https://apps.who.int/iris/handle/10665/338781

- **Longer duration:** a systematic review of school-based nutrition education programs found interventions that last longer than one year were more likely to demonstrate effectiveness (Silveira et al., 2011[26]). These results are supported by an earlier meta-analysis which found school-based obesity interventions implemented for longer than a year reduced obesity levels (Gonzalez-Suarez et al., 2009[27]).
- **Holistic approach involving the community:** given the complexity of childhood obesity, schools are increasingly moving towards holistic approaches to reducing BMI (often referred to as "comprehensive school health" or "health promoting schools") (Okely and Hammersley, 2018[28]). Holistic approaches to reducing obesity aim to change the school and community environment in order for the easy choice to be the healthy choice.
- **Parental involvement**: obesity is a complex health issue and requires initiatives implemented in both the school and home environment. The importance of transferring knowledge and skills regarding healthy eating and exercise in schools to the home is supported by a recent article which found nearly all successful school-based obesity interventions promoted family involvement (Waters et al., 2011[19]; Okely and Hammersley, 2018[28]; Ash et al., 2017[29]).
- **Training and support for teachers**: to successfully implement school-based obesity interventions all staff involved must receive the appropriate training and professional development support and as well as ongoing capacity building and support (Jones et al., 2014[22]).

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

The impact of ToyBox on different outcome indicators of interest indicate the intervention is more effective among children in high-SES kindergartens (see "Effectiveness"). Possible reasons for this disparity include:

- Lower levels of access to outdoor space – e.g. private gardens or nearby parks – for children living in low-SES areas thereby making it difficult for parents/caregivers to implement ToyBox recommendations on physical activity (De Craemer et al., 2014[8])
- Lower levels of health literacy among parents/caregivers in low-SES areas
- Less funding among schools in low-SES areas to implement and deliver ToyBox as intended.

The points outlined above represent possible explanations only – therefore, future studies should explore this topic in further detail to understand why ToyBox affects SES groups differently. Findings from this research can be used to adapt ToyBox to ensure it reduces, as opposed to exacerbates, existing health inequalities.

Without this information, specific recommendations on how to enhance equity for ToyBox is not possible. Nevertheless, previous research on school-based obesity interventions in low SES areas can shed light on effective strategies (Box 8.3).

Box 8.3. Effective school-based obesity strategies in low-SES areas

Research by Lambrinous et al. (2020[30]) identified several strategies to increase the effectiveness of school-based obesity interventions in low-SES areas. At a high level, these include:

- Undertaking a situational analysis and formative research to guide the implementation and delivery of school-based obesity interventions.
- Focusing less on education and more on changing the environment to promote healthy lifestyles, parental engagement and interactive activities.
- Adapting the programme so that it culturally aligns with the community.
- Collaborating with community stakeholders.

Enhancing the evidence-base

Several RCTs evaluating ToyBox across multiple European sites are available (see assessment of "Effectiveness"). These studies focus on intermediate outcomes namely changes in sedentary behaviour, physical activity and eating behaviours. Given ToyBox is ultimately interested in reducing rates of overweight and obesity in children, further studies are encouraged to include objectively measured BMI as an outcome.

To assist policy makers compare the performance of ToyBox against similar school-based interventions, programme administrators may wish to convert data into indicators that are universally recognised (and therefore frequently reported). For example:

- Percentage of children who consume fruits at least once per day
- Percentage of children who consume vegetables at least once per day
- Percentage of children whose weight-for-height is greater than 2 standard deviations above WHO Child Growth Standards median[5]
- Percentage of children whose weight-for-height is greater than 3 standard deviations above WHO Child Growth Standards median[6]
- Percentage of adults (i.e. parents) who consume recommended amount of fruits and vegetables everyday (i.e. 400 grammes)

To better understand the impact of ToyBox across different groups of children, a breakdown of evaluation results by priority population groups is encouraged. Previous studies have done this by presenting results by SES status and gender, however, it is also important to understand how ToyBox affects children from different ethnic backgrounds as well as by location (e.g. rural versus urban kindergartens, if possible). A breakdown of results by ethnicity, for example, would be an important contributor to the wider literature on school-based obesity interventions given the current paucity of available studies (Amini et al., 2015[31]).

To evaluate the long-term impact of ToyBox on rates of obesity, it is important to collect data frequently using the same measures, and, ideally, the same individuals (i.e. panel data). Longitudinal panel data is considered the "gold standard" as it reduces bias by taking into account differences across individuals. Given this policy requires long-term funding and support, responsibility for this policy option lies with higher-level policy makers as opposed to ToyBox administrators.

Enhancing extent of coverage

Implementation of ToyBox in Malta recorded a participation rate of around 70% at the both kindergarten and individual level. These figures are higher than those recorded in other ToyBox European sites yet lower than the 85% figure considered high for school-based obesity interventions (Fung et al., 2012[32]). In future rounds of student recruitment, a multi-pronged approach for boosting participation could be considered. Example strategies include (Jones et al., 2014[22]):

- Promoting the intervention with support from government organisations to enhance trust among parents. For example, the *Good for Kids, Good for Life* intervention in New South Wales (Australia) was promoted using a support letter from the State's Chief Health Officer. Policy makers however should first consider if messaging from government organisations may in fact reduce uptake among disadvantaged groups. For example, there is evidence showing those with a low SES and/or lower level of education are more anxious and suspicious of prevention messaging from public health authorities (Peretti-Watel and Constance, 2009[33]).
- Promoting ToyBox as a healthy behaviour intervention that aims to boost enjoyable physical activity and healthy eating as opposed to obesity prevention. By framing ToyBox in a positive light, this may reduce stigma associated with participation.
- Increasing efforts to recruit students whose parents are from culturally or linguistically diverse backgrounds given consent may be harder to obtain (for example, by including staff members who are knowledgeable about relevant cultural characteristics).
- Promoting the intervention over a sufficiently long time period using colourful, "eye-grabbing" material in conjunction with frequent digital and face-to-face follow-up with parents.

Transferability

This section explores the transferability of ToyBox and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring ToyBox.

Previous transfers

ToyBox operates in six EU countries – Belgium, Bulgaria, Germany, Greece, Malta, Poland and Spain. As outlined under "Effectiveness", ToyBox has led to positive outcomes across these countries, such as reducing the level of sedentary behaviour. Following the success of ToyBox, two non-EU countries, Scotland and Malaysia, transferred the intervention to their own country. The impact of ToyBox in these countries is not publically available.

A full list of reports and publications produced by the ToyBox EU study are at: http://www.toybox-study.eu/.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Several indicators to assess the transferability of ToyBox were identified (see Table 8.3). Indicators were drawn from international databases and surveys to maximise coverage across OECD and non-OECD

European countries. Please note the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

The owner setting for the transferability assessment of ToyBox is Spain given this was the only country where ToyBox operates and where data for all indicators was available.

Table 8.3. Indicators to assess the transferability of ToyBox

Indicator	Reasoning	Interpretation
Sector specific context (early childhood education)		
Enrolment rate in early childhood education (children aged 3-5 years)	ToyBox targets children aged 3-4 who attend early childhood education (i.e. kindergarten). Therefore, ToyBox will have a greater extent of coverage in countries with higher enrolment rates.	↑ = "more transferable"
Student to teacher ratio in early childhood education	ToyBox will be more transferable to countries with a low student to teacher ratios given a reduced workload.	↓ = "more transferable"
% of teachers who are highly motivated*	ToyBox will be more transferable to countries whose teachers are highly motivated	↑ = "more transferable"
Political context		
Childhood obesity strategy	ToyBox will be more transferable to countries that prioritise childhood obesity	"Yes" = more transferable
Economic context		
Annual expenditure on early childhood education and care per child in USD, converted to purchasing power parities (PPP)	ToyBox will be more successful in countries who spend more on early childhood education and care	↑ = "more transferable"

* This indicator represents the proportion of teacher who report that influencing the development of children and young people is of moderate or high importance in deciding to become a better teacher.

Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[34]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[35]), "OECD data: Education", https://data.oecd.org/education.htm; OECD (2019[3]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Results

Results from the transfer assessment show ToyBox is likely to have political support given it targets childhood obesity, which is a political priority in most countries (see Table 8.4). Further, in countries where data is available, teacher motivation levels and spending on early childhood education and care (ECEC) are on average higher than the owner setting, Spain. For example, Spain spends USD PPP 7 759 on ECEC compared to USD PPP 9 729, which is the average spend across OECD and non-OECD EU countries. Nevertheless, ToyBox may have a lower extent of coverage in other countries given enrolment rates in ECEC are relatively high in Spain (97% versus 83%, which is the OECD and non-OECD EU average).

Table 8.4. Transferability assessment by country, ToyBox (OECD and non-OECD European countries)

A darker shade indicates ToyBox is more suitable for transferral in that particular country

	Enrolment rate by age – 3-5 years (%)	Ratio of students to teaching staff in educational institutions, primary	Teacher motivation level (%)*	Childhood obesity strategy	Funding for early childhood education, USD PPP
Spain	**97**	**14**	**89**	**Yes**	**7 759**
Australia	57	15	96	No**	7 863
Austria	90	12	96	Yes	11 009
Belgium †	98	13	95	Yes	n/a
Bulgaria †	n/a	n/a	95	Yes	n/a
Canada	n/a	17	99	Yes	n/a
Chile	79	19	97	Yes	6 727
Colombia	64	23	98	Yes	n/a
Costa Rica	60	12	n/a	No	n/a
Croatia	n/a	n/a	95	No	n/a
Cyprus	n/a	n/a	n/a	Yes	n/a
Czech Republic	87	19	93	Yes	6 109
Denmark	99	12	94	Yes	18 502
Estonia	91	13	88	Yes	8 137
Finland	82	14	83	Yes	13 186
France	1.00	19	92	No	8 894
Germany †	94	15	n/a	Yes	12 817
Greece †	n/a	9	n/a	No	n/a
Hungary	92	10	93	Yes	7 401
Iceland	97	11	79	Yes	17 310
Ireland	60	15	n/a	Yes	4 568
Israel	1.00	15	97	Yes	5 049
Italy	91	12	79	Yes	8 780
Japan	n/a	16	89	Yes	7 609
Latvia	93	12	93	Yes	6 222
Lithuania	86	11	91	Yes	6 677

	Enrolment rate by age – 3-5 years (%)	Ratio of students to teaching staff in educational institutions, primary	Teacher motivation level (%)*	Childhood obesity strategy	Funding for early childhood education, USD PPP
Spain	**97**	**14**	**89**	**Yes**	**7 759**
Luxembourg	85	9	n/a	Yes	19 326
Malta †	n/a	n/a	96	Yes	n/a
Mexico	73	26	99	Yes	2 570
Netherlands	89	16	86	Yes	6 959
New Zealand	n/a	17	96	Yes	9 599
Norway	97	10	89	Yes	19 663
Poland †	n/a	10	n/a	Yes	7 164
Portugal	91	12	94	No	n/a
Republic of Korea	n/a	17	n/a	Yes	n/a
Romania	n/a	n/a	98	Yes	n/a
Slovak Republic	78	18	93	Yes	6 123
Slovenia	91	10	89	Yes	9 329
Sweden	94	14	94	Yes	15 442
Turkey	38	17	98	Yes	n/a
United Kingdom	72	20	n/a	Yes	5 971
United States	n/a	15	99	Yes	n/a

Note: The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). *Results in Canada and the United Kingdom represents Alberta and England only, respectively. Further, results for Belgium are an average of the Belgium Flemish and Belgium French teachers. **There are a number of strategies focusing on children and young people within the proposed National Obesity Prevention Strategy (2022-2032). † = countries that have already transferred ToyBox to their country. n/a = data not available; PPP = purchasing power parity.

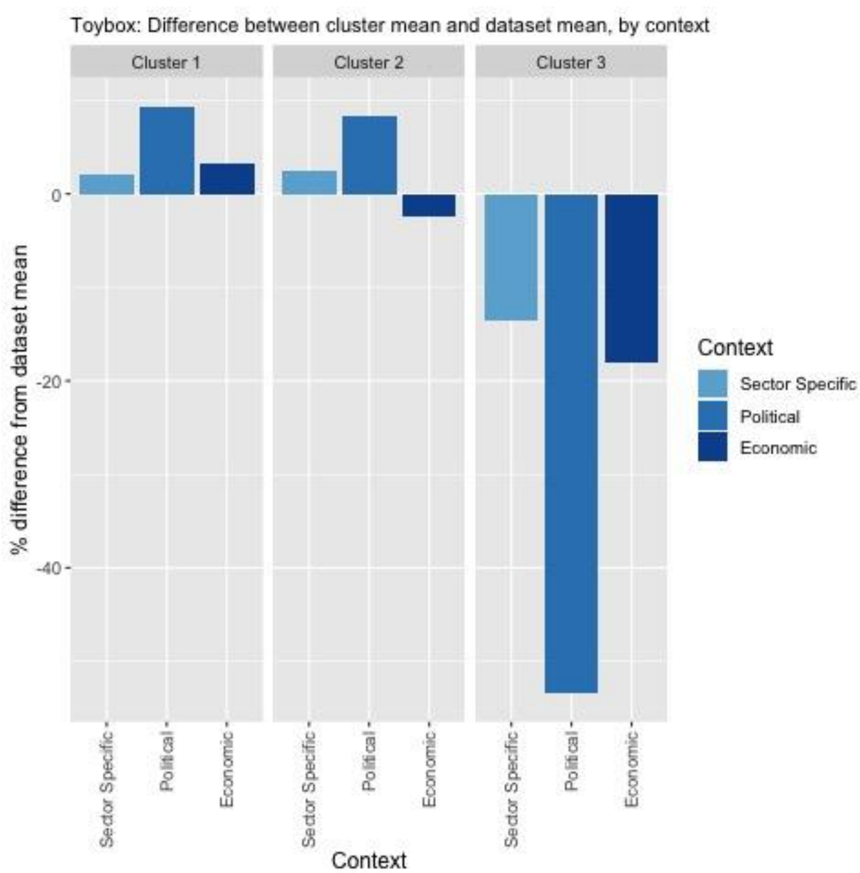
Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[34]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[35]), "OECD data: Education", https://data.oecd.org/education.htm; OECD (2019[3]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 8.3. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 8.1 and Table 8.5:

- Countries in cluster one have political, economic and sector specific arrangements in place to transfer ToyBox. Countries in this cluster are therefore less likely to experience issues in implementing and operating ToyBox in their local context.
- Countries in cluster two also have political and sector specific arrangements in place to transfer ToyBox, but would benefit from increasing spending on early childhood education and care (ECEC) to ensure affordability.
- Countries in cluster three would benefit from undertaking further analyses to ensure ToyBox is affordable (given relatively low levels of funding for early childhood education) and that it aligns with overarching political priorities.
- It is important to note that Spain and Greece, which operate ToyBox, fall under clusters two and three, respectively, meaning conditions in which these clusters could improve on, although ideal, are not pre-requisites.

Figure 8.1. Transferability assessment using clustering, ToyBox



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en; WHO (n.d.[34]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[35]), "OECD data: Education", https://data.oecd.org/education.htm; OECD (2019[3]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Table 8.5. Countries by cluster, ToyBox

Cluster 1	Cluster 2	Cluster 3
Austria	Canada	Australia
Belgium	Estonia	Costa Rica
Bulgaria	Finland	Croatia
Chile	Iceland	France
Colombia	Italy	Greece
Czech Republic	Japan	Portugal
Denmark	Malta	
Germany	Netherlands	
Hungary	New Zealand	
Ireland	Republic of Korea	
Israel	Romania	
Latvia	Slovak Republic	
Lithuania	Spain	
Luxembourg	Turkey	
Mexico	United States	
Norway		
Poland		
Slovenia		
Sweden		
Switzerland		
United Kingdom		

Note: Due to high levels of missing data, Cyprus is not included in the analysis.

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of ToyBox. For example, there is no international data measuring the level of parental engagement in schools. Therefore, Box 8.4 outlines several new indicators policy makers should consider before transferring ToyBox.

Box 8.4. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators, as well as those outlined within WHO's "Making every school a health-promoting school" report (WHO, 2021[36]).

Population context

- What is the ethnicity and cultural diversity of the target population?
- What is the level of acceptability of ToyBox amongst parents?*
- What is the level of health literacy amongst parents? (e.g. knowledge regarding what constitutes health eating, and the impact of healthy eating and exercise on overall health and well-being)
- What is the level of parental engagement with schools and teachers?
- What is the level of physical inactivity amongst children?

Sector specific context (early childhood education)

- What is the level of acceptability of ToyBox amongst teachers and the Head of School?*
- Does the school have an overarching policy/framework in place to promote healthy lifestyles amongst students?

- What is the level of health literacy amongst teachers? (How comfortable do teachers feel activities part of ToyBox?)
- Does the school already include healthy lifestyle lessons in the formal curricula?
- What infrastructure is available in schools for children to be active? (e.g. playgrounds)
- How much greenspace is there for children to be physically active in the school environment?
- Do kindergartens have access to a canteen on site? Or is food provided by parents?
- What are the regulations/legislation regarding data collection from young children?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target setting?

* Research into acceptability of ToyBox among teachers and parents has previously been undertaken in Scotland. See Malden et al. (2020[37]) for further details.

Conclusion and next steps

ToyBox is a school-based childhood obesity intervention targeting children aged 3-4 years. The intervention aims to alter four energy-related behaviours with the greatest impact on weight, as identified within the academic literature. The intervention operates in several European countries and two non-EU countries.

ToyBox has led to statistically significant improvements in intermediate outcomes related to obesity including reductions in sedentary behaviour. However, statistically significant results typically do not apply to the whole population being studied or for all indicators being measured – for example, results from ToyBox in Belgium indicate the intervention is more effective among high SES kindergartens. Further, there is limited evidence on the impact of ToyBox on BMI directly (a final health outcome). Regarding efficiency, economic evaluations of ToyBox found it is cost-effective, however, these results are limited in scope (i.e. by focusing on sedentary behaviour only).

An assessment of ToyBox against the OECD Framework as well as a review of the literature on school-based obesity prevention programs identified several policy options to enhance implementation. These include, but are not limited to: boosting parental and community engagement; increasing duration beyond 24 weeks; integrating obesity prevention into the curriculum for kindergarten teachers; and boosting participation by using government supported promotional material. In addition, researchers are encouraged to report the impact of ToyBox on BMI directly, and, to the extent possible, provide results by different population groups beyond SES and gender (e.g. by ethnicity and location (urban versus regional)).

Box 8.5 outlines next steps for policy makers and funding agencies regarding ToyBox.

Box 8.5. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance ToyBox are listed below:

- Support policy efforts to provide teachers with appropriate training to deliver nutrition and physical activity lessons, for example, by including these topics in the curriculum to become a kindergarten teacher
- Support policy efforts to boost population health literacy in order to motivate parental involvement school-based obesity programs
- Ensure funding for future scale-up and transfer efforts
- Promote findings from the ToyBox case study to better understand what countries/regions are interested in transferring the intervention
- Promote "lessons learnt" from regions that have transferred ToyBox to their local setting.

References

Amini, M. et al. (2015), *Effect of school-based interventions to control childhood obesity: A review of reviews*, Isfahan University of Medical Sciences(IUMS), https://doi.org/10.4103/2008-7802.162059. [31]

Annemans, L. and L. Pil (n.d.), *Building a framework for long-term nutrition economic evaluations of interventions to address childhood obesity: The ToyBox study*, Ghent University, https://ec.europa.eu/jrc/sites/jrcsh/files/20151112-13-health-nutrition-economics-pil_en.pdf. [14]

Ash, T. et al. (2017), *Family-based childhood obesity prevention interventions: A systematic review and quantitative content analysis*, BioMed Central Ltd., https://doi.org/10.1186/s12966-017-0571-2. [29]

Brown, T. et al. (2019), "Interventions for preventing obesity in children", *Cochrane Database of Systematic Reviews*, https://doi.org/10.1002/14651858.cd001871.pub4. [12]

CDC (2017), *Acting Early to Prevent Obesity*, CDC Division of Nutrition, Physical Activity and Obesity, https://www.cdc.gov/obesity/downloads/acting-early-to-prevent-obesity.pdf. [25]

De Craemer, M. et al. (2016), "The effect of a cluster randomised control trial on objectively measured sedentary time and parental reports of time spent in sedentary activities in Belgian preschoolers: The ToyBox-study", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 13/1, https://doi.org/10.1186/s12966-015-0325-y. [7]

De Craemer, M. et al. (2014), "The effect of a kindergarten-based, family-involved intervention on objectively measured physical activity in Belgian preschool boys and girls of high and low SES: The ToyBox-study", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 11/1, https://doi.org/10.1186/1479-5868-11-38. [8]

De Craemer, M. et al. (2017), "Effect and process evaluation of a kindergarten-based, family-involved cluster randomised controlled trial in six European countries on four- to six-year-old children's steps per day: The ToyBox-study", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 14/1, https://doi.org/10.1186/s12966-017-0574-z. [9]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [16]

European Commission (2019), *Farm to Fork Strategy: For a fair, healthy and environmentally-friendly food system*, https://ec.europa.eu/food/sites/food/files/safety/docs/f2f_action-plan_2020_strategy-info_en.pdf. [23]

Fung, C. et al. (2012), "From "best practice" to "next practice": the effectiveness of school-based health promotion in improving healthy eating and physical activity and preventing childhood obesity", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 9/1, p. 27, https://doi.org/10.1186/1479-5868-9-27. [32]

Gerritsen, S. (2016), "Nutrition education for early childhood managers, teachers and nursery cooks: a prerequisite for effective obesity prevention", *Public Health*, Vol. 140, pp. 56-58, https://doi.org/10.1016/j.puhe.2016.05.025. [24]

Gonzalez-Suarez, C. et al. (2009), "School-Based Interventions on Childhood Obesity. A Meta-Analysis", *American Journal of Preventive Medicine*, Vol. 37/5, pp. 418-427, https://doi.org/10.1016/j.amepre.2009.07.012. [27]

Jones, R. et al. (2014), "School-based obesity prevention interventions: Practicalities and considerations", *Obesity Research and Clinical Practice*, Vol. 8/5, pp. e497-e510, https://doi.org/10.1016/j.orcp.2013.10.004. [22]

Lambrinou, C. et al. (2019), "Mediators of the effectiveness of a kindergarten-based, family-involved intervention on pre-schoolers' snacking behaviour: The ToyBox-study", *Public Health Nutrition*, Vol. 22/1, pp. 157-163, https://doi.org/10.1017/S1368980018002653. [11]

Latomme, J. et al. (2017), "Effect and process evaluation of a kindergarten-based, family-involved intervention with a randomized cluster design on sedentary behaviour in 4- to 6-year old European preschool children: The ToyBoxstudy", *PLoS ONE*, Vol. 12/4, https://doi.org/10.1371/journal.pone.0172730. [6]

Lloyd, J. et al. (2018), "Effectiveness of the Healthy Lifestyles Programme (HeLP) to prevent obesity in UK primary-school children: a cluster randomised controlled trial", *The Lancet Child and Adolescent Health*, Vol. 2/1, pp. 35-45, https://doi.org/10.1016/S2352-4642(17)30151-7. [18]

Malden, S. et al. (2020), "Assessing the acceptability of an adapted preschool obesity prevention programme: ToyBox-Scotland", *Child: Care, Health and Development*, Vol. 46/2, pp. 213-222, https://doi.org/10.1111/cch.12736. [37]

Manios, Y. et al. (2014), "Designing and implementing a kindergarten-based, family-involved intervention to prevent obesity in early childhood: the ToyBox-study.", *Obesity reviews : an official journal of the International Association for the Study of Obesity*, Vol. 15 Suppl 3/SUPPL.3, pp. 5-13, https://doi.org/10.1111/obr.12175. [4]

Manios, Y. et al. (2018), "Prevalence and sociodemographic correlates of overweight and obesity in a large Pan-European cohort of preschool children and their families: The ToyBox-study", *Nutrition*, Vol. 55-56, pp. 192-198, https://doi.org/10.1016/j.nut.2018.05.007. [15]

National Cancer Institute (2020), *Alberta Project Promoting active Living and healthy Eating (APPLE Schools)*, https://rtips.cancer.gov/rtips/programDetails.do?programId=3624004. [20]

OECD (2022), *OECD data: Education*, https://data.oecd.org/education.htm. [35]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [3]

OECD/European Union (2018), *Health at a Glance: Europe 2018: State of Health in the EU Cycle*, OECD Publishing, Paris/European Union, Brussels, https://doi.org/10.1787/health_glance_eur-2018-en. [1]

Okely, A. and M. Hammersley (2018), *School–home partnerships: the missing piece in obesity prevention?*, Elsevier B.V., https://doi.org/10.1016/S2352-4642(17)30154-2. [28]

on behalf of the Feel4Diabetes-study group (2020), “Effective strategies for childhood obesity prevention via school based, family involved interventions: a critical review for the development of the Feel4Diabetes-study school based component”, *BMC Endocrine Disorders*, Vol. 20/S2, https://doi.org/10.1186/s12902-020-0526-5. [30]

Peretti-Watel, P. and J. Constance (2009), “Comment les fumeurs pauvres justifient-ils leur pratique et jugent-ils la prévention ?”, *Déviance et Société*, Vol. 33/2, p. 205, https://doi.org/10.3917/ds.332.0205. [33]

Pinket, A. et al. (2016), “Effect and process evaluation of a cluster randomized control trial on water intake and beverage consumption in preschoolers from six European countries: The ToyBox-study”, *PLoS ONE*, Vol. 11/4, https://doi.org/10.1371/journal.pone.0152928. [10]

Silveira, J. et al. (2011), *Effectiveness of school-based nutrition education interventions to prevent and reduce excessive weight gain in children and adolescents: A systematic review*, J Pediatr (Rio J), https://doi.org/10.2223/JPED.2123. [26]

ToyBox (2020), *ToyBox – a European multi-country study to develop an obesity prevention programme specifically for pre-school children*, http://www.toybox-study.eu/?q=en/node/1. [5]

Waters, E. et al. (2011), *Interventions for preventing obesity in children*, John Wiley and Sons Ltd, https://doi.org/10.1002/14651858.CD001871.pub3. [19]

WHO (2021), *Making every school a health-promoting school: Global standards and indicators*, World Health Organization and the United Nations Educational, Scientific and Cultural Organization, https://www.who.int/publications/i/item/9789240025059. [36]

WHO (2021), *Nutrition action in schools: a review of evidence related to the nutrition-friendly schools initiative*, https://www.who.int/publications/i/item/9789241516969. [17]

WHO (2018), *WHO European Childhood Obesity Surveillance Initiative (COSI)*. [2]

WHO (2017), *Best buys and other recommended interventions for the prevention and control of noncommunicable diseases*, WHO, Geneva, https://apps.who.int/iris/bitstream/handle/10665/259232/WHO-NMH-NVI-17.9-eng.pdf;jsessionid=3E76AC01272E9377F8382B8BC19545AF?sequence=1 (accessed on 10 September 2019). [13]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [34]

Wolfenden, L. et al. (2012), “Engaging parents in child obesity prevention: Support preferences of parents”, *Journal of Paediatrics and Child Health*, Vol. 48/2, https://doi.org/10.1111/j.1440-1754.2010.01776.x. [21]

Notes

[1] Participating countries include Belgium, Bulgaria, Germany, Greece, Malta, Spain and Poland.

[2] The intervention concentrates on each EBRBs for four weeks (16 weeks) which is then repeated, however, for only two weeks (eight weeks).

[3] In addition, the importance of good oral health is also being emphasised in Malta.

[4] An evaluation of the ToyBox (Malta) was planned for year 2020, however, due to unforeseen barriers caused by COVID-19, the evaluation was put on hold indefinitely.

[5] See following link for WHO Child Growth Standards: https://www.who.int/childgrowth/standards/weight_for_height/en/ (indicator designed for children under five years of age)

[6] Ibid.

9 The Danish Whole Grain Partnership

This chapter covers the case study of the Danish Whole Grain Partnership, a public-private partnership that aims to increase average daily intake of whole grains in the population. The case study includes an assessment of the Danish Whole Grain Partnership against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

The Danish Whole Grain Partnership: Case study overview

Description: the Danish Whole Grain Partnership (DWGP) is a public-private partnership (PPP) between the Danish Veterinary and Food Administration (government), the Danish Cancer Society, the Danish Heart Foundation and the Danish Diabetes Association as well as a number of food companies. The overall objective of DWGP is to increase average daily intake of whole grain in the population. A key element of DWGP is the logo its member use on high whole grain products and is the focus of this case study.

Best practice assessment:

Table 9.1. OECD best practice assessment of the Danish Whole Grain Partnership

Criteria	Assessment
Effectiveness	DWGP is associated with an increase in whole grain consumption across sex and age groups.
Efficiency	Studies measuring efficiency of DWGP are not available, however, meeting the whole grain consumption threshold, which DWGP aims to do, is associated with significant health care cost and labour productivity savings.
Equity	The design of the DWGP logo makes it accessible to different population groups, however, it is unclear whether these products are more expensive.
Evidence-base	Changes in whole grain consumption were measured using cohort studies, which aren't necessarily generalisable. The evidence-base supporting the association between whole grain consumption and certain diseases, risk factors and mortality is well-established.
Extent of coverage	Extent of coverage has grown significantly since DWGP's inception – between 2011 and 2019, the proportion of people buying products with the logo increased from 40% to 80%.

Enhancement options: to *enhance effectiveness and equity*, policy makers could consider options such as partnering with retail outlets to offer discounts/promotions on products carrying the DWGP logo. To enhance the *evidence-base*, analysing the impact of DWGP beyond sex and age group (e.g. by socio-economic group) will provide a better understanding its impact on different populations. To *enhance the extent of coverage*, policy makers may want to consider offering small producers incentives to become a DWGP member.

Transferability: in 2019 the "European Action on Whole Grain Partnerships" was created, which involves transferring DWGP Denmark to three new countries. Materials to assist countries implement the Partnership were created as part of the Action. Publically available data to measure the transferability potential of DWGP is limited, given indicators on the food retail market and consumer behaviour are collected by private research companies and thus not available for public use. Data that was available indicate DWGP would receive significant political support in other OECD and non-OECD European countries.

Conclusion: DWGP uses a multi-pronged strategy to boost whole grain consumption, including an easy-to-understand logo. Since DWGP's inception, whole grain consumption in Denmark has increased markedly. To enhance the performance of DWGP, policy makers could consider options outlined in this case study such as offering discounts/promotions on DWGP products.

Intervention description

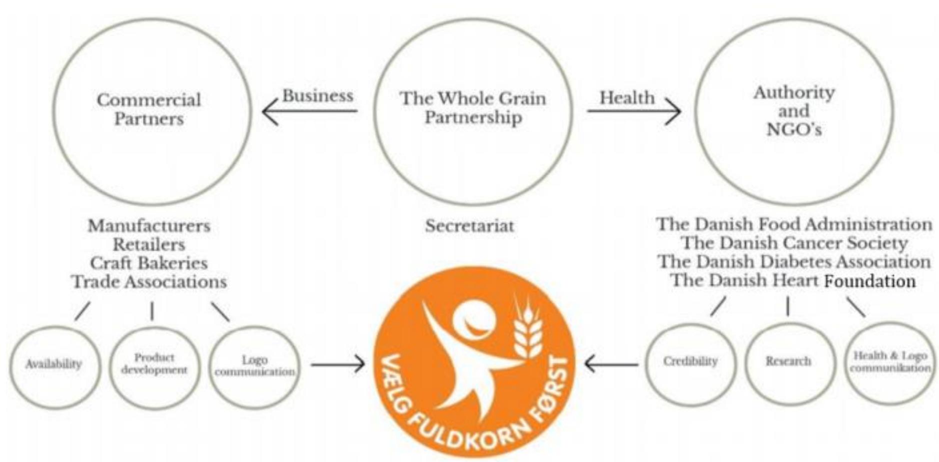
A Global Burden of Disease Study released in 2018 estimated that between 2007 and 2017 the number of deaths attributed to insufficient whole grain consumption increased by about 17%, from 2.63 million to

3.07 million deaths (Stanaway et al., 2018[1]). Consequently, insufficient whole grain consumption became the second leading dietary risk factor for population health behind high sodium consumption (Stanaway et al., 2018[1]).

Persistently low rates of whole grain consumption have prompted policy makers across the world to act, including Denmark (Lourenço et al., 2019[2]). In Denmark, findings showing increased levels of fat in the population's diet and a decline in bread consumption (caused by growing popularity in a diet promoting low levels of carbohydrates) led to discussions between the Danish Veterinary and Food Administration, the food industry and non-governmental health organisations (NGOs) on how to boost whole grain consumption (Fuldkorn, 2020[3]). Following these discussion, in 2008, the National Food Institute within the Technical University of Denmark released a report defining what is considered a whole grain product[1] and a scientifically based whole grain consumption recommendation of 75g / 10 megajoules (mJ) per day (DTU Fødevareinstituttet, 2008[4]).

The adoption of the recommended consumption of whole grains into national dietary guidelines led to the establishment of the Danish Whole Grain Partnership (DWGP) in 2008. DWGP is a public-private partnership (PPP) between the Danish Veterinary and Food Administration (government), the Danish Cancers, the Danish Heart Foundation and the Danish Diabetes Association as well as a number of commercial partners such as food manufacturers and retailers (Figure 9.1).

Figure 9.1. Structural overview of the Danish Whole Grain Partnership



Note: The wording in the orange logo translates to "Choose whole grains first".
Source: WholEUGrain (2021[5]), "Toolbox: A guide to implement a successful national whole grain partnership", https://www.gzs.si/Portals/288/Toolbox_opdateret%2009082021.pdf.

The main objective DWGP is to increase the average daily intake of whole grain in the population. The Partnership achieves this by employing a multi-pronged strategy (Lourenço et al., 2019[2]):

- Increasing the availability of "tasty" whole grain products, for example by adding small amounts (5-20%) of whole grain to relevant products.
- Promoting the development of whole grain products and incorporating whole grains in all cereal-based products
- Promoting the whole grain logo (see below for further details), informing people about the health benefits of whole grains as well as dispelling myths regarding whole grains
- Helping shape new norms for whole grains via campaigns, events and structural changes.

The whole grain logo – pictured in Figure 9.1 – ("choose whole grains first") – represents a key pillar of the Partnership. The logo is printed on products developed by DWGP members given they meet minimum whole grain requirements (Table 9.2) as well as wider dietary requirements outlined within the Nordic Keyhole labelling scheme. That products must meet both the DWGP and Keyhole requirements is a key strength of the intervention as it limits unintended consequences arising from the "halo effect" (see Box 9.1).

Table 9.2. Whole Grain Partnership logo requirements (examples)

	Breakfast cereals and muesli	Rice	Pasta and noodles
Whole grain (calculated as product dry matter)	At least 65% whole grain	100% whole grain	At least 60% whole grain
Fat	Max 8g/100g	-	-
Sugars	Max 13g/100g	-	-
Added sugars	Max 9g/100g	-	-
Dietary fibre	At least 6g/100g	At least 3g/100g	At least 6g/100g
Salt	Max 1.0g/100g	-	Max 0.1g/100g

Source: Fuldkorn (2020[6]), "The Whole Grain Logo Manual: Guidelines for use of the Danish Whole Grain Logo"", https://fuldkorn.dk/wp-content/uploads/2020/05/Fuldkornslogomanualen_revideret-udgave_gældende-fra-5.-maj-2020-31.-december-2022_English.pdf.

Box 9.1. Food labelling and the "halo effect"

The halo effect refers to the tendency for people to overestimate the "healthfulness" of a product based on a single labelling claim (Cecchini and Warin, 2015[7]). For example, research has shown that consumers often confuse "low fat" products with "low calorie" products (Brownell and Koplan, 2011[8]), which may result in an increase in overall calorie consumption. The requirement that products with the Whole Grain logo also meet nutrition guidelines outlined by the Nordic Keyhole labelling scheme prevents "unhealthy" high whole grain products using the logo (Health Norway, 2019[9]).

In order to become a partner, organisations pay a fee, which is dependent on their size.[2] At present, DWGP includes 30 partners ranging from manufacturers in the food industry, retailers, Danish Veterinary and Food Administration, craft bakers, millers, associations and non-government health organisations (health NGOs) (Fuldkorn, 2020[6]).

OECD Best Practices Framework assessment

This section analyses DWGP against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 9.2 for a high-level assessment). Further details on the OECD Framework can be found in Annex A.

Box 9.2. Assessment of the Danish Whole Grain Partnership

Effectiveness

- Whole grain consumption has increased in Denmark since the inception of DWGP – for example between 2000-04 and 2011-12, consumption of whole grains in grammes per day increased by 64% and 71% for men and women, respectively.
- Using latest available estimates, the median intake of whole grain is above the recommended threshold (75g/10 mega joule), with 50% of the population meeting this threshold

Efficiency

- Studies measuring efficiency of DWGP are not available. A study by the University of Copenhagen found that increasing whole grain consumption to the recommended level would lead to significant health care cost savings and improvements in labour force productivity.

Equity

- There is some evidence to suggest that pre-packaged food products with a healthy label (or, in general, foods perceived as healthy) are more expensive. For example, in Romania (a country that will adopt DWGP) products high in whole grain are more expensive than refined grain products. However, this is not the case in Denmark.

Evidence-base

- In 2000-04 and 2011-12, whole grain consumption was measured using data from the Danish diet and physical activity survey, while data for 2015-19 was obtained from the Diet, Cancer and Health (DCH) – Next Generation (NG) cohort study
- It is likely that people with a high socio-economic status are over-represented in DCH-NG limiting the generalisability of results. Further, the data is cross-sectional meaning there is no data on whole grain consumption for the same participants before DWGP was established
- The evidence-base supporting the association between whole grain consumption and certain diseases, risk factors and overall mortality is well-established

Extent of coverage

- Extent of coverage has grown significantly since DWGP's inception – for example, the number of products with the logo increased from 157 to 987 (2009-20), which may in part explain a rise in the number of consumers who are aware of the logo (from 20% to 64% over a similar period)

Effectiveness

DWGP is considered one of the most successful interventions for boosting whole grain consumption, which can be classified in one of two ways (see Box 9.3).

Box 9.3. Defining whole grain consumption

Whole grains can be quantified as either grammes per day or grammes of product per day. The generally accepted portion size is 16 g/day or 30g product/day. For example, if a person consumes one slice of whole grain bread (50g) containing 50% whole grains, then the intake will be 25g whole grains or 50g whole grain product.

Energy intake differs across age groups and genders. For this reason, comparing whole grain consumption across population groups in grammes per day is not appropriate. Instead, whole grain consumption is translated into grammes per 10 megajoules (MJ) to reflect similar energy intakes. It is recommended people consume at least 75g/10 MJ of whole grains per day.

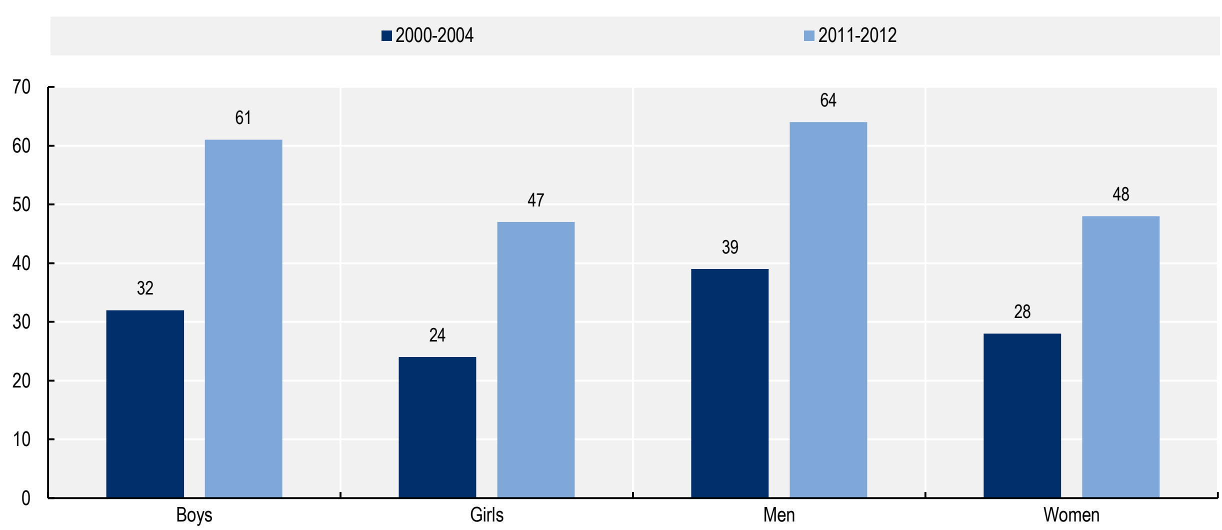
Source: Kryø and Tjønneland (2016[10]), "Whole grains and public health", https://doi.org/10.1136/bmj.i3046; Ross et al. (2015[11]), "Recommendations for reporting whole-grain intake in observational and intervention studies", https://doi.org/10.3945/ajcn.114.098046.

Since the introduction of DWGP, consumption of whole grain has increased for children and adults. The evolution of whole grain consumption has been studied using data from a nationally representative survey on diet and physical activity in Denmark and a cohort study.

Results from the data show consumption of whole grain increased between the period 2000-04 and 2011-12 for both men and women – specifically, from 39 to 64 grammes/day for men and from 28 to 48 grammes/day for women (Figure 9.2) (Mejborn et al., 2013[12]).

Mejborn et al. (2013[12]), using 2011-12 data, also measured whole grain consumption in grammes per 10 MJ. The study found that the total population on average consumed 60g/10 MJ of whole grains per day and that 27% of the population met the recommended 75g threshold. Since then, whole grain consumption has increased markedly with 54% of the population now meeting the recommended whole grain consumption threshold (Andersen et al., 2020[13]).

Figure 9.2. Change in whole grain consumption (g/day) – 2000-04 and 2011-12



Note: Figures for boys and girls in 2011-12 may be overestimated as it excludes younger children which were included in 2000-04 (as younger children consume less whole grains in total).
Source: Mejborn et al. (2013[12]), "Wholegrain intake of Danes 2011-12".

Results from these studies have led external researchers to conclude that DWGP is one of the "most successful intervention[s] to increase WG [whole grain] consumption" (Suthers, Broom and Beck, 2018[14]). Further, whole grain consumption in Denmark is now one of the highest in the OECD (Table 9.3).

Table 9.3. Mean whole grain intake in g/day for adults in selected OECD countries

Country	Mean whole grain intake (g/day)	Year	Population
Denmark	58	2011-12	Men and women, 15-75 years
Sweden	58	1992-96	Men, 30-60 years
Norway	51	1998	Women, 40-55
Sweden	41	1992-96	Women, 30-60 years
Ireland	29.4	2008-10	Men and women, 18+
United Kingdom	26.2	2008-11	Men and women, 18+
United States	15.5	2011-12	Men and women, 19+
France	4.7	2009-10	Men and women, 18+
Italy	3.8	2005-06	Men and women, 18-64

Source: Landberg and Scheers (2021[15]), "Whole Grains and Health".

Efficiency

Meeting recommended levels of whole grain consumption leads to health care savings and improves labour force productivity

The efficiency of DWGP has not been estimated, however, studies indicate there are high costs associated with insufficient whole grain consumption. A study by the University of Copenhagen (2020[16]) estimated the annual economic impact if Danes met the recommended 75g/10 MJ per day of whole grains. The results found meeting this threshold would lead to:

- 129 million Danish Krone (DKK) (EUR 17.35 million) saved in health care costs
- DKK 1 239 million (EUR 167 million) reduction in lost labour productivity
- DKK 1 185 million (EUR 159 million) reduction in the loss of life quality.

Studies on the cost of failing to meet whole grain consumption are also available, however, they are not specific to Denmark. For example, Lieffers et al. (2018[17]) estimated the cost of failing to meet recommended whole grain consumption in Canada at CAD 3.27 billion (EUR 2.21 billion) per year, which covers both direct and indirect costs of associated chronic conditions such as ischemic heart disease, stroke and diabetes (Lieffers et al., 2018[17]).

Equity

Whole grain intake is lower amongst disadvantaged groups, which may reflect lower levels of access to nutritious products

Whole grain intake is lower among people with lower education levels and worse risk factors. In 2020, Andersen et al. (2020[13]) compared whole grain intake among different population groups in a Danish cohort. Results from the analysis indicate less advantaged groups in society consume lower levels of whole grain, specifically:

- Those with a “long education” (e.g. MSc or higher university degree) were 20% more likely to meet recommended whole grain intake levels compared to those with a “short education” (e.g. primary school, high school or a short course)
- Those who are obese are 39% less likely to meet recommended whole grain intake levels compared to those with a normal weight.

Findings from the literature indicate less advantaged groups have lower levels of access to nutritious foods. The DWGP logo is displayed on products that meet pre-defined dietary requirements. The logo has a simple design and message (“Choose whole grains first”) (Figure 9.1) and is therefore easily interpretable by the wider population. The costs of applying the logo to products high in whole grain are not explicitly passed onto consumers. Nevertheless, international studies into the difference in price between products with and without health logos indicate the former can be more expensive, which exacerbates existing health inequities. For example:

- Research undertaken in Canada found bread products with a front-of-package whole grain label were 74% less likely to be found in the lower price range (i.e. bread below CAD 3.00 per loaf) (Sumanac, Mendelson and Tarasuk, 2013[18]).
- In Romania, a country in the process of adopting the Whole Grain Partnership, research has shown that whole grain products are more expensive the refined grain products. It is important to note that in Denmark, there is no evidence to suggest that products with the whole grain logo are systematically more expensive than substitute products without the logo.

Higher prices of foods with health labels may reflect a higher willingness-to-pay amongst consumers for “healthier” products and/or greater production costs (e.g. breads high in whole grain take longer to bake and have a shorter shelf life) (Sumanac, Mendelson and Tarasuk, 2013[18]; Van Loo et al., 2011[19]). Access to high whole grain products by lower income groups may be further curtailed if food stores sell a lower number of high whole grain products. For example, research has found lower-income neighbourhoods have less access to nutritious foods (Larson, Story and Nelson, 2009[20]). A report analysing availability of products with the Whole Grain logo is not available in Denmark, however, feedback from DWGP indicate such products are sold in a variety of stores across the country, including discount stores and retail chains.

It is important to note that DWGP also aims to increase whole grain content in foods that do not have the logo. Therefore, all groups in society, regardless of their attitude towards healthy eating, stand to benefit from DWGP.

Evidence-base

> *Whole grain consumption at the population level relied on data from cohort studies, which have their limitations. The evidence supporting the health impact of whole grain consumption is well established*

Two different surveys were used to collect data on whole grain consumption. Data to measure the level of whole grain intake within the Danish population has been measured for periods 2000-04, 2011-12 and 2015-19 (see “Effectiveness”). Data for the first two observations (i.e. period 2000-04 and 2011-12) were based on data from the nationally representative Danish diet and physical activity survey. Conversely, measures of whole grain intake in the period 2015-19 were measured by the Danish Cancer Society using data from the Diet, Cancer and Health – Next Generation (DCH-NG) cohort study (Andersen et al., 2020[13]). The focus of the evidence-based assessment is on the latest study from the Danish Cancer Society.

The DCH-NG cohort study includes data from men and women above the age of 18 who are descendants of participants of the preceding DCH cohort. In total 183 764 people were eligible for the study and 38 553 agreed to participate.

Consumption of whole grain was measured using the food-frequency questionnaire. To measure whole grain intake, survey participants completed a 376-item food-frequency questionnaire (FFQ), which is considered a reliable and valid measurement tool. The questionnaire asked participants to state average daily intake of each food and beverage item over the past year ranging from never to eight or more times per day. The intake of whole grain was estimated by multiplying consumption frequency of whole grain foods by a standardised portion size, which has a pre-defined whole grain intake (obtained from the Danish National Food Institute, Technical University of Denmark).

Limitations associated with DCH-NG data to measure whole grain consumption are summarised below:

- Cohort studies, such as DCH, are overrepresented by individuals with a high socio-economic status (SES). Therefore, it is possible that high DCH-NG cohort also includes a disproportionate number of people with a high SES, who have the knowledge and resources to lead healthy lifestyles (Andersen et al., 2020[13]).
- DCH data is cross-sectional therefore there is no information on whole grain consumption for the same population group prior to the establishment of the Partnership.

The evidence-base supporting the relationship between whole grain intake cardiovascular diseases (CVDs), cancer, type 2 diabetes, overweight and overall mortality is well established and summarised in a document developed as part of the WholEUGrain project (see Box 9.4 for further details) (WholEUGrain, 2021[21]).

Box 9.4. Evidence supporting the association between whole grains and diseases, risk factors and mortality

The evidence base associating whole grains with CVDs (coronary heart diseases, stroke, heart failure and overall CVD risk), type 2 diabetes, cancer (e.g. breast and gastrointestinal cancers), mortality and overweight was summarised in a report developed as part of the WholEUGrain project. A selection of findings are outlined below:

- The relative risk of developing coronary heart disease is 21% lower for those who consume high levels of whole grain
- Those who consume a diet high in whole grain have a 21-33% lower risk of developing type 2 diabetes
- To date, the evidence supporting a protective role of whole grains in regard to weight gain, overweight and obesity is limited, but in general, there is a small inverse relationship.

As part of the report, the authors undertook an umbrella review based on systematic reviews and meta-analyses from prospective cohort studies as well as randomised controlled trials.

Source: Chapter 3 of WholEUGrain (2021[21]), "WholEUGrain project: a European Action on Whole Grain Partnerships – Deliverable number 4.1 (evidence base for the health benefits of whole grains including sustainability aspects)", https://www.gzs.si/Portals/288/210427_WholEUGrain_Deliverable%204.1_FINAL%20report.pdf.

Extent of coverage

DWGP's extent of coverage has grown significantly since its inception

Key indicators reflecting the reach of DWGP are summarised below:[3]

- The number of products with the whole grain logo increased from 150 to 987 between 2009-20

- Consumer awareness of the logo increased from around 20% to 64% between 2009 and 2019
- The proportion of people who buy products with the logo increased from 40% to 80% between 2011 and 2019
- The number of DWGP members increased from 18 to 30 between 2009 and 2020.

Policy options to enhance performance

DWGP is a world-renowned intervention for boosting whole grain consumption. A 2018 systematic review into public health interventions aimed at increasing whole grain intake concluded DWGP was the “most successful” (Suthers, Broom and Beck, 2018[14]). Further, Curtain et al. in (2020[22]) noted Denmark was one of few nations to markedly increase whole grain consumption as a result of DWGP.

The success of DWGP is not attributable to a single characteristic, rather a suite of characteristics considered essential for boosting whole grain consumption. For example, there are a range of activities involved in the Partnership including marketing campaigns; there are a comprehensive group of stakeholders involved, which increases the availability of whole grain products; the logo is placed on the front of the package and is colourful and easy to interpret; in addition, DWGP also aims to increase whole grain content in foods without the logo.

To further enhance DWGP’s performance, several policy options have been listed. Policy options may target DWGP administrators or other policy makers (e.g. at the national level) where proposed changes fall outside the scope of day-to-day administrators.

Each of the policy options align with high-level recommendations outlined by the European Commission (Box 9.5).

Box 9.5. European Commission policy recommendations to address whole grain intake

To boost whole grain consumption, the European Commission have outlined three high-level policy recommendations:

- Increase the awareness of consumers regarding the benefits of whole grain and also provide information on how to recognise the appropriate products
- Make the healthy option available by improving the food environment (e.g. increasing availability)
- Implement financial incentives to promote the purchase of healthful foodstuffs by consumers.

Note: The first two recommendations are currently in place as part of DWGP.
Source: European Commission (2020[23]), “Whole grain”, https://ec.europa.eu/jrc/en/health-knowledge-gateway/promotion-prevention/nutrition/whole-grain#.

Enhancing effectiveness

Improve health literacy levels. Research has shown that low rates of health literacy reduce understanding of nutrition-related information (Campos, Doxey and Hammond, 2011[24]). A nation-wide study of health literacy in Denmark revealed approximately 40% of the population have either inadequate or problematic health literacy. When adjusting for confounders, those in the following groups have higher odds of inadequate health literacy: men, young people, immigrants, and individuals with a basic education and below average income (Svendsen et al., 2020[25]). To enhance the effectiveness of the DWGP logo, efforts to enhance health literacy (with a focus on nutritional knowledge), particularly among vulnerable groups, are encouraged (OECD, 2019[26]). Example policies to boost health literacy are outlined in Box 9.6.

Box 9.6. Boosting rates of health literacy

In 2018, OECD released the Health Working Paper "Health literacy for people-centred care". The paper outlined high-level policy options to boost population health literacy such as:

- Counselling and training interventions in community settings and elsewhere (e.g. workplaces);
- Encouraging health literacy in schools, for example by incorporating health literacy into the education curricula;
- Media campaigns and website that promote health literacy that are easy to access and navigate.

Source: Moreira (2018[27]), "Health literacy for people-centred care: Where do OECD countries stand?", https://doi.org/10.1787/d8494d3a-en.

Increasing the number of producers signed up to DWGP will also enhance the intervention's effectiveness, as explored under "Enhancing extent of coverage".

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

Implement strategies to increase affordability. The rise of cheap foods low in nutritional value has contributed to higher rates of overweight and obesity in poorer populations (e.g. in Denmark, 14.3% of the population are obese in the lowest income quintile compared to 11.4% in the highest income quintile) (Eurostat, 2014[28]). To improve access to high whole grain foods, policies that reduce the price of products with the whole grain logo could be considered, as has been done in other countries. For example:

- *Singapore:* In Singapore, the Health Promotion Board (a government organisation promoting healthy living) partnered with supermarkets to provide discounts on brown rice and to encourage price competition. Over a period of three years, brown rice sales increased by 15% (Toups, 2020[29]).
- *South Africa*: In 2009, the private health insurance company, Discovery, implemented the Healthy Food Program, which provides members with a 10-25% discount on "healthy food purchases" at supermarkets. An evaluation in 2013 revealed that those enrolled in the Program were between 2-3 times more likely to consume at least three servings of whole grain foods per day compared to those not enrolled (An et al., 2013[30]). By offering this discount to holders of private health insurance only, this policy risks increasing inequalities. It is nonetheless used here as an example to demonstrate the positive impact of making healthy foods more affordable.

It is important to note, however, that the market economy, not policy instruments, are the main driver of prices.

Review how access to high whole grain products differs across population groups. A review into the price difference between products with and without the Whole Grain Partnership logo would provide important information on whether lower socio-economic groups face barriers to purchasing high whole grain foods. Similarly, a review into where Whole Grain Partnership products are sold is important for understanding if certain geographical regions have limited access to these products (e.g. by urban/regional/remote areas and by type of store such as a supermarkets and health food stores). Findings from the study will guide follow-up action to improve equal access to high whole grain products.

Enhancing the evidence-base

Explore the possibility of natural experiments and/or experimental studies. The increase in whole grain intake cannot be directly attributed to the Whole Grain Partnership as studies do not control for whether a person was exposed to the logo or not. To address this limitation, researchers could explore the possibility of undertaking natural experiments – i.e. an empirical study where participants are "naturally" exposed to the logo or not. This may not be possible in Denmark given the Whole Grain Partnership logo is widely known, however, it may be possible in countries transferring the intervention as part of WholEUGrain initiative (described further under "Transferability assessment") – namely Romania, Slovenia, and Bosnia and Herzegovina. Alternatively, or in addition, researchers could run experimental studies in a controlled environment, as has been done to evaluate the impact of the food labelling scheme, Nutri-Score (see Box 9.7 for an example study). However, caution must be taken when interpreting results from these studies given they can markedly overestimate the impact of food labelling schemes (Dubois et al., 2020[31]).

Box 9.7. Assessing the impact of Nutri-Score

Nutri-Score is a "traffic light" food labelling scheme available on food products across numerous European countries, such as France. To evaluate the impact of Nutri-Score on nutrient intake, Egnell et al. (2019[32]) undertook a 3-armed control trial involving nearly 3 000 participants who were randomly exposed to one of the following food labelling schemes: 1) Nutri-Score, 2) reference intakes (% of recommended intake by each nutrient category) or 3) no label.

The researchers created a web-based supermarket that included 750 food items representative of products commonly sold in France (each item included a name, price and picture). Participants in each group were then asked to "purchase" items as if they were in their local supermarket (Egnell et al., 2019[32]).

To evaluate the impact of Nutri-Score, researchers compared the overall nutritional quality within virtual shopping carts across the different groups. Results from the analysis found the nutritional quality of food purchased was higher for those in the Nutri-Score group compared to the reference intake and no labels group (Egnell et al., 2019[32]).

The impact of Nutri-Score has also been evaluating using a real-life grocery shopping setting (Allais et al., 2017[33]), which, similar to Egnell et al. (2019[32]), found Nutri-Score improved the nutritional quality of food purchased and reduced calories.

Collect food consumption data using population surveys. Food purchases from retail stores are a reliable data source however they are not directly linked to consumption. Further, this type of data cannot be used to analyse the impact of nutrition labelling schemes across population groups (for instance, by age, gender and education), except for data linked to loyalty card registration. Future studies using survey-based data on consumption would enhance the evidence-base supporting DWGP.

Enhancing extent of coverage

Increase access to small producers. Small producers of whole grain products may face barriers to becoming a Whole Grain member given the cost of reformulating products to meet specific guidelines as well as annual membership costs (see Box 9.8). To increase the number of members and therefore products with the whole grain logo, policy makers could offer membership subsidies and/or tax benefits that incentivise manufactures to reformulate their products.

Box 9.8. Costs to manufacturers

Access to the Whole Grain Partnership may be limited for small producers given the costs of reformulating products as well as annual membership costs, as described below.

Reformulation costs

Health food labelling initiatives encourage manufacturers to reformulate products to meet nutritional guidelines (i.e. by gaining a competitive advantage in the market). Manufacturers incur a cost to reformulate products, for example to: invest in research and development, develop new production process as well as market the new product to consumers. A study by the UK Foods Standard Agency estimated the cost of reformulation between GBP 5 000 (EUR 5 928) to GBP 45 000 (EUR 53 357) per product (depending on factors such as availability of replacement ingredients and whether production processes need to change) (Food Standards Agency, 2010[34]). Further details on product reformulation and its impact on the food industry can be found in OECD's The Heavy Burden of Obesity report (2019) (OECD, 2019[35]).

Membership costs

To become a Whole Grain Partnership member manufacturers pay a membership fee, which is dependent on their annual turnover. The lowest fee level is DKK 10 000/year (approximately EUR 1 345) for producers with a turnover of less than DKK 5 million (EUR 670 000). Founding members pay a higher fee while large retailers pay a fee of 155 000 DKK/year (EUR 20 843). Further, there is a graduation of fees among retail partners while there are different arrangements in place for bakers and schools. The annual membership fee may act as a barrier for certain producers, in particular for small businesses.

Policy makers can also enhance the extent of coverage through non-financial incentives. For example, in Chile, the Ministry of Agriculture has put in place a platform that brings together public institutions and private industry, working together to promote reformulation toward healthier products (OECD, 2019[36]). In addition, policy makers can put in place actions to encourage consumption of products with the DWGP logo for example by promoting such foods in workplaces, schools and hospitals.

Transferability

This section explores the transferability of DWGP and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring DWGP.

Previous transfers

The success of DWGP led to the European project – "A European Action on Whole Grain Partnerships" (WholEUGrain). The project, which will run from 2019-22, is designed to assist countries transfer and adapt the Whole Grain Partnership to their local setting. Four countries, including Denmark, are involved in WholEUGrain – Romania, Slovenia, and Bosnia and Herzegovina (European Commission, 2019[37]).

As part of WholEUGrain, a "Toolbox" to guide countries through the implementation process was developed (see Box 9.9 for further details). In addition, there is a three-day summer or spring school, which will be hosted every year of the project (typically in person, however, due to COVID-19 pandemic, in 2021 and partly in 2022, were run virtually). The summer and spring schools consists of several webinars providing answers to questions such as “what are the pre-requisites for a well-functioning Partnership”?

Box 9.9. Toolbox guide for implementing the Whole Grain Partnership

To assist countries transfer the Whole Grain Partnership to their local setting, WholEUGrain developed a Toolbox guide with help from the Danish Whole Grain Partnership. The Toolbox outlines a multi-step process for running a public private partnership to boost whole grain intake. The Toolbox is available on the WholEUGrain website: https://www.gzs.si/wholeugrain/vsebina/Publications/Reports/Toolbox.

- Map potential partners in the Whole Grain Partnership and perform a stakeholder analysis
- Set up a taskforce to drive the formal creation of the Whole Grain Partnership
- Develop a financing model
- Define and describe the different roles of each partner
- Describe the code of conduct
- Outline a partnership agreement that partners must sign
- Describe a model for organising work and rules of procedures for different stakeholders
- Establish a secretariat to co-ordinate activities, execution of decisions and managerial support
- Develop a long-term strategy and yearly action plan
- Map external stakeholders that can assist in achieving stated objectives.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

A few indicators to assess the transferability of the Whole Grain Partnership were identified (see Table 9.4). Indicators were drawn from international databases and surveys to maximise coverage across OECD and non-OECD European countries. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

The transferability assessment of DWGP is in particular limited given indicators related to the food retail market and consumer behaviour are collected by private research companies and therefore not available for public use.

Table 9.4. Indicators to assess the transferability of the Danish Whole Grain Partnership

Indicator	Reasoning	Interpretation
Sector specific context (retail food, food service sectors)		
Current nutrition labelling policies for pre-packaged foods	WG Partnership is more transferable to countries that have with existing structure in place to support front-of-pack (FOP) nutrition labels (e.g. regulatory frameworks)	FOP scheme in place = more transferable
Political context		
Operational strategy/action plan/policy to reduce unhealthy eating	The WG Partnership will be more successful in countries which prioritise healthy eating	“Yes” = more transferable

Indicator	Reasoning	Interpretation
Economic context		
Prevention expenditure as a percentage of current health expenditure (CHE)	The WG Partnership is a prevention intervention, therefore, it will be more successful in countries that allocate a higher proportion of health spending to prevention	↑ value = more transferable

Source: OECD (2018[38]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[39]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[35]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Results

Over half (64%) of OECD and non-OECD European countries have a FOB nutrition labelling scheme, however, they do not relate to whole grain consumption, rather they focus on the overall nutrition quality of a product based on salt, sugar and fat intake (see Table 9.5). These results indicate there is support for food labelling schemes to help people make better choices.

The majority of countries have in place a national action plan to reduce levels of unhealthy eating (91%) and spend proportionally more on preventative care than Denmark (2.4% versus 2.5% of current health expenditure) – similarly, these results reflect political support for interventions that encourage people to eat better.

Table 9.5. Transferability assessment by country, the Danish WholeGrain Partnership (OECD and non-OECD European countries)

A darker shade indicates the Danish Whole Grain Partnership is more suitable for transferral in that particular country

	FOP* labelling	Mandatory or voluntary FOP**	Unhealthy eating action plan	Prevention expenditure percentage CHE***
Denmark	**Yes**	**V**	**Yes**	**2.44**
Australia	Yes	V	Yes	1.93
Austria	No	None	Yes	2.11
Belgium	Yes	V	Yes	1.65
Bulgaria	Yes	V	Yes	2.83
Canada	No	None	Yes	5.96
Chile	Yes	M	Yes	n/a
Colombia	No	None	Yes	2.05
Costa Rica	No	None	Yes	0.60
Croatia	Yes	V	Yes	3.16
Cyprus	No	None	No	1.26
Czech Republic	Yes	V	Yes	2.65
Estonia	No	None	Yes	3.30
Finland	Yes	M	Yes	3.98
France	Yes	V	Yes	1.80
Germany	Yes	V	Yes	3.20
Greece	No	None	No	1.27
Hungary	No	None	Yes	3.04
Iceland	Yes	V	Yes	2.68
Ireland	Yes	V	Yes	2.60
Israel	Yes	M	Yes	0.37
Italy	No	None	Yes	4.41
Japan	No	None	Yes	2.86

	FOP* labelling	Mandatory or voluntary FOP**	Unhealthy eating action plan	Prevention expenditure percentage CHE***
Denmark	**Yes**	**V**	**Yes**	**2.44**
Latvia	No	None	Yes	2.58
Lithuania	Yes	V	Yes	2.17
Luxembourg	Yes	V	Yes	2.18
Malta	No	None	Yes	1.30
Mexico	Yes	M	Yes	2.92
Netherlands	Yes	V	Yes	3.26
New Zealand	Yes	V	No	n/a
Norway	Yes	V	Yes	2.45
Poland	Yes	V	Yes	2.28
Portugal	Yes	V	Yes	1.68
Republic of Korea	Yes	V	Yes	3.48
Romania†	No	None	Yes	1.42
Slovak Republic	No	None	Yes	0.77
Slovenia†	Yes	V	Yes	3.13
Spain	Yes	V	Yes	2.13
Sweden	Yes	V	No	3.27
Switzerland	Yes	V	Yes	2.63
Turkey	No	None	Yes	n/a
United Kingdom	Yes	V	Yes	5.08
United States	No	None	Yes	2.91

Note: The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). † = transferring the Whole Grain Partnership as part of WholEUGrain. *FOP = front-of-pack; M = mandatory; V = voluntary. ***CHE = current health expenditure. n/a = no available data.

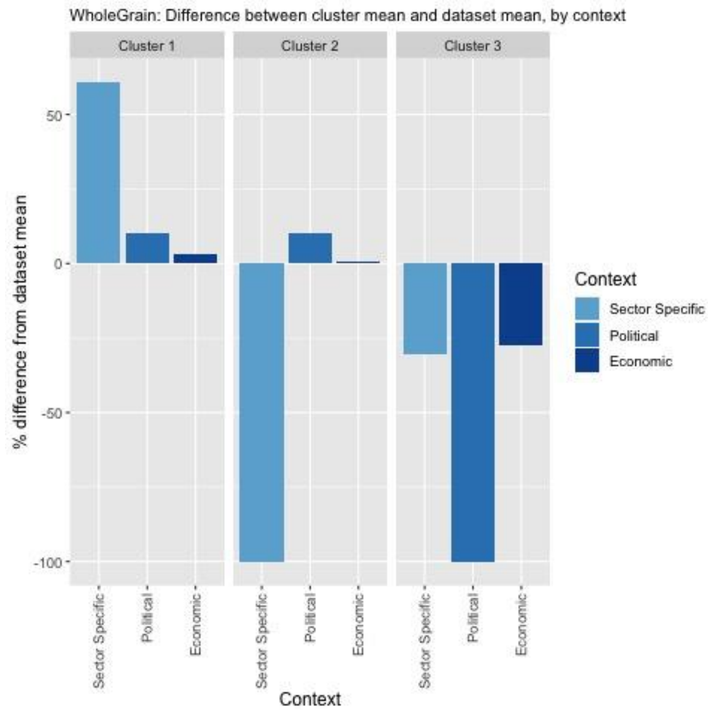
Source: OECD (2018[38]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[39]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[35]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 9.4. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 9.3 and Table 9.6:

- Countries in cluster one, which includes Denmark, have sector specific, political and economic arrangements in place to transfer DWGP. Countries in this cluster are therefore less likely to experience issues in implementing and operating DWGP in their local context.
- Countries in cluster two, prior to transferring DWGP, would benefit from assessing whether the sector is ready to implement such an intervention (e.g. determining whether front-of-pack labelling is allowed).
- Countries in cluster three would similarly benefit from assessing the sector's readiness to implement DWGP, as well as ensuring that the intervention aligns with overarching political priorities and is affordable in the longer term given relatively low levels of spending on prevention.

Figure 9.3. Transferability assessment using clustering, The Danish WholeGrain Partnership



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD (2018[38]), "Preventative care spending as a proportion of current health expenditure", https://data.oecd.org/healthres/health-spending.htm; WHO (2019[39]), "Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)", https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en; OECD (2019[35]), *The Heavy Burden of Obesity: The Economics of Prevention*, https://dx.doi.org/10.1787/67450d67-en.

Table 9.6. Countries by cluster, the Danish WholeGrain Partnership

Cluster 1	Cluster 2	Cluster 3
Australia	Austria	Cyprus
Belgium	Canada	Greece
Bulgaria	Colombia	New Zealand
Chile	Costa Rica	Sweden
Croatia	Estonia	
Czech Republic	Hungary	
Denmark	Italy	
Finland	Japan	
France	Latvia	
Germany	Malta	
Iceland	Romania	
Ireland	Slovak Republic	
Israel	Turkey	
Lithuania	United States	
Luxembourg		
Mexico		
Netherlands		
Norway		
Poland		
Portugal		
Republic of Korea		
Slovenia		
Spain		

Cluster 1	Cluster 2	Cluster 3
Switzerland United Kingdom		

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of public health interventions, in particular for DWGP given indicators on the food retail market and consumer behaviour are collected by private research companies (e.g. Euromonitor International). Hence, Box 9.10 outlines several new indicators policy makers could consider before transferring DWGP.

Box 9.10. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect information for the following indicators:

Population context

- Is there data to measure baseline consumption of whole grain in the country (e.g. national survey data)?
- What are the current dietary habits of the population?
- What factors are important to people when purchasing food?
- What proportion of food consumed is pre-packaged?
- What is the attitude towards whole grains in society?
- Where do people purchase their food (e.g. supermarkets (online vs in-person), locally in fresh-food markets)?
- What proportion of people report using nutrition food labels to guide food-purchasing decisions?

Sector specific context (retail food, food service sectors)

- What nutritional labels already exist on products?
- Does the legal and regulatory framework support nutrition food labels?
- How many local producers of high whole grain products are there in the country?*
- Are there any legal impediments for establishing a formal public/private partnership between government, private entities, NGOs, research bodies and other potential partners?
- Is there a legal definition of what constitutes a high whole grain product?
- What, if any, food based dietary guidelines exist? How are whole grains represented?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?
- Are there existing structures or relationships in place that are conducive to establishing a public-private partnership among key stakeholders?

*DWGP noted that the small size of the country allowed members to meet frequently (Fuldkorn, 2020[3]). This may not be possible in a large country.

Conclusion and next steps

DWGP uses a multi-pronged strategy to boost whole grain consumption in Denmark. Activities to boost consumption include increasing the availability of whole grain products, promoting the development of whole grain products and the whole grain logo, delivering educational campaigns and events and promoted whole grain s as a climate-positive food.

DWGP is associated with an increase in whole grain consumption. The introduction of DWGP is associated with an increase in whole grain consumption. Given there is strong evidence to support the link between high whole grain consumption and lower risk of developing certain cancers (e.g. colorectal cancer), type 2 diabetes and CVDs, DWGP plays an important role in improving population health (WholEUGrain, 2021[21]).

An assessment of DWGP's performance against the best practice criteria highlighted potential areas for improvement. These include, but are not limited to, partnerships between policy makers and retail outlets offering discounts/promotions on DWGP products as well as making it easier for small producers to sign up to the Partnership.

There are a number of factors countries need to consider before transferring DWGP. Indicators measuring the transferability potential of DWGP to OECD and non-OECD European countries is limited given data on the food retail market and consumer behaviour are not for public use. Instead, this case study outlines a range of indicators policy makers should consider before transferring the Partnership such as existing dietary habits and attitudes towards whole grains in society.

Box 9.11 outlines next steps for policy makers and funding agencies regarding DWGP.

Box 9.11. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance DWGP are listed below:

- Support policy efforts to enhance population health literacy to encourage people to make healthy choices (such as purchasing products with a the Whole Grain logo)
- Support and encourage food companies to adopt the Whole Grain logo and add whole grain to relevant products
- Support efforts to increase the affordability of high whole grain products
- Promote findings from the DWGP case study to understand what countries are interested in transferring the intervention.

References

Allais, O. et al. (2017), *Évaluation Expérimentation Logos Nutritionnels, Rapport pour le FFAS*, https://solidarites-sante.gouv.fr/IMG/pdf/rapport_final_groupe_traitement_evaluation_logos.pdf. [33]

Andersen, J. et al. (2020), "Intake of whole grain and associations with lifestyle and demographics: a cross-sectional study based on the Danish Diet, Cancer and Health—Next Generations cohort", *European Journal of Nutrition*, Vol. 60/2, pp. 883-895, https://doi.org/10.1007/s00394-020-02289-y. [13]

An, R. et al. (2013), "Eating Better for Less: A National Discount Program for Healthy Food Purchases in South Africa", *American Journal of Health Behavior*, Vol. 37/1, pp. 56-61, https://doi.org/10.5993/ajhb.37.1.6. [30]

Brownell, K. and J. Koplan (2011), "Front-of-Package Nutrition Labeling — An Abuse of Trust by the Food Industry?", *New England Journal of Medicine*, Vol. 364/25, pp. 2373-2375, https://doi.org/10.1056/nejmp1101033. [8]

Campos, S., J. Doxey and D. Hammond (2011), "Nutrition labels on pre-packaged foods: a systematic review", *Public Health Nutrition*, Vol. 14/8, pp. 1496-1506, https://doi.org/10.1017/s1368980010003290. [24]

Cecchini, M. and L. Warin (2015), "Impact of food labelling systems on food choices and eating behaviours: a systematic review and meta-analysis of randomized studies", *Obesity Reviews*, Vol. 17/3, pp. 201-210, https://doi.org/10.1111/obr.12364. [7]

Curtain, F., A. Locke and S. Grafenauer (2020), "Growing the Business of Whole Grain in the Australian Market: A 6-Year Impact Assessment", *Nutrients*, Vol. 12/2, p. 313, https://doi.org/10.3390/nu12020313. [22]

DTU Fødevareinstituttet (2008), *Wholegrain: definition and scientific background for recommendations of wholegrain intake in Denmark*. [4]

Dubois, P. et al. (2020), "Effects of front-of-pack labels on the nutritional quality of supermarket food purchases: evidence from a large-scale randomized controlled trial", *Journal of the Academy of Marketing Science*, Vol. 49/1, pp. 119-138, https://doi.org/10.1007/s11747-020-00723-5. [31]

Egnell, M. et al. (2019), "Front-of-Pack Labeling and the Nutritional Quality of Students' Food Purchases: A 3-Arm Randomized Controlled Trial", *American Journal of Public Health*, Vol. 109/8, pp. 1122-1129, https://doi.org/10.2105/ajph.2019.305115. [32]

European Commission (2020), *Whole Grain*, https://ec.europa.eu/jrc/en/health-knowledge-gateway/promotion-prevention/nutrition/whole-grain# (accessed on 14 December 2020). [23]

European Commission (2019), *WholEUGrain – A European action on Whole Grain partnerships [WholEUGrain] [874482] - project*, https://webgate.ec.europa.eu/chafea_pdb/health/projects/874482/summary (accessed on 14 December 2020). [37]

Eurostat (2014), *Body mass index (BMI) by sex, age and income quintile*. [28]

Food Standards Agency (2010), *Impact assessment of recommendations on saturated fat and added sugar reductions, and portion size availability, for biscuits, cakes, buns, chocolate confectionery and soft drinks*, https://webarchive.nationalarchives.gov.uk/20130106062613/http://www.food.gov.uk/multimedia/pdfs/satfatimpactassessment.pdf. [34]

Fuldkorn (2020), *The story of the partnership and whole grains*, https://fuldkorn.dk/om-partnerskabet/historien-om-partnerskabet-og-fuldkorn/ (accessed on 8 October 2020). [3]

Fuldkorn (2020), *The Whole Grain Logo Manual: Guidelines for Use of the Danish Whole Grain Logo*, https://fuldkorn.dk/wp-content/uploads/2020/05/Fuldkornslogomanualen_revideret-udgave_gældende-fra-5.-maj-2020-31.-december-2022_English.pdf. [6]

Health Norway (2019), *The Keyhole – for healthier food*, https://www.helsenorge.no/en/kosthold-og-ernaring/keyhole-healthy-food/. [9]

Jensen, J. (2020), *Vurdering af sundhedsøkonomiske gevinster ved øget overholdelse af kostrådene*, University of Copenhagen, https://static-curis.ku.dk/portal/files/240258550/IFRO_Udredning_2020_07.pdf. [16]

Kyrø, C. and A. Tjønneland (2016), "Whole grains and public health", *BMJ*, p. i3046, https://doi.org/10.1136/bmj.i3046. [10]

Larson, N., M. Story and M. Nelson (2009), "Neighborhood Environments", *American Journal of Preventive Medicine*, Vol. 36/1, pp. 74-81.e10, https://doi.org/10.1016/j.amepre.2008.09.025. [20]

Lourenço, S. et al. (2019), "The Whole Grain Partnership—How a Public–Private Partnership Helped Increase Whole Grain Intake in Denmark", *Cereal Foods World*, https://doi.org/10.1094/cfw-64-3-0027. [2]

Mejborn, H. et al. (2013), *Wholegrain intake of Danes 2011-12*, Division of Nutrition, National Food Institute, Technical University of Denmark. [12]

Meyre, D. (ed.) (2018), "The economic burden of not meeting food recommendations in Canada: The cost of doing nothing", *PLOS ONE*, Vol. 13/4, p. e0196333, https://doi.org/10.1371/journal.pone.0196333. [17]

Moreira, L. (2018), "Health literacy for people-centred care: Where do OECD countries stand?", *OECD Health Working Papers*, No. 107, OECD Publishing, Paris, https://doi.org/10.1787/d8494d3a-en. [27]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [26]

OECD (2019), *OECD Reviews of Public Health: Chile: A Healthier Tomorrow*, OECD Reviews of Public Health, OECD Publishing, Paris, https://doi.org/10.1787/9789264309593-en. [36]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [35]

OECD (2018), *Preventative care spending as a proportion of current health expenditure*, OECD, Paris. [38]

Rikard Landberg and N. Scheers (2021), *Whole Grains and Health*, Wiley-Blackwell. [15]

Ross, A. et al. (2015), "Recommendations for reporting whole-grain intake in observational and intervention studies", *The American Journal of Clinical Nutrition*, Vol. 101/5, pp. 903-907, https://doi.org/10.3945/ajcn.114.098046. [11]

Stanaway, J. et al. (2018), "Global, regional, and national comparative risk assessment of 84 behavioural, environmental and occupational, and metabolic risks or clusters of risks for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017", *The Lancet*, Vol. 392/10159, pp. 1923-1994, https://doi.org/10.1016/s0140-6736(18)32225-6. [1]

Sumanac, D., R. Mendelson and V. Tarasuk (2013), "Marketing whole grain breads in Canada via food labels", *Appetite*, Vol. 62, pp. 1-6, https://doi.org/10.1016/j.appet.2012.11.010. [18]

Suthers, R., M. Broom and E. Beck (2018), "Key Characteristics of Public Health Interventions Aimed at Increasing Whole Grain Intake: A Systematic Review", *Journal of Nutrition Education and Behavior*, Vol. 50/8, pp. 813-823, https://doi.org/10.1016/j.jneb.2018.05.013. [14]

Svendsen, M. et al. (2020), "Associations of health literacy with socioeconomic position, health risk behavior, and health status: a large national population-based survey among Danish adults", *BMC Public Health*, Vol. 20/1, https://doi.org/10.1186/s12889-020-08498-8. [25]

Toups, K. (2020), "Global approaches to promoting whole grain consumption", *Nutrition Reviews*, Vol. 78/Supplement_1, pp. 54-60, https://doi.org/10.1093/nutrit/nuz067. [29]

Van Loo, E. et al. (2011), "Consumers' willingness to pay for organic chicken breast: Evidence from choice experiment", *Food Quality and Preference*, Vol. 22/7, pp. 603-613, https://doi.org/10.1016/j.foodqual.2011.02.003. [19]

WHO (2019), *Existence of operational policy/strategy/action plan to reduce unhealthy diet related to NCDs (Noncommunicable diseases)*, https://apps.who.int/gho/data/node.imr.NCD_CCS_DietPlan?lang=en. [39]

WholEUGrain (2021), *Toolbox: A guide to implement a successful national whole grain partnership*, https://www.gzs.si/Portals/288/Toolbox_opdateret%2009082021.pdf. [5]

WholEUGrain (2021), *WholEUGrain project: a European Action on Whole Grain Partnerships - Deliverable number 4.1 (evidence base for the health benefits of whole grains including sustainability aspects)*, https://www.gzs.si/Portals/288/210427_WholEUGrain_Deliverable 4.1_FINAL report.pdf. [21]

Notes

[1] The Danish Food Institute define a whole grain as "the intact and processed (dehulled, ground, cracked, flaked or the like) grain, where the fractions endosperm, bran, and germ are present in the same proportions as in the intact grain" (DTU Fødevareinstituttet, 2008[4]).

[2] Annual turnover < DKK 5 million (EUR 0.67 million) = fee is DKK 10 000 (EUR 1 344) per year; annual turnover < DKK 15 million (EUR 2 million) = fee is DKK 25 000 (EUR 3 361) per year; and if annual turnover is > DKK 15 million (EUR 2 million) = annual fee is DKK 50 000 (EUR 6 721) per year.

[3] Data provided by the Whole Grain Partnership, Denmark.

10 StopDia pilot

This chapter covers the case study of the StopDia Pilot, a lifestyle intervention aiming to prevent type 2 diabetes mellitus among Finland's Somali population. The case study includes an assessment of the StopDia Pilot against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

StopDia (Somali population) Pilot: Case study overview

Description: StopDia is a lifestyle intervention aiming to prevent type 2 diabetes mellitus (T2DM) by improving diet, encouraging physical activity (PA) and reducing overweight in people at high risk of T2DM. The StopDia pilot was a culturally adapted version of StopDia for adult Somali individuals in the region of Helsinki in Finland, which was delivered in co-operation with a local mosque to a group of 24 people at high risk based on the Finnish Diabetes Risk Score (FINDRISC) test.

Best practice assessment:

Table 10.1. OECD best practice assessment of StopDia for the Somali population

Criteria	Assessment
Effectiveness	Evidence from the StopDia pilot indicates it improves diet, however, results for other outcome indicators were not statistically significant More broadly, lifestyle interventions have found to be effective in reducing T2DM risk factors, in particular body weight, and the incidence of T2DM.
Efficiency	Efficiency studies into the StopDia Pilot are not available. Cost-effectiveness models of lifestyle interventions generally conclude that they are cost-effective. However, some of the assumptions, in particular on how long effects of interventions are sustained, may not be achieved in reality
Equity	The StopDia pilot improves equity of access through increasing access to prevention for a high-risk and underserved population group. It can also reduce inequality in health outcomes if it is effective
Evidence-base	Strong data collection methods were used to evaluate the impact of the StopDia Pilot, however, missing information on withdrawals/dropouts and controlling for confounders limit the overall quality of the study
Extent of coverage	The proportion of eligible people who participated in the StopDia Pilot was 73%. The intervention has the potential to be scaled-up to a larger population given only a small fraction of the Somali population had the opportunity to participate.

Enhancement options: many factors associated with effectiveness of T2DM lifestyle interventions are already reflected in the StopDia Pilot. To *enhance effectiveness* further, the duration of the intervention could be increased. Depending on the cost implications, this may or may not increase *efficiency*. Participant retention and adherence are important for effectiveness; this could possibly be improved by engaging families of participants. To *enhance the evidence-base*, future evaluations of small-scale implementations, such as the StopDia Pilot, could be improved by increasing the sample sizes of studies; increasing the follow-up time; and by evaluating effectiveness in terms of a more complete set of relevant outcome indicators. Finally, to *enhance extent of coverage,* the StopDia Pilot could be extended to the entire Somali community in in Finland, and to high-risk population groups of other ethnic backgrounds.

Transferability: a high-level comparison of Finland with other OECD countries and non-OECD EU Member States suggests that StopDia can be transferred. For example, it is likely that StopDia would receive political support given it addresses key public health priorities – i.e. T2DM prevention and unhealthy diets. However, more detailed information needs to be analysed to determine transferability for each target country.

Conclusion: initial evidence from the StopDia Pilot found the intervention led to an improvement in outcomes, however, only changes in diet were statistically significant. While effectiveness and cost-effectiveness remains to be convincingly demonstrated, it may constitute an attractive blueprint for interventions to prevent T2DM in ethnic minorities or migrant population groups in various OECD countries and non-OECD EU Member States.

Intervention description

StopDia is a lifestyle intervention aiming to prevent type 2 diabetes mellitus (T2DM) by improving diet, encouraging physical activity (PA) and reducing overweight. Unhealthy diets, sedentary lifestyles and overweight and obesity are major risk factors for T2DM (Uusitupa et al., 2019[1]; Carbone et al., 2019[2]). StopDia was initially designed to reach people at increased risk of T2DM in the general Finnish population. The intervention for the general population is currently being evaluated in a randomised controlled trial (RCT) involving approximately 3 000 participants from the provinces of Northern Savo, Southern Carelia, and Päijät-Häme, which have a combined population of about 580 000 people (Pihlajamäki et al., 2019[3]).

StopDia has also been adapted for a Somali ethnic minority living in Finland and piloted as a small-scale intervention in this group (hereafter referred to as the “StopDia Pilot”). Among other disadvantaged population groups, immigrants living in Finland have been identified as being at increased risk of T2DM (see Hussein et al. (2020[4]) and Weiste Paakkanen et al. (2013[5])). In addition to different risk profiles across population groups, the effectiveness of lifestyle interventions may depend on cultural factors, requiring adaptations for ethnic minorities.

The StopDia Pilot was aimed at Somali adults living in the region of Helsinki in Finland, and delivered in co-operation with a local mosque. A group of 24 people participated in the Pilot. The intervention consisted of (Hussein et al., 2020[4]):

- Screening for individuals at increased risk, to include people with a risk score of 12 points or more in the Finnish Diabetes Risk Score (FINDRISC) test[1] and people with previous gestational diabetes. A researcher as well as volunteers with Somali backgrounds recruited participants at the mosque and were available to assist people take the FINDRISC test.
- Group lifestyle counselling through six group meetings spread across 12 weeks. Meetings were led by the Somali researcher who moderated discussions in the group and provided coaching among pairs of participants. Meetings lasted for approximately 1.5 hours each, following a similar structure but revolving around a different theme every time (e.g. “eating well”, “joy of movement”, “active everyday”, etc.). Participants were provided with a workbook, which included a diary of physical activities and fruit and vegetable consumption, to be kept throughout the duration of the intervention and discussed at the group meetings.
- Digital support for lifestyle change, using the BitHabit healthy lifestyle mobile application for the 12 weeks. The BitHabit application allows for browsing of behavioural suggestions and selecting those that the users want to perform; daily self-monitoring of selected behaviours; and getting summary feedback for habits. It also provides anonymous information on selections of other users and a self-learning section that provides information on the prevention of T2DM.

OECD Best Practices Framework assessment

This section analyses StopDia against the five criteria within OECD’s Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage. Further details on the OECD Framework can be found in Annex A.

Given limited evidence on the StopDia Pilot for certain criteria, the OECD Framework was applied to the StopDia Pilot and more broadly to similar lifestyle interventions that T2DM (see Box 10.1). Results from the assessment should therefore only be taken as an indication of how the StopDia Pilot could perform if implemented widely.

Box 10.1. Assessment of the StopDia pilot and other lifestyle interventions to prevent type 2 diabetes (T2DM)

Effectiveness

- There is limited evidence on the effectiveness of StopDia Pilot so far. Findings from the before-and-after evaluation of the StopDia Pilot suggest that the intervention may have reduced T2DM risk factors, in particular, diet.
- Systematic reviews and meta-analyses show that lifestyle interventions generally reduce incidence T2DM in people at increased risk. However, this evidence is not necessarily applicable to the StopDia Pilot.

Efficiency

- No evidence of the cost-effectiveness of the StopDia Pilot is available.
- Most simulation models conclude that lifestyle interventions to prevent T2DM are cost-effective. However, estimates of cost per QALY gained range widely, from cost-saving to more than USD 140 000 in the United States. Estimates are sensitive to assumptions on the effectiveness of interventions, participant adherence and therefore the persistence of the intervention effect over time, and to costs.
- The context-dependency of cost-effectiveness and the wide range of QALY estimates from prior models leave it uncertain whether existing evidence can be generalised and applied to the StopDia pilot.

Equity

- The intervention specifically targeted and successfully reached an ethnic minority in Finland, whose members are at increased risk of T2DM. It increases access in a high-risk and underserved population group, and has a positive effect on equity in terms of access and, possibly, health outcomes.

Evidence-base

- Strong data collection methods were used to evaluate the impact of the StopDia Pilot, however, missing information, for example, on withdrawals/dropouts and controlling for confounders limit the overall quality of the study.

Extent of coverage

- Of the 33 people who were identified as eligible for the StopDia Pilot, 24 (73%) agreed to participate in the intervention. Overall, this represents a small fraction of the more than 20 000 people with a Somali background in Finland, indicating the intervention has the potential to be scaled-up to reach a significantly larger population.

Effectiveness

Initial evidence indicates the StopDia pilot is effective, however, it is limited in scope

Initial evidence from a before-and-after evaluation of the StopDia Pilot indicate the intervention achieved small improvements in lifestyle-related T2DM risk factors, including increased vegetable consumption, increased physical activity (PA) and weight loss (Hussein et al., 2020[4]).

The pilot was evaluated in terms of overall diet quality (based on using a healthy diet score); intake of fruit, berries, and vegetables; the average number of steps per day; and waist circumference. However, only the difference in vegetable consumption (80% of participants reported eating vegetables at least once a day after the intervention compared to 50%) was statistically significant. The reduction in waist circumference, increase in step count and increase in diet quality were not statistically significant. Consistent with the increased step count, participants reported higher planned and incidental exercise after the intervention, and felt more competent in increasing physical activity (ibid.).

Lifestyle interventions that aim to improve diet and physical activity have so far been found to reduce incidence type 2 diabetes mellitus (T2DM) in people at increased risk

The effectiveness of lifestyle interventions to prevent T2DM has been widely studied. Systematic reviews of the evidence have generally concluded that lifestyle interventions that combine improvements to diet with increases in PA are effective in terms of preventing or delaying the onset of T2DM. It is less clear whether such interventions are also effective in terms of mortality and morbidity, in particular T2DM-related complications. The following recent systematic reviews synthesised evidence of effectiveness:

- The Cochrane review by Hemmingsen et al. (2017[6]) concluded that there was evidence of moderate quality[2] that interventions that improved diet and increased PA reduced the incidence of T2DM in people at increased risk. However, there is no firm evidence that such interventions reduce the complications associated with T2DM or mortality, nor that changes to diet alone or increased PA alone have an effect on any of these outcomes. The review synthesised results from 12 RCTs of interventions that aimed to improve diet alone, increase PA alone, and interventions that combined changes to diet and PA against standard prevention or no intervention. Primary outcomes were all-cause mortality, incidence of T2DM, and serious adverse events. The review also included a number of secondary outcome measures, including health-related quality of life and measures of blood glucose control. The trials included a total of 5 238 adults between the ages of 45 and 63 years of various ethnic backgrounds, who did not receive glucose-lowering medicines. Trial follow-up time was from two to six years.
- Systematic reviews and meta-analyses by Haw et al. (2017[7]) and by Uusitupa et al. (2019[1]), which pooled data from 17 and seven RCTs respectively, many of which were also included in the review by Hemmingsen et al. (2017[6]), also found that the combination of improved diet and increased PA reduced the incidence of T2DM in people at increased risk.

Reviews by Haw et al. (2017[7]) and by Uusitupa et al. (2019[1]) also concluded that lifestyle interventions remained effective after they were no longer provided. However, Haw et al. (2017[7]) found that, while interventions had long-term effects, the magnitude of the effects declined over time. Based on four RCTs of lifestyle interventions that followed participants after the end of the active intervention, three of which combined diet and PA, interventions were estimated to lead to a 45% reduction in the risk of developing T2DM at the end of the active intervention period compared to a 28% reduction at the end of the follow-up period. Interventions in these trials lasted from one to six years and follow-up after end of the active intervention for another five to nine years.

In a network meta-analysis that compared various T2DM prevention interventions against each other, Yamaoka, Nemoto and Tango (2019[8]) found that lifestyle interventions were at least as effective as preventive medication in reducing the incidence of T2DM. Although individual comparisons of the various interventions against control groups suggest that lifestyle interventions may be more effective than medication, differences between lifestyle interventions and medication were not statistically significant. Nevertheless, lifestyle changes may have the advantage that their effects persist after the end of the active intervention while such longer-term effects are not present in medication-based prevention; i.e. medication is only an effective preventive strategy for as long it is administered (Haw et al., 2017[7]).

It is unclear whether evidence from RCTs can be generalised

It is not clear the extent to which conclusions of these reviews can be generalised to all types of interventions that improve diet and increase PA and whether such evidence allows for inferring that the StopDia pilot is likely to be effective. There is some heterogeneity across the studies included in the reviews above, both in terms of the populations targeted and the interventions provided. None of the studies evaluated an intervention identical to StopDia in a population of Somali ethnic background. Study participants comprised people from diverse ethnic backgrounds, mainly Caucasians from Australia, Europe and North America but also African Americans and people from China, India and Pakistan. Studies also used various criteria to identify people at high risk, such as criteria related to impaired glucose tolerance (IGT), impaired fasting glucose (IFG) or dysmetabolism. Interventions varied in terms of the types of diet and PA support provided to participants, the intensity of desired PA, the duration of the interventions and the frequency of contacts with participants. The PA component of interventions was sometimes targeted according to the body mass index (BMI) of participants. In the studies included in the review by Hemmingsen et al. (2017[6]), the number of contacts with participants in the interventions ranged from 3 to 46. Importantly, interventions in the studies included in the reviews by Haw et al. (2017[7]), Hemmingsen et al. (2017[6]) and Uusitupa et al. (2019[1]) lasted from one to six years, which is significantly longer than in the StopDia pilot (12 weeks).

Digitally-delivered diet and physical activity interventions can also be effective

A recent systematic review by Van Rhoon et al. (2020[9]) found some evidence that digitally-delivered diet and PA interventions for adults at high risk of T2DM were effective in terms of achieving short-term (≤6 months) weight loss but remained inconclusive in terms of weight loss in the longer term (≥12 months). Some studies included in the review found reductions in HbA_{1c}[3] and fasting glucose levels. However, only one study reported a reduction in incidence of T2DM. The review included 19 studies of 21 interventions, most of which (14/19) were conducted in the United States and the remainder in Australia, Germany, India and Hong Kong. Nine interventions were “stand-alone”, while the others also as included support by a human health coach, delivered either face-to-face or through digital communication technology.

These conclusions by Van Rhoon et al. (2020[9]) are consistent with a prior review by Bian et al. (2017[10]), who also found that digital lifestyle interventions achieved weight loss and improvements in blood glucose levels. It remains less clear, on the other hand, which characteristics make digital interventions effective and whether they are effective on their own or only in combination with face-to-face interactions with participants. Based on the review by Van Rhoon et al. (2020[9]), digitally-delivered behaviour change techniques that were associated with effectiveness were encouragement to get social support, goal setting for behaviours and outcomes, feedback on behaviour, self-monitoring of behaviour and outcomes, and problem solving. Self-monitoring and problem solving were also found to be effective behaviour change techniques in a meta-regression analysis by Kebede (2018[11]), who investigated the effectiveness of digitally-delivered interventions in terms of blood glucose levels in patients with poorly controlled T2DM. Van Rhoon et al. (2020[9]) also found that providing health and lifestyle information and advice, diet tracking, and activity tracking were digital features associated with effective interventions.

Efficiency

The efficiency of the StopDia Pilot has not been assessed. However, data on cost of the intervention were collected. These indicate that the intervention had a direct cost of EUR 650 (USD PPP 950) per participant, of which 96% were for human resources.[4] Human resource costs were mainly related to upfront investments in adapting the StopDia intervention for the Somali community, including translation and cultural adaptation of materials for participants and the BitHabit application, and recruiting and training of staff for delivery of the intervention (representing 77% of the total direct costs). Direct costs of delivering the intervention, including risk screening, group counselling, and briefing participants on the use of the

BitHabit application, represented a smaller share (approximately EUR 120 (USD PPP 175) per participant, equivalent to 18% of the total).

In general, lifestyle interventions generally increase costs in the short-term. They can be expensive as a result of their labour-intensive nature, including, for example, advice and counselling by dieticians, case managers and exercise physiologists, and periodic medical reviews and advice by nurses and physicians. For example, the RCTs included in the systematic review by Hemmingsen at al. (2017[6]), reported mean direct costs per participant in intervention groups ranging from USD 225 to USD 3 625. These costs can be offset, in the medium- to long-term by reductions in medical costs of managing T2DM, in particular from managing T2DM with regular use of medication and from treating the complications that result from T2DM. These cost-offsetting effects are achieved through avoiding or delaying disease onset and disease progression to more severe stages. From a societal perspective, costs can be offset by the benefits of reduced morbidity, such as reduced absenteeism from work and increased productivity.

Three recent systematic reviews of the literature on cost-effectiveness of lifestyle interventions to prevent T2DM in people at increased risk concluded with some confidence that these were cost-effective. Zhou et al. (2020[12]) found a median incremental cost-effectiveness ratio (ICER) of USD 12 510 per quality-adjusted life year (QALY) gained and Roberts et al. (2017[13]) a median of USD 10 980.[5]

However, these results need to be interpreted with some caution. Limitations of the evidence cast doubts on the validity of a general conclusion that lifestyle interventions are cost-effective and, therefore, also whether it can be assumed that the StopDia Pilot is likely to be cost-effective. First, nearly all cost-effectiveness estimates included in systematic reviews above[6] were made using models that generally assume that interventions are as effective as observed in clinical trials. They may all be similarly optimistic in their assumptions on the effects of interventions. Second, the range of base-case ICERs estimated by the studies included in these reviews is nevertheless wide, varying from being cost-saving (i.e. ICERs < 0) to USD 143 000 per QALY gained.[7] This suggests that cost-effectiveness is context dependent and subject to uncertainty. The scope of lifestyle interventions for high-risk people in systematic reviews includes interventions that differ in terms of their more detailed characteristics and are delivered to different target groups in different settings. These differences affect both, their effectiveness and their costs. Not surprisingly, all reviews find that models are sensitive to assumptions on the effectiveness of interventions, participant adherence and therefore the persistence of the intervention effect over time, and to costs. Also, models generally assume that a favourable effect on T2DM risk factors persists with a diminishing size over time before people return to their baseline trajectories in risk factors and extrapolate effects on outcomes over long time horizons. Because benefits accrue over a long time, models with longer time horizons report more favourable ICERs (NICE Guideline Updates Team, 2017[14]; Roberts et al., 2017[13]). However, it is highly uncertain whether benefits truly last over time horizons of several decades.

Despite the above studies, evidence on cost-effectiveness of digitally-delivered lifestyle interventions is considered lacking (see, for example, the review by Van Rhoon (2020[9])). Nevertheless, if digital interventions have comparable effectiveness as face-to-face counselling and if they can be delivered at lower cost through automation and lower human resource needs, it can be assumed they are cost-effective.

Equity

The StopDia Pilot achieved its objective of making the StopDia intervention accessible to the Somali minority in Finland and proved to be well-received (Hussein et al., 2020[4]). The intervention targeted an ethnic minority in Finland, whose members are at increased risk of T2DM and who, for reasons related to culture and language, have lower levels of access to prevention programs compared to the general population (Hussein et al., 2020[4]). The StopDia pilot is therefore a promising concept to increase access in high-risk and underserved population groups, and has a positive effect on equity in terms of access. However, its ultimate effects on equity will depend on whether the intervention can be scaled and achieve broader coverage of high-risk people in the Somali, and other ethnic, minorities (see section on Extent of coverage). While it also has the potential to reduce health inequalities in Finland, further research is needed to better understand the intervention's impact on health outcomes.

Evidence-base

Strong data collection methods were used to evaluate the impact of the StopDia Pilot

Evidence evaluating the StopDia Pilot is based on a before-and -after study (Hussein et al., 2020[4]). Effectiveness of the StopDia pilot has been evaluated by comparing objective lifestyle outcome measures, including height, weight, waist circumference, blood pressure, and nutrition and exercise habits, before and after delivery of the intervention (which are considered "strong" data collection methods, see table below). However, because the evaluation lacked a control group observed differences cannot be attributed to the intervention with confidence (i.e. a "moderate" quality study design was used, see Table 10.2). In addition, differences in measurements of nearly all variables before and after the intervention did not reach statistical significance, which may be related to the fact that 24 people participated in the pilot, providing only a small sample for statistical inference. While effects of the intervention were measured using objective lifestyle-related T2DM risk factors, in particular BMI, the evaluation did not evaluate effects on T2DM incidence.

Table 10.2. Evidence-based assessment, StopDia Pilot

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Somewhat likely
	What percentage of selected individuals agreed to participate?	73%
Selection bias score: Moderate		
Study design	Indicate the study design	Cohort (one group pre + post)
	Was the study described as randomised?	N/A
	Was the method of randomisation described?	N/A
	Was the method of randomisation appropriate?	N/A
Study design score: Moderate		
Confounders	Were there important differences between groups prior to the intervention?	Can't tell
	What percentage of potential confounders were controlled for?	N/A
Confounders score: Weak		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	92%
Withdrawals and dropouts score: Strong		

Source: Effective Public Health Practice Project (1998[15]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

The participation rate in the StopDia Pilot was relatively high and the intervention reached its objectives in terms of recruitment of participants (Hussein et al., 2020[4]). Of the 33 persons that were found at high risk of T2DM and therefore eligible for the intervention, 24 (73%) agreed to participate in the pilot, of which 22 completed the group counselling session and contributed data to the evaluation after delivery of the intervention (ibid.). This can be considered a high participation rate compared to other studies of lifestyle interventions for T2DM prevention that reported this metric (Aziz et al., 2015[16]; NICE Guideline Updates Team, 2017[14]). Some participants, however, struggled to find time to attend the group sessions and, on average, participants only attended 50% of the sessions that were offered (three of six). All 22 participants registered as users of the BitHabit application (Hussein et al., 2020[4]). The intervention garnered a high level of interest among non-participants.

The high participation rate was attributed to several factors including recruitment and delivery in a culturally familiar and trusted environment. This raises questions about how coverage of the intervention could be extended to the wider Somali community, including people who do not attend religious services at the mosque, or other minority groups who are at high risk of T2DM. According to Statistics Finland, there are approximately 20 000 people of Somali background currently live in Finland (OSF, 2020[17]). This represents some 5% of the 400 000 people with foreign background in the country (ibid.).

It should also be noted that the StopDia Pilot initially offered the BitHabit application as a standalone intervention to those who would not have time to attend group counselling. However, all participants wanted to attend the group counselling sessions and the digital intervention on its own was not taken up (Hussein et al., 2020[4]). Prior OECD research indicates that mobile apps to improve their health have so far achieved only modest uptake (around 2%) in the adult population (15-64 years) (OECD, 2019[18]).

Policy options to enhance performance

Options to enhance the performance of the StopDia Pilot are based on an analysis of facilitators of and barriers to success of similar interventions elsewhere.

Enhancing effectiveness

Prior reviews of lifestyle interventions to prevent T2DM revealed a number of key success factors for enhancing effectiveness, many of which are already reflected in the design of StopDia (see Box 10.2). However, evidence also suggests that the effectiveness of the StopDia pilot could be improved further by **providing the intervention over a longer period of time** and possibly also through additional measures to **improve adherence to the intervention**.

The **group counselling sessions in the StopDia pilot could be provided over a longer period of time to enhance effectiveness**. Duration of the intervention is a factor likely to be relevant for effectiveness and the three-month duration of the StopDia pilot, with six group counselling sessions, may be too short. It is not entirely clear from the systematic reviews summarised under "Effectiveness" for how long a lifestyle intervention needs to last to be effective. It is notable, however, that interventions found to be effective generally last for at least one year. Given that effectiveness requires lifestyle changes to be sustained, that effectiveness appears to at least decline after the end of the active intervention (Haw et al., 2017[7]), and that the benefits of T2DM prevention accrue over the long-term, it is reasonable to assume that effectiveness increases with duration of the intervention. A systematic review that focused on implementation-related aspects of T2DM prevention in high-income countries outside of clinical trials found that only 16% of the 38 studies included in the review reported an intervention duration of less than six months (Aziz et al., 2015[16]). Although the frequency of group counselling sessions tends to be lower in interventions of longer duration (e.g. monthly), the absolute number of sessions throughout the duration of the intervention is higher in most interventions than the six groups contacts in the StopDia pilot (ibid.). The review by Aziz et al. (2015[16]) cautiously confirms that studies of interventions that provide a higher degree of contact with participants report a stronger effect, in particular over long durations even if this results in lower frequency of contacts. The authors conclude that the initial 12 months of an intervention can be considered as the intensive phase, in which lifestyle changes are brought about, and that longer interventions then continue with a follow-up and maintenance phase, in which participants receive support to sustain the changes.

Adherence to the intervention could also be improved, possibly by considering whether different approaches to lifestyle changes work for men and women, by engaging entire families, by providing group counselling sessions more flexibly to facilitate attendance, and by considering the balance between intervention intensity and adherence. The latter can be considered if the intervention is scaled to achieve broader coverage (see “Enhancing extent of coverage”). Acceptance and uptake of the intervention are also key prerequisites for lifestyle interventions to achieve their desired effects. The StopDia pilot achieved a high initial uptake, i.e. a high proportion of those identified at high risk agreed to participate in the intervention, compared to other lifestyle interventions that aim to prevent T2DM (see, for example, Aziz et al. (2015[16]) and NICE Guidelines Updates Team (2017[14])). On the other hand, adherence to the intervention in terms of participation in the six group sessions was moderate (Hussein et al., 2020[4]). Available evidence lends strong support to interventions for ethnic minorities that are culturally adapted, delivered in a familiar environment and, in an appropriate language to increase acceptance and uptake, such as the StopDia pilot for the Somali community in Finland.

Evidence cautiously suggests that men and women need to be engaged differently and that entire families of people at high risk may need to be involved in preventive interventions, to increase adherence and thereby the likelihood that lifestyle changes actually occur and can be maintained. While group counselling session in the StopDia pilot were delivered in separate groups for men and women (Hussein et al., 2020[4]), the strategies for lifestyle change were the same. A review of barriers and facilitating factors in interventions to prevent or manage T2DM in vulnerable population groups, including migrants, ethnic minorities and people with low socio-economic status, found that the most important barriers to uptake were limited knowledge, family and friends, economic factors such as the price of healthy food, cultural and language barriers and work-related commitments (Breuing et al., 2020[19]). Family and friends were also an important facilitator, so their effect depends on whether their behaviour is supportive of the lifestyle change or obstructive (ibid.). For example, it may be difficult to change dietary habits if family members are unwilling to do so. While men saw family as a facilitator, women more often viewed family as a barrier because tasks related to childcare and the household reduced the time available to adhere to preventive behaviours. While knowledge was also reported to be a facilitator, limited knowledge, for instance of how to make sense of dietary advice, was a common barrier. The amount of information on diabetes prevention was sometimes perceived as overwhelming and information about food and cooking was often designed based on western diets, leaving participants from minorities with difficulties in meal preparation and food choices.

If the intervention is scaled to include a larger number of participants, group counselling sessions could be offered more flexibly to make them as accessible as possible and increase uptake. Finding time to attend the group counselling sessions was identified as one reasons for moderate participation rates in the StopDia pilot (Hussein et al., 2020[4]). In broader implementations, counselling could be offered at various times of the day, including during evenings and at weekends, and in various settings to allow participants to choose the most convenient option.

Lastly, the review by Gillett et al. (2012[20]) suggests that there may be a trade-off between the intensity of the intervention, i.e. the extent of PA and dietary restrictions targeted, and participant uptake and adherence. Discrete choice experiments conducted in the United States found that, while people valued hypothetical interventions with large benefits in terms of weight loss and T2DM risk reduction, they also expressed a high willingness to participate in interventions that involved low lifestyle sacrifices. This implies that the potentially large effects of interventions that aim for high levels of PA and impose significant dietary restrictions can be undermined by poorer uptake and adherence. If, as a corollary, uptake and adherence can be increased by aiming for more moderate lifestyle changes, the overall effect of such "lighter" interventions may ultimately be greater.

Given the StopDia pilot is targeted at a specific population with unique needs, the policy options above should only be considered if deemed appropriate by those with relevant cultural experience. Further, consideration should be given to the trade-off policies have on different best practice criteria – for example, the StopDia pilot could become more effective with a longer duration, which would increase costs.

Box 10.2. Factors impacting the effectiveness of lifestyle interventions to prevent T2DM

Evidence on other lifestyle interventions to prevent T2DM suggest that interventions that are effective have the following characteristics, most of which are incorporated into the design of the StopDia pilot:

- Interventions are targeted to people who are at increased risk of T2DM and whose risk can be reduced through lifestyle changes (NICE, 2017[21]).
- Participants are engaged face-to-face in individual or group sessions (Johnson et al., 2013[22]).
- Interventions combine advice on diet with encouraging PA, rather than targeting only one or the other (Hemmingsen et al., 2017[6]).
- Support given to participants combines information and education on healthy diets and PA with goal-setting and monitoring of lifestyle versus goals (Hemmingsen et al., 2017[6]; Uusitupa et al., 2019[1]; NICE, 2017[21]). In general, behaviour change techniques such as goal setting, planning, self-monitoring, and feedback are associated with better health outcomes (Browne et al., 2019[23]; Janssen et al., 2013[24]; Forster et al., 2016[25]; Celis-Morales, Lara and Mathers, 2015[26]).
- Information given to participants is culturally appropriate and advice can be readily understood and put into practice in daily life (Breuing et al., 2020[19]; NICE, 2017[21]). If possible, interventions foster social support for participants to make lifestyle changes, for example in the family (ibid.).
- Contact with participants lasts for a prolonged period of time (e.g. at least 1-2 years) and participants adhere to advice provided, so that interventions achieve sustained lifestyle changes that result, in particular, in long-term weight loss (Aziz et al., 2015[16]; Haw et al., 2017[7]; Hemmingsen et al., 2017[6]; Uusitupa et al., 2019[1]; NICE, 2017[21]).
- Interventions have an initial intensive phase that aims to educate participants and bring about desired lifestyle changes, followed by a less intensive phase that aims to build the independence of participants and sustain changes (Aziz et al., 2015[16]; NICE, 2017[21]).

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

Equity could be further improved by increasing coverage across high-risk population groups, i.e. extending the intervention to the entire Somali community and other minority groups whose members are at high risk of T2DM. This is discussed below in the section on "Enhancing extent of coverage".

However, transfer of the intervention to other contexts and for other minority groups **need to carefully consider their possible effects on equity of access and inequality in health outcomes**. T2DM and its risk factors tend to be more prevalent among ethnic minorities in high-income countries.[8] These minority groups may be less well served by broad prevention programs for several reasons (e.g. there is some evidence that PA does not have the same protective effect among all ethnic groups (Boyer et al., 2018[27])).

Enhancing the evidence-base

The evaluation of the StopDia pilot lacked a control group and had a small study size. This is not unusual given the intervention is a pilot that targets a specific group of people. Future evaluation attempts could be more rigorous by:

- ***Increasing sample sizes***: to allow of detecting statistically significant differences in relevant indicators.[9]
- ***Comparing an intervention group against a concurrent control group***: to allow for attribution of observed effects to the intervention. Control groups can be created, for instance, through randomisation to the intervention or control or through creation of a non-random control group matched on key personal characteristics of the people in the intervention group. However, it is important to acknowledge this may not be possible due to ethical reasons.
- ***Increasing the follow-up time to at least 1-2 years***: to assess whether effects of lifestyle changes are sustained.
- ***Evaluating effectiveness in terms of a more complete set of relevant outcome indicators***: to provide a full evaluation in terms of the intervention logic, from process-related indicators of implementation to effects of implementation on T2DM risk factors and final health outcomes.
- By *formally* ***estimating cost-effectiveness***.

Incidence of T2DM and incidence of T2DM-related complications are particularly relevant indicators of final outcomes for interventions that aim to prevent T2DM. However, because progression to disease and, for incident cases, to disease complications, occur slowly and only in a subset of at-risk people included in studies, evaluating effectiveness in terms of these indicators requires long follow-up time and large samples. The existing evidence from RCTs provide information on final outcome indicators.

Evaluations of broader implementations of interventions outside of clinical trials have tended not to report T2DM incidence, but mainly effects in terms of risk factors, in particular body weight (Aziz et al., 2015[16]; Johnson et al., 2013[22]). Body weight, or BMI, have been established as risk factors for T2DM and weight loss is an attractive intermediate outcome, given that it is easy to measure and has been shown to predict T2DM incidence (Penn et al., 2013[28]). However, studies across different target populations suggest that weight loss is not equally associated with T2DM incidence in all ethnic groups and across all methods of identifying high-risk populations (ibid.). Implementation-focused studies have also reported process-related indicators (ibid. and Ackermann and O'Brien (2020[29])). A list of indicators of interest for lifestyle interventions to prevent T2DM is provided in 0.

Enhancing extent of coverage

Coverage of the intervention, and thereby its positive effect on equity, could be enhanced by **broadening recruitment** for the intervention beyond the narrow target group of the StopDia Pilot. Broadening the coverage of the intervention would obviously require more resources for recruitment of a larger number of participants and for delivery of the intervention.

Risk screening and recruitment for the StopDia intervention for the Somali minority in Finland **could initially be expanded beyond the mosque in Helsinki**, where only a small fraction of the more than 20 000 people with Somali background in Finland were reached. In England, for example, the evaluation of the early phase of implementation of the NHS Diabetes Prevention Programme (DPP) showed that a broad and community-based recruitment strategy was key to ensuring adequate coverage of the intervention in high-risk populations (Penn et al., 2018[30]).

Coverage could further be expanded by **adapting the intervention to other minority groups**. Among the more than 400 000 people with foreign backgrounds who live in Finland, other minority groups may also be at increased risk of T2DM. More than 30 000 people are of Iraqi or Turkish background, including a Kurdish community. Kurdish women were identified by Weiste Paakkanen (2013[5]) as one other minority group at particular high risk of T2DM.

Transferability

This section explores the transferability of the StopDia Pilot and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring the intervention.

Previous transfers

The StopDia intervention, which targets all people at high risk of T2DM, has been implemented in three provinces in Finland – Northern Savo, Southern Carelia, and Päijät-Häme. The StopDia Pilot represents an adapted version of the original intervention to suit the needs of the Somali population. To date, neither StopDia nor the StopDia Pilot have been transferred outside of Finland.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of the StopDia Pilot are listed in Table 10.3. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 10.3. Indicators to assess the transferability of the StopDia Pilot

Indicator	Reasoning	Interpretation
Population context		
% of residents born in a foreign country*	StopDia (with a focus on a migrant population) will be more applicable in countries with a higher proportion of people born in a foreign country	↑ value = more transferable
% of residents born in Somalia*	As above	↑ value = more transferable
% of individuals using the internet for seeking health information in the last 3 months	StopDia offers a digital service to support healthy lifestyles (BitHabit), therefore, StopDia is more likely to be successful in populations comfortable seeking health information online	↑ value = more transferable
ICT Development Index**	StopDia's digital support service will be more accessible in more digitally advanced countries	↑ value = more transferable
% of the population with access to recreational green space within 10min walking distance	StopDia participants are encouraged to do outdoor activities, therefore StopDia is more likely to be successful in countries where people have better access to green space	↑ value = more transferable

Indicator	Reasoning	Interpretation
Political context		
Operational strategy/action plan/policy to prevent T2DM	StopDia will be more successful in countries which prioritise Type 2 Diabetes prevention	"Yes" = more transferable
Operational strategy/action plan/policy to reduce unhealthy eating	StopDia will be more successful in countries which prioritise unhealthy eating	"Yes" = more transferable
A national eHealth policy or strategy exists	StopDia includes a digital service therefore it will be more successful in countries that prioritise eHealth	"Yes" = more transferable
Economic context		
Prevention expenditure as a percentage of current health expenditure (CHE)	StopDia is a prevention intervention, therefore, it will be more successful in countries that allocate a higher proportion of health spending to prevention	↑ value = more transferable

* The indicators may understate the proportion of people with foreign ethnic backgrounds because they do not capture second- or third-generation immigrants, i.e. people who have foreign ethnic backgrounds but were born in their host country; the StopDia pilot was designed for people of Somali ethnic background in Finland, including those born in Finland. **The ICT development index represents a country's information and communication technology.

Source: OECD (2020[31]), "Stock of foreign-born population by country of birth", https://stats.oecd.org; WHO (n.d.[32]), "Global Health Observatory", https://www.who.int/data/gho; WHO (2015[33]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; ITU (2020[34]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en. OECD (2019[35]), "Dataset: ICT Access and Usage by Households and Individuals", https://stats.oecd.org/Index.aspx?DataSetCode=ICT_HH2.

Results

Findings from the data are in Table 10.4 and show that:

- Sweden and Norway are the only countries with a higher proportion of Somali-born people in its population (0.67% and 0.53%, respectively) than in Finland (0.21%). Somali-born people represent more than 0.1% of the total population in Denmark, the Netherlands and the United Kingdom. However, the vast majority of countries for which data are available have a higher proportion of foreign-born people in their populations than Finland.
- Digital health literacy (as measured by proportion of people who seek health information online) and ICT development is higher in Finland than all other OECD and non-OECD European countries. For example, 76% of people in Finland are digitally health literate compared to an average of 54% in remaining countries. Therefore, the mHealth component of the StopDia Pilot may be less effective in other countries. Nevertheless, most countries have a standalone eHealth policy indicating there is political support for digital health interventions.
- All countries have national action plans or strategies for T2DM prevention and the reduction of unhealthy diets related to NCD, suggesting that T2DM prevention through lifestyle changes may be well aligned with current public health priorities. According to the WHO NCD Country Capacity Survey, Greece and Sweden are the only countries that report neither a stand-alone T2DM prevention strategy nor a strategy to reduce unhealthy diets related to NCDs.
- Spending on prevention is higher in Finland than in all countries with the exception of Canada, Italy and the United Kingdom indicating potential funding issues.

In addition, it should be noted that risk screening of potential participants and delivery of the StopDia pilot relied on non-remunerated volunteers, who were from the same ethnic background and who studied nursing or other health care-related disciplines. Sufficient people with such profiles may not be available in the target setting, especially if the intervention were to be implemented at scale. Delivery might therefore have to rely on health professionals, such as nurses. No data on the number of nurses relative to the population are available for Finland.

Table 10.4. Transferability assessment by country, StopDia Pilot (OECD and non-OECD European countries)

A darker shade indicates that the StopDia Pilot may be more suitable to transfer to that country

	% residents born in a foreign country	Residents born in Somalia (%)	% individuals seeking health information online	ICT Development Index value	% population access to green space	National T2DM plan	Unhealthy eating action plan	National eHealth policy	Prevention expenditure percentage CHE**
Finland	**7**	**0.21**	**76**	**8.10**	**99.85**	**Yes**	**Yes**	**Yes**	**3.98**
Australia	30	0.04	42	8.20	89.5*	Yes	Yes	Yes	1.93
Austria	19	0.06	53	7.50	98.41	No	Yes	No	2.11
Belgium	17	0.06	49	7.70	94.89	Yes	Yes	Yes	1.65
Bulgaria	n/a	n/a	34	6.40	n/a	Yes	Yes	Yes	2.83
Canada	n/a	n/a	59	7.60	n/a	Yes	Yes	Yes	5.96
Chile	n/a	n/a	27	6.10	n/a	Yes	Yes	Yes	n/a
Colombia	n/a	n/a	41	5.00	n/a	Yes	Yes	n/a	2.05
Costa Rica	n/a	n/a	44	6.00	n/a	Yes	Yes	Yes	0.60
Croatia	n/a	n/a	53	6.80	n/a	Yes	Yes	Yes	3.16
Cyprus	n/a	n/a	58	6.30	n/a	Yes	No	Yes	1.26
Czech Republic	n/a	n/a	56	7.20	97.72	Yes	Yes	No	2.65
Denmark	10	0.19	67	8.80	89.18	Yes	Yes	Yes	2.44
Estonia	15	0.00	60	8.00	97.25	No	Yes	Yes	3.30
France	12	n/a	50	8.00	93.03	Yes	Yes	n/a	1.80
Germany	16	n/a	66	8.10	95.93	Yes	Yes	n/a	3.20
Greece	n/a	n/a	50	6.90	93.85	No	No	Yes	1.27
Hungary	6	0.00	60	6.60	91.49	No	Yes	No	3.04
Iceland	17	0.01	65	8.70	61.34	No	Yes	Yes	2.68
Ireland	n/a	n/a	57	7.70	94.47	Yes	Yes	Yes	2.60
Israel	20	n/a	50	7.30	n/a	Yes	Yes	No	0.37
Italy	10	0.02	35	6.90	88.11	Yes	Yes	Yes	4.41
Japan	n/a	n/a	n/a	8.30	n/a	Yes	Yes	Yes	2.86
Latvia	12	n/a	48	6.90	95.23	Yes	Yes	Yes	2.58
Lithuania	5	0.00	61	7.00	94.82	Yes	Yes	Yes	2.17
Luxembourg	47	0.01	58	8.30	98.72	No	Yes	Yes	2.18

	% residents born in a foreign country	Residents born in Somalia (%)	% individuals seeking health information online	ICT Development Index value	% population access to green space	National T2DM plan	Unhealthy eating action plan	National eHealth policy	Prevention expenditure percentage CHE**
Finland	**7**	**0.21**	**76**	**8.10**	**99.85**	**Yes**	**Yes**	**Yes**	**3.98**
Malta			59	7.50	n/a	Yes	Yes	No	1.30
Mexico	1		50	4.50		Yes	Yes	No	2.92
Netherlands	13	0.15	74	8.40	97.00	No	Yes	Yes	3.26
New Zealand	26	0.02		8.10		Yes	No	Yes	n/a
Norway	16	0.53	69	8.40	95.40	Yes	Yes	Yes	2.45
Poland	n/a	n/a	47	6.60	92.63	Yes	Yes	Yes	2.28
Portugal	n/a	n/a	49	6.60	83.33	Yes	Yes	No	1.68
Republic of Korea	n/a	n/a	50	8.80	n/a	Yes	Yes	n/a	3.48
Romania	n/a	n/a	33	5.90	n/a	Yes	Yes	Yes	1.42
Slovak Republic	4	0.00	53	6.70	95.63	Yes	Yes	n/a	0.77
Slovenia	13	0.00	48	7.10	93.50	Yes	Yes	No	3.13
Spain	14	0.00	60	7.50	93.26	Yes	Yes	No	2.13
Sweden	19	0.67	62	8.50	99.14	No	No	Yes	3.27
Switzerland	30	0.09	67	8.50	97.31	Yes	Yes	Yes	2.63
Turkey	3	0.01	51	5.50	n/a	Yes	Yes	No	n/a
United Kingdom	14	0.17	67	8.50	91.43	Yes	Yes	Yes	5.08
United States	14	0.03	38	8.10	n/a	Yes	Yes	Yes	2.91

* The figure for Australia represent the average cross each major city and refer to access to green space within 400m. **CHE = current health expenditure. n/a = no data available. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details).

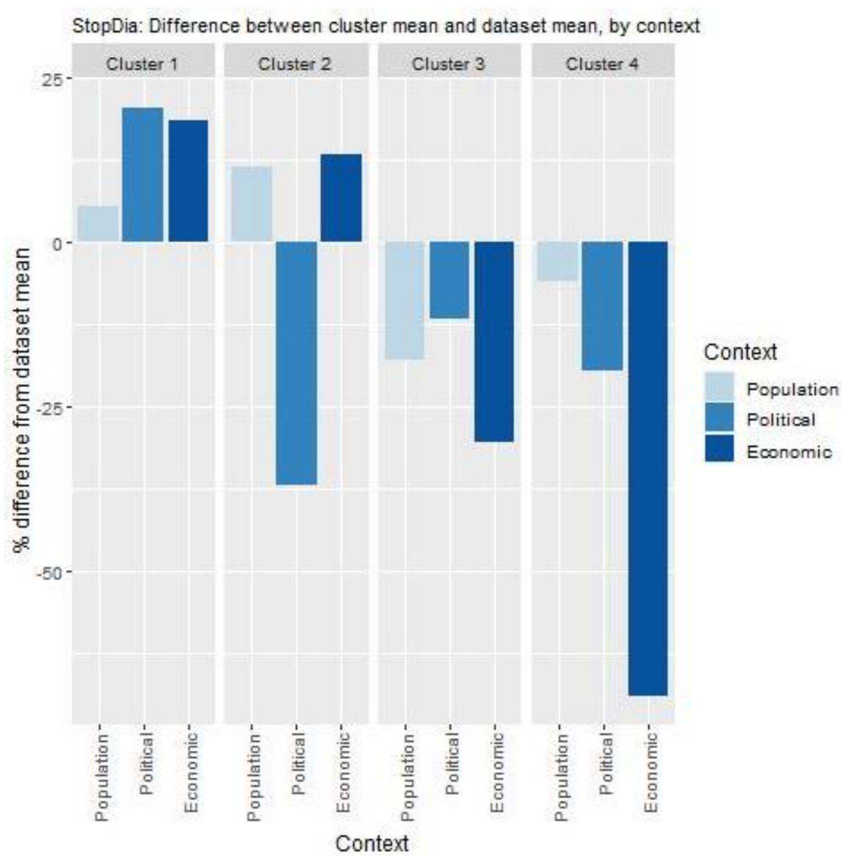
Source: OECD (2020[31]), "Stock of foreign-born population by country of birth", https://stats.oecd.org; WHO (n.d.[32]), "Global Health Observatory", https://www.who.int/data/gho; WHO (2015[33]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; ITU (2020[34]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en. OECD (2019[35]), "Dataset: ICT Access and Usage by Households and Individuals", https://stats.oecd.org/Index.aspx?DataSetCode=ICT_HH2.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of four groups, based on indicators reported in Table 10.3. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 10.1 and Table 10.5:

- Countries in cluster one, including Finland, have population, political and economic arrangements in place to transfer the StopDia Pilot. Countries in this cluster are therefore less likely to experience issues associated with implementing and operating the StopDia Pilot in their local context.
- Countries in cluster two also have population and economic arrangements to support the StopDia Pilot. Prior to transferring the intervention, however, these countries may wish to consider ensuring the StopDia Pilot aligns with overarching political priorities.
- Remaining countries are in clusters three and four, which should consider whether the intervention aligns with political priorities as well as increase funding on preventative care to ensure long-term affordability.

Figure 10.1. Transferability assessment using clustering, the StopDia Pilot



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD (2020[31]), "Stock of foreign-born population by country of birth", https://stats.oecd.org; WHO (n.d.[32]), "Global Health Observatory", https://www.who.int/data/gho; WHO (2015[33]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; ITU (2020[34]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; OECD Health Statistics 2021, https://doi.org/10.1787/health-data-en. OECD (2019[35]), "Dataset: ICT Access and Usage by Households and Individuals", https://stats.oecd.org/Index.aspx?DataSetCode=ICT_HH2.

Table 10.5. Countries by cluster, StopDia Pilot

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Australia	Austria	Colombia	Costa Rica
Belgium	Estonia	Czech Republic	Cyprus
Bulgaria	Hungary	Israel	Greece
Canada	Iceland	Malta	New Zealand
Chile	Luxembourg	Mexico	
Croatia	Netherlands	Portugal	
Denmark	Sweden	Slovak Republic	
Finland		Slovenia	
France		Spain	
Germany		Turkey	
Ireland			
Italy			
Japan			
Latvia			
Lithuania			
Norway			
Poland			
Republic of Korea			
Romania			
Switzerland			
United Kingdom			
United States			

New indicators to assess transferability

The transferability assessment based on publically available indicators needs to be interpreted with caution given reliable data are not publicly available for several important indicators and there are gaps in available data for some countries. Additional primary indicators to assess transferability are summarised in Box 10.3. While there appears comparable need for T2DM prevention in the populations of most in countries in the target setting, it is particularly important to assess in more detail which migrant populations/ethnic minorities are priorities for T2DM prevention in each country and how access barriers to T2DM prevention for these groups are best overcome. Also, while in most countries T2DM prevention and reducing unhealthy diets are a priority for public health policy, more detailed analysis is required to identify compatible and synergistic interventions as well as competing interventions that may exist already. Culturally adapted T2DM prevention interventions for minority populations have already been trialled in a number of OECD countries (Lagisetty et al., 2017[36]). Nurses could be one category of health professionals who could support implementation of the intervention in the target settings. However, the most appropriate human resources would need to be assessed in each setting, in particular if people delivering the intervention should have the same ethnic background as participants.

More detailed assessment of transferability should take into account the following information from the owner setting (Finland):

- The StopDia intervention was adapted for the Somali community in Finland to overcome language barriers and because of a perception among this, and other migrant communities, that health care services are intended only for people who are ill and not for prevention (Hussein et al., 2020[4]). Both imply access barriers to preventive services delivered to the general population in health care settings.
- Direct costs of the StopDia pilot for the Somali minority were estimated at EUR 650 per participant, 96% of which were related to human resources for adapting and delivering the intervention to the Somali community. These estimates do not include costs related to training, which was provided by local universities and research centres. Risk screening and delivery of the intervention was

supported by non-remunerated volunteers. Costs of human and other resources may differ in target settings, affecting affordability and cost-effectiveness of the intervention. In particular, human resource costs may be higher if the intervention is delivered over a longer duration and at scale, and can therefore not rely solely on volunteers.

- The StopDia Pilot for the Somali minority has not yet been scaled. Implementing the intervention at scale in a target setting would require strong political commitments to garner support in local minority communities and require additional resources in planning and implementation.

Box 10.3. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators:

Population context

- Which migrant populations/ethnic minorities are priorities for T2DM prevention in the target context?
- What are the main barriers for these priority populations that keep them from accessing preventive services and health care? (E.g. Is health literacy a problem?)
- In which setting are the access barriers for these priority populations best overcome?
- How acceptable are lifestyle interventions to these priority populations?

Sector specific context (community and migrant health)

- What, if any, compatible and synergistic interventions exist? (E.g. Other health interventions for migrant populations and/or ethnic minorities and T2DM prevention interventions for the general population that could support the intervention to prevent T2DM.)
- What, if any, competing interventions exist? (E.g. Other interventions that aim to prevent T2DM in migrant populations and/or ethnic minorities.)
- Are necessary human resources and work force skills available to adapt and deliver the intervention to priority migrant populations and/or ethnic minorities?

Political context

- Will the intervention receive political support from key decision-makers in the target setting?
- Will the intervention receive commitments from key decision-makers in the target setting?

Economic context

- What is the cost of implementing the intervention in the target setting? (E.g. How do infrastructure and human resource needs, and the respective costs of these resources, differ between the owner and target settings?)
- How do costs in the target setting affect anticipated cost-effectiveness of the intervention?

Conclusion and next steps

The StopDia Pilot was a culturally adapted version of StopDia for Somali adults in the region of Helsinki, Finland. The Pilot was delivered to a group of 24 people in co-operation with a local mosque. Findings from the before-and-after evaluation of the Pilot found the intervention achieved small improvements in lifestyle-related T2DM risk factors, including increased vegetable consumption, increased physical activity

(PA) and weight loss. Outcomes were measured using strong data collection methods, for example, volunteers from the local community were provided with comprehensive training to take objective participant measurements (e.g. height and weight). However, similar to most public health interventions, the quality of evidence was weaker in other areas (e.g. RCTs are considered to be of higher quality than a cohort pre / post study with only an intervention group, which was used to evaluate the StopDia Pilot). Future evaluations of StopDia for the Somali population would be improved by increasing the sample sizes of studies; increasing the follow-up time; and by evaluating effectiveness in terms of a more complete set of outcome indicators.

While lifestyle interventions can be effective and cost-effective in high-risk population groups, it should also be noted that they are costly to implement and that their success crucially depends on participant adherence and on sustaining lifestyle changes in the longer term. At the same time, the literature suggests that participant uptake and retention in interventions are frequent challenges in broad implementations, as is adherence by participants to diet and PA recommendations. While interventions can be designed to improve adherence, this also implies that lifestyle interventions can be a part of broader T2DM prevention strategies but are alone not sufficient. They need to be integrated with other prevention policies, such as building a healthy environment that encourages people to undertake physical activity as part of their everyday life and policies that encourage healthy food choices, such as regulation and taxation.

A transferability assessment of the StopDia Pilot to other OECD and non-OECD EU countries broadly indicates the intervention would have political support given most countries have national plans in place to address T2DM and unhealthy eating. Further, the digital component of the intervention will likely be encouraged by most governments given the increasing focus on eHealth. However, limitations on available data to assess transferability mean further analysis is needed before choosing to transfer the intervention (see Box 10.4).

Box 10.4. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance the StopDia Pilot are listed below:

- Support policy efforts outlined in this case study, for example, funding to expand recruitment, which is necessary to increase the sample size and therefore validity of future evaluation results
- Support research into whether the StopDia Pilot can be adapted to suit other ethnic minority groups who are also at higher risk of T2DM
- Promote findings from the StopDia Pilot case study to understand what countries/regions are interested in transferring the intervention

References

Abate, N. and M. Chandalia (2003), “The impact of ethnicity on type 2 diabetes”, *Journal of Diabetes and its Complications*, Vol. 17/1, pp. 39-58, https://doi.org/10.1016/s1056-8727(02)00190-3. [41]

Ackermann, R. and M. O’Brien (2020), *Evidence and Challenges for Translation and Population Impact of the Diabetes Prevention Program*, Springer, https://doi.org/10.1007/s11892-020-1293-4. [29]

Aziz, Z. et al. (2015), *A systematic review of real-world diabetes prevention programs: Learnings from the last 15 years*, BioMed Central Ltd., https://doi.org/10.1186/s13012-015-0354-6. [16]

Bian, R. et al. (2017), "The Effect of Technology-Mediated Diabetes Prevention Interventions on Weight: A Meta-Analysis", *Journal of Medical Internet Research*, Vol. 19/3, p. e76, https://doi.org/10.2196/jmir.4709. [10]

Boyer, W. et al. (2018), "Protective role of physical activity on type 2 diabetes: Analysis of effect modification by race-ethnicity", *Journal of Diabetes*, Vol. 10/2, pp. 166-178, https://doi.org/10.1111/1753-0407.12574. [27]

Breuing, J. et al. (2020), "Barriers and facilitating factors in the prevention of diabetes type 2 and gestational diabetes in vulnerable groups: A scoping review", *PLOS ONE*, Vol. 15/5, p. e0232250, https://doi.org/10.1371/journal.pone.0232250. [19]

Browne, S. et al. (2019), "Effectiveness of interventions aimed at improving dietary behaviours among people at higher risk of or with chronic non-communicable diseases: an overview of systematic reviews", *Eur J Clin Nutr*, Vol. 73, pp. 9-23, https://doi.org/10.1038/s41430-018-0327-3. [23]

Carbone, S. et al. (2019), *Obesity, risk of diabetes and role of physical activity, exercise training and cardiorespiratory fitness*, W.B. Saunders, https://doi.org/10.1016/j.pcad.2019.08.004. [2]

Casarini, D. (ed.) (2013), "Importance of Weight Loss Maintenance and Risk Prediction in the Prevention of Type 2 Diabetes: Analysis of European Diabetes Prevention Study RCT", *PLoS ONE*, Vol. 8/2, p. e57143, https://doi.org/10.1371/journal.pone.0057143. [28]

CDC (2020), *National Diabetes Statistics Report 2020 - Estimates of Diabetes and Its Burden in the United States*, https://www.cdc.gov/diabetes/pdfs/data/statistics/national-diabetes-statistics-report.pdf. [46]

Celis-Morales, C., J. Lara and J. Mathers (2015), *Personalising nutritional guidance for more effective behaviour change*, Cambridge University Press, https://doi.org/10.1017/S0029665114001633. [26]

Eddy, D. and L. Schlessinger (2003), "Archimedes", *Diabetes Care*, Vol. 26/11, pp. 3093-3101, https://doi.org/10.2337/diacare.26.11.3093. [47]

Eddy, D., L. Schlessinger and R. Kahn (2005), "Clinical outcomes and cost-effectiveness of strategies for managing people at high risk for diabetes", *Annals of Internal Medicine*, Vol. 143/4, https://doi.org/10.7326/0003-4819-143-4-200508160-00006. [40]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [15]

Forster, H. et al. (2016), *Personalised nutrition: The role of new dietary assessment methods*, Cambridge University Press, https://doi.org/10.1017/S0029665115002086. [25]

Gillett, M. et al. (2012), "Non-pharmacological interventions to reduce the risk of diabetes in people with impaired glucose regulation: A systematic review and economic evaluation", *Health Technology Assessment*, Vol. 16/33, pp. 1-235, https://doi.org/10.3310/hta16330. [20]

Haw, J. et al. (2017), “Long-term sustainability of diabetes prevention approaches: A systematic review and meta-analysis of randomized clinical trials”, *JAMA Internal Medicine*, Vol. 177/12, pp. 1808-1817, https://doi.org/10.1001/jamainternmed.2017.6040. [7]

Hemmingsen, B. et al. (2017), “Diet, physical activity or both for prevention or delay of type 2 diabetes mellitus and its associated complications in people at increased risk of developing type 2 diabetes mellitus”, *Cochrane Database of Systematic Reviews* 12, https://doi.org/10.1002/14651858.CD003054.pub4. [6]

Hussein, I. et al. (2020), *WP7 - Finland Individual pilot action report*. [4]

ITU (2020), *The ICT Development Index (IDI): conceptual framework and methodology*, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx (accessed on 26 February 2021). [34]

Janssen, V. et al. (2013), “Lifestyle modification programmes for patients with coronary heart disease: a systematic review and meta-analysis of randomized controlled trials”, *European Journal of Preventive Cardiology*, Vol. 20/4, pp. 620-640, https://doi.org/10.1177/2047487312462824. [24]

Johnson, M. et al. (2013), “Can diabetes prevention programmes be translated effectively into real-world settings and still deliver improved outcomes? A synthesis of evidence”, *Diabetic Medicine*, Vol. 30/1, pp. 3-15, https://doi.org/10.1111/dme.12018. [22]

Kebede, M. et al. (2018), “Effectiveness of Digital Interventions for Improving Glycemic Control in Persons with Poorly Controlled Type 2 Diabetes: A Systematic Review, Meta-analysis, and Meta-regression Analysis”, *Diabetes Technology & Therapeutics*, Vol. 20/11, pp. 767-782, https://doi.org/10.1089/dia.2018.0216. [11]

Lagisetty, P. et al. (2017), “Culturally Targeted Strategies for Diabetes Prevention in Minority Population: A Systematic Review and Framework”, *Diabetes Educator*, Vol. 43/1, pp. 54-77, https://doi.org/10.1177/0145721716683811. [36]

Lindström, J. and J. Tuomilehto (2003), “The diabetes risk score: A practical tool to predict type 2 diabetes risk”, *Diabetes Care*, Vol. 26/3, pp. 725-731, https://doi.org/10.2337/diacare.26.3.725. [38]

Meeks, K. et al. (2016), *Disparities in type 2 diabetes prevalence among ethnic minority groups resident in Europe: a systematic review and meta-analysis*, Springer-Verlag Italia s.r.l., https://doi.org/10.1007/s11739-015-1302-9. [43]

Montesi, L., M. Caletti and G. Marchesini (2016), “Diabetes in migrants and ethnic minorities in a changing World”, *World Journal of Diabetes*, Vol. 7/3, p. 34, https://doi.org/10.4239/wjd.v7.i3.34. [42]

NICE (2017), *Type 2 diabetes: prevention in people at high risk*, https://www.nice.org.uk/guidance/ph38/resources/type-2-diabetes-prevention-in-people-at-high-risk-pdf-1996304192197 (accessed on 22 September 2020). [21]

NICE Guideline Updates Team (2017), *Type 2 diabetes: prevention in people at high risk [A] Evidence reviews for interventions for people at high risk of type 2 diabetes*, https://www.nice.org.uk/guidance/ph38/evidence/evidence-reviews-pdf-4600705357. [14]

OECD (2022), *Guidebook on Best Practices in Public Health*, OECD Publishing, Paris, https://doi.org/10.1787/4f4913dd-en. [37]

OECD (2020), *Stock of foreign-born population by country of birth*, https://stats.oecd.org/Index.aspx?QueryId=48877. [31]

OECD (2019), *Individuals using the Internet for seeking health information - last 3 m (%) (all individuals aged 16-74)*, OECD, Paris. [35]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [18]

OSF (2020), *Population Structure*, https://www.stat.fi/til/vaerak/2019/02/vaerak_2019_02_2020-05-29_tie_001_en.html. [17]

Penn, L. et al. (2018), "NHS Diabetes Prevention Programme in England: Formative evaluation of the programme in early phase implementation", *BMJ Open*, Vol. 8/2, p. 19467, https://doi.org/10.1136/bmjopen-2017-019467. [30]

Pihlajamäki, J. et al. (2019), "Digitally supported program for type 2 diabetes risk identification and risk reduction in real-world setting: Protocol for the StopDia model and randomized controlled trial", *BMC Public Health*, Vol. 19/1, pp. 1-13, https://doi.org/10.1186/s12889-019-6574-y. [3]

Roberts, S. et al. (2017), *Preventing type 2 diabetes: Systematic review of studies of cost-effectiveness of lifestyle programmes and metformin, with and without screening, for pre-diabetes*, BMJ Publishing Group, https://doi.org/10.1136/bmjopen-2017-017184. [13]

Schünemann, H. et al. (2020), "Chapter 14: Completing 'Summary of findings' tables and grading the certainty of the evidence", in Higgins, J. and J. Thomas (eds.), *Cochrane Handbook for Systematic Reviews of Interventions*, https://training.cochrane.org/handbook/current/chapter-14 (accessed on 9 November 2020). [39]

Ujcic-Voortman, J. et al. (2009), "Diabetes prevalence and risk factors among ethnic minorities", *The European Journal of Public Health*, Vol. 19/5, pp. 511-515, https://doi.org/10.1093/eurpub/ckp096. [44]

Uusitupa, M. et al. (2019), *Prevention of type 2 diabetes by lifestyle changes: A systematic review and meta-analysis*, MDPI AG, https://doi.org/10.3390/nu11112611. [1]

Van Rhoon, L. et al. (2020), "A systematic review of the behaviour change techniques and digital features in technology-driven type 2 diabetes prevention interventions", *DIGITAL HEALTH*, Vol. 6, p. 205520762091442, https://doi.org/10.1177/2055207620914427. [9]

Weiste Paakkanen, A. et al. (2013), "Migrant Health and Wellbeing Study (Maamu)", *European Journal of Public Health*, Vol. 23/suppl_1, https://doi.org/10.1093/eurpub/ckt124.116. [5]

WHO (2015), *Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage*, Global Observatory for eHealth, https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage. [33]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [32]

WHO Regional Office for Europe (2020), *Diabetes Data and Satistics*, https://www.euro.who.int/en/health-topics/noncommunicable-diseases/diabetes/data-and-statistics (accessed on 9 November 2020). [45]

Yamaoka, K., A. Nemoto and T. Tango (2019), "Comparison of the Effectiveness of Lifestyle Modification with Other Treatments on the Incidence of Type 2 Diabetes in People at High Risk: A Network Meta-Analysis", *Nutrients*, Vol. 11/6, p. 1373, https://doi.org/10.3390/nu11061373. [8]

Zhou, X. et al. (2020), "Cost-effectiveness of diabetes prevention interventions targeting high-risk individuals and whole populations: A systematic review", *Diabetes Care*, Vol. 43/7, pp. 1593-1616, https://doi.org/10.2337/dci20-0018. [12]

Annex 10.A. StopDia pilot indicators

A full range of potential indicators to measure the impact of StopDia, or other lifestyle interventions that aim to prevent T2DM, are listed below. This includes process-related indicators to evaluate implementation and indicators of intermediate and final outcomes. Data on outcome indicators need to be collected at different points in time, in particularly at baseline before delivery of the intervention and at different follow-up periods after delivery of the intervention. Indicators considered widely accepted and therefore high-priority have been highlighted.

Annex Table 10.A.1. Indicators to evaluate lifestyle interventions to prevent type 2 diabetes mellitus (T2DM)

Indicators in bold and italics are considered to be of high priority

Indicator category	Indicators
Final outcomes (effects on T2DM-related and general health indicators)	***Incidence of type 2 diabetes mellitus (T2DM)*** ***Time to progression to T2DM*** ***Incidence of T2DM-related adverse events and complications*** ***Change in fasting glucose or HbA$_{1c}$ levels*** Change in perceived health status (% of participants in good or very good health) or health-related quality of life ***Number of quality-adjusted life years (QALYs) gained*** ***Number of disability-adjusted life years (DALYs) averted***
Intermediate outcomes (effects on T2DM risk factors)	***Change in body-mass index*** Change in waist circumference ***Change in index scores of diet quality, focussing on intake of fat, saturated fat and fibre*** Self-efficacy for healthy eating and physical activity ***Change in consumption of fruits and vegetables*** Change in consumption of processed and unprocessed red meat, white rice, and sugar-sweetened beverages Change in consumption of tobacco and alcohol Change in percentage of participants who eat or skip breakfast Change in percentage of participants who eat snacks in between meals Percentage of population whose free sugar intake is less than 10% of total calorie intake Percentage of the population who consume less than 5 grammes of salt per day Percentage of the population whose saturated fatty acid intake is less than 10% of total calorie intake (less than 1% for trans fatty acids) ***Number of steps taken per day*** Changes in the amount of moderate to vigorous physical activity (PA) each week percentage adults (18+) reporting doing at 150min of moderate-intensity physical activity in a week OR 75min or vigorous-intensity (or a combination of the two) Percentage population who engage in performance enhancing physical activity at least once a week (aerobic and/or muscle strengthening)
Process-related indicators	Percentage of high-risk population targeted by the intervention Percentage of high-risk population who agree to participate in the intervention (penetration) Percentage of participants who attend a minimum number of face-to-face counselling sessions (participation) Content actually delivered in face-to-face sessions vs. content planned Percentage of participants who actively use the digital lifestyle application Participant satisfaction

Source: Further details can be found within OECD (2022[37]), *Guidebook on Best Practices in Public Health*, https://doi.org/10.1787/4f4913dd-en.

Notes

[1] See Lindström and Tuomilehto (2003[38]) and https://www.mdcalc.com/findrisc-finnish-diabetes-risk-score.

[2] Based on the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, applied in Cochrane reviews for assessing certainty (or quality) of a body of evidence (Schünemann et al., 2020[39]).

[3] HbA_{1c} – glycated haemoglobin – is a form of hemoglobin that is chemically linked to a sugar and is used as an indicator of how well blood sugar levels are controlled

[4] Cost data provided by administrators of the StopDia pilot in Finland.

[5] Roberts (2017[13]) reported a median of GBP 7 490, converted at 2017 purchasing power parities. The review by the NICE Guideline Updates Team (2017[14]) reported no median cost per QALY. It included 9 studies, all of which were also included by Zhou et al. (2020[12]) or Roberts et al. (2017[13]). Zhou et al. (2020[12]) included 28 studies and Roberts et al. (2017[13]) 27 studies; 12 studies were included in both reviews.

[6] With the notable exception of the model described in Chapter 6 note 7.

[7] The latter estimate can be considered an outlier, and was produced by the Archimedes model (Eddy and Schlessinger, 2003[47]) used to estimate cost-effectiveness of the Diabetes Prevention Program (DPP) in the United States from the perspective of a health care payer (Eddy, Schlessinger and Kahn, 2005[40]). The reasons for the difference in findings between the Archimedes model and the Markov-type models used in the majority of studies are not entirely clear. They are discussed at length in the earlier review by Gillett et al. (2012[20]), which concludes that the differences are likely driven by, among other factors, more conservative, and possibly more realistic, assumptions on baseline disease progression and occurrence of complications, and on the effectiveness of the intervention.

[8] See, for example, Abate and Chandalia (2003[41]), CDC (2020[46]), Montesi, Caletti and Marchesini (2016[42]), (Meeks et al. (2016[43]), Ujcic-Voortman et al. (2009[44]), and WHO Regional Office for Europe (2020[45]).

[9] The 24 participants in the StopDia pilot for the Somali community is a small sample to detect statistically significant differences.

11 SI!

This chapter covers the case study of SI!, a multidimensional school-based obesity prevention intervention in Spain targeting lifestyle behaviour change in 3-5 year-olds. The case study includes an assessment of SI! against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

The SI! intervention: Case study overview

Description: the SI! intervention is a multidimensional school-based obesity prevention intervention in Spain which targets lifestyle behaviour change in 3-5 year-olds. The intervention seeks to shape knowledge and attitudes in terms of nutrition, physical activity (PA) and general cardiovascular health. Children are the primary focus of the intervention, but families, teachers and schooling environments are also involved, in order to create a more holistic approach.

Best practice assessment:

Table 11.1. OECD best practice assessment of the SI! intervention

Criteria	Assessment
Effectiveness	The intervention successfully impacted the children's behaviours, notably in terms of PA, and saw a reduction in anthropometric measurements, although these were at times limited
Efficiency	Economic evaluations of comparable school-based interventions conclude they are generally cost-effective, and can even be cost-saving
Equity	The intervention largely targets individuals of low SES, but outcomes were ultimately favourable for children of higher SES
Evidence-base	Evidence to evaluate SI! is strong in many areas including study design, data collection methods used and control for confounders. However, similar to most public health interventions, neither researchers not participants were blinded.
Extent of coverage	The intervention in its entirety has relatively extensive coverage, although this is limited in the initial trial

Enhancement options: to *enhance effectiveness*, the nutritional quality of foods within schools could be further regulated, and additional PA sessions could be integrated into the school week. To *enhance equity*, the intervention could be adapted to the specific needs of more vulnerable groups, and key indicators could be broken down by family SES and ethnicity, for example. To *enhance the evidence-base*, more objective measures could be used in the design and evaluation of the study.

Transferability: the SI! intervention is broadly transferable to other settings within OECD and European countries. For example, it is likely school-based healthy lifestyle interventions will receive political support given obesity is a topic public health issue in most OECD and European countries. However, prior to transfer, policy makers in the target setting should collect important primary data such as level of acceptance amongst teachers and parents.

Conclusion: although data was not available to fully assess the intervention in terms of cost-effectiveness and extent of coverage, the SI! intervention can be considered a best practice in terms of outcomes, compared to the impact of similar multidimensional interventions targeting childhood obesity. To further enhance implementation, intervention administrators could take into consideration policy options laid out in this case study, such as additional monitoring of the food environment.

Intervention description

Cardiovascular diseases (CVD) are a leading cause of death, comprising approximately half of all non-communicable disease (NCD) deaths (Benziger, Roth and Moran, 2016[1]). One of the primary determinants of CVD is obesity, as well as its associated comorbidities (diabetes, hypertension) (Rodríguez-Artalejo et al., 2002[2]). In 2018, almost 60% of people in OECD countries were overweight, and 25% were obese (OECD, 2019[3]). The adoption of unhealthy behaviours leading to the development of CVD risk factors takes place in early childhood (Peñalvo et al., 2013[4]). However, obesity is largely preventable, highlighting the importance of effective health promotion early on in the life course.

The SI! intervention is a school-based multidimensional health intervention in Madrid, Spain, targeting cardiovascular health. It seeks to equip schoolchildren with the behaviours and skills necessary to maintain healthy life habits throughout the life course. The intervention focuses on diet, physical activity (PA), body and heart, and emotional management. The 2011 trial in Madrid studied in this analysis[1] included children aged three, four and five years of age and also involved families, teachers and schooling environments. The intervention is delivered over a four-week period every year and is dedicated to teaching children, parents and children about the importance of leading a healthy lifestyle (112 hours in total, 70 of which are dedicated to children) (Peñalvo et al., 2013[4]). On a broader level, the intervention helps promote healthier school and home environments, by working with the canteens, for instance, to design nutritionally adequate menus, or by recommending healthy snacks to the children's families (20 hours) (Peñalvo et al., 2013[4]).

Twenty-four schools in Madrid participated in the 2011 study, with half the schools completing the intervention and the other half being assigned to the control group. The aim of the intervention was to have a positive effect on the schoolchildren's lifestyle behaviours, as well as on adiposity markers.

OECD Best Practices Framework assessment

This section analyses SI! against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 11.1 for a high level assessment of SI!). Further details on the OECD Framework can be found in in Annex A.

Box 11.1. Assessment of SI! school-based multidimensional intervention

Effectiveness

- The intervention has been successful in improving objective and subjective measures of health amongst young children

Efficiency

- Cost information is not available for the SI! intervention
- Findings from similar school-based interventions indicate they are typically cost-effective or even cost-saving

Equity

- The selection criteria for participating schools indicates the intervention is focused on students from ethnic and/or lower socio-economic backgrounds

Evidence-base

- The primary outcome of SI! evaluated changes in knowledge, habits and attitudes (KHA) of children using a survey delivered by trained paediatric psychologists. Objective outcome measures such as BMI were also collected
- The quality of evidence to evaluate the change in KHA and objective outcome measures was "strong" in many areas including the data collection methods used, controlling for confounders and overall study design

Extent of coverage

- Information on participation rates not publically available and has therefore not been assessed. An analysis by OECD found that school-based interventions capture 90% of children aged between 8 and 18 years.

Effectiveness

Effect of the intervention on healthy lifestyle behaviours

The results of the SI! Intervention show that the intervention was generally successful in positively impacting the schoolchildren's knowledge, attitude and habits (KAH) relating to the intervention content across all age groups (Peñalvo et al., 2015[5]). Indeed, all three years had higher overall KAH scores than the control group at every follow-up check. The greatest improvements were seen in terms of physical activity, where the KAH was consistently higher in every age group (Peñalvo et al., 2015[5]). At the one-year follow-up for instance, knowledge, attitudes and habits regarding physical activity were higher in the intervention group than the control by 1.41, 2.10 and 2.52 in KAH scores from baseline for children aged three, four and five years, respectively (Table 11.2). There were also marginal improvements for the dietary component across all years, however, some participants aged four and five showed no difference in KAH scores. Despite the overall positive impact of the intervention, there were little to no changes in terms of the KAH scores relating to body and heart, further, they were not statistically significant (Peñalvo et al., 2015[5]). Further, data was not available in year two for those aged five and in year three for those aged four or five.

Table 11.2. Yearly differential changes on KAH scores between intervention and control groups from baseline by trial component

Score	1 Year Follow-up Diff (95% CI)	2 Year Follow-up Diff (95% CI)	3 Year Follow-up Diff (95% CI)
Age three			
KAH overall	4.36** (1.87 to 6.86)	5.71** (3.74 to 7.68)	3.92** (1.86 to 5.97)
KAH Diet	1.51* (0.10 to 2.92)	1.65* (0.33 to 2.97)	0.94* (0.19 to 1.70)
KAH Physical Activity	1.41* (0.47 to 2.35)	3.72** (2.52 to 4.94)	2.59** (1.41 to 3.77)
KAH Body & Heart	0.83 (−0.22 to 1.88)	0.35 (−0.34 to 1.05)	0.33 (−0.36 to 1.02)
Age four			
KAH overall	3.49* (1.26 to 5.72)	4.69** (2.82 to 6.56)	
KAH Diet	0.83 (−0.10 to 1.77)	1.54** (0.76 to 2.32)	
KAH Physical Activity	2.10** (0.91 to 3.28)	2.69** (1.33 to 4.94)	
KAH Body & Heart	0.61 (−0.24 to 1.45)	0.35 (−0.10 to 0.81)	
Age five			
KAH overall	2.34* (0.89 to 3.79)		
KAH Diet	0.14 (−1.02 to 1.29)		

Score	1 Year Follow-up Diff (95% CI)	2 Year Follow-up Diff (95% CI)	3 Year Follow-up Diff (95% CI)
KAH Physical Activity	2.52** (1.50 to 3.55)		
KAH Body & Heart	0.46 (−0.14 to 1.06)		

Note: The scores were based on self-reported surveys, and evaluated by trained psychologists.
* denotes 0.001 < p value ≤ 0.05.
** denotes p value ≤ 0.001.
Source: Peñalvo et al. (2015[5]), "The SI! Program for Cardiovascular Health Promotion in Early Childhood", https://doi.org/10.1016/j.jacc.2015.08.014.

Effect of the intervention on adiposity markers

The SI! intervention had marginal effects on adiposity markers, but these were more significant than the results of similar studies. Due to the duration of the trial, the greatest overall change in anthropometric measurements was seen for those aged three years. There were no significant differences observed in either the one-year (five years of age) or the two-year (four years of age) groups. The waist circumference was in fact lower for the control than the intervention group at the three year follow-up, but this result was not statistically significant (p = 0.179) (Peñalvo et al., 2015[5]). Nonetheless, 1.1% of children in the intervention group were considered obese and 7% overweight by the end of the intervention, versus 1.3% and 7.4% in the control group, respectively (Peñalvo et al., 2015[5]). The effects in terms of BMI and subscapular skinfold (to assess body fat) were minimal, but the results were still favourable towards the intervention group throughout (Peñalvo et al., 2015[5]). Finally, the z-score (the median value of the reference population) for tricep skinfold and waist circumference was more likely to decline by at least 0.1 in the intervention group[2] (Peñalvo et al., 2015[5]).

The results of this trial are more significant than those of comparable studies. Very few interventions of two years duration or less have had any positive impact on children's anthropometric measurements (Peñalvo et al., 2015[5]). The *Healthy Study* in the United States, a similar three-year multidimensional intervention targeting childhood obesity in 11-year-olds, for instance, did not alter the incidence or prevalence of obesity in either the intervention or control group, nor the remission of overweight or obesity (Foster et al., 2008[6]). Similarly, the *CATCH study,* a comparable three-year multifaceted intervention targeting children's cardiovascular health also in the United States, did not record successful outcomes in terms of cholesterol measures, blood pressure or body size (Luepker, 1996[7]). Finally, the *ToyBox-study*, a school-based intervention seeking to prevent childhood obesity in six European countries did not have any significant impact on the prevalence of obesity or overweight amongst the participants (Miguel-Berges et al., 2019[8]). However, the study did nonetheless lead to an increase in physical activity amongst Belgian schoolchildren (De Craemer et al., 2014[9]). These results point to the potential of the SI! intervention and the importance of long-term comprehensive health promotion interventions early in life.

Efficiency

The OECD's 2019 obesity report highlights that the investment in school-based interventions corresponds approximately to its GDP benefit, and that annual savings in health expenditure for this type of intervention across all countries could amount to USD PPP 37 million (EUR 25 million) (OECD, 2019[3]). Moreover, the average yearly cost per capita for school-based interventions in Spain is USD PPP 3.05 (EUR 2.09), and these interventions could save USD PPP 0.18 (EUR 0.12) per capita in health expenditure annually.

It is possible that the SI! intervention is cost-effective given that it is comparable to other cost-effective school-based childhood obesity interventions. According to the Join Action on Nutrition and Physical Activity (JANPA), the SI! intervention's overall budget was under EUR 50 000 per year. No additional data on the cost-effectiveness of the intervention was available. However, comparable multicomponent school-based obesity prevention interventions were generally found to be cost-effective or even cost-saving (Zanganeh et al., 2019[10]). A school-based nutrition and PA intervention including children and their parents in Germany, for example, achieved costs of EUR 11.11 (USD PPP 16.24) for each centimetre reduction in waist circumference (Kesztyüs et al., 2011[11]). The overall intervention generally presented favourable cost-effectiveness ratios (Kesztyüs et al., 2011[11]). Finally, a comprehensive PA intervention in schools in Australia reached cost-effectiveness ratios of AUD 1 408 (USD PPP 978) per BMI unit avoided and AUD 563 (USD PPP 391) per 10% reduction in BMI z-score (Sutherland et al., 2016[12]).

Equity

The SI! intervention can be said to focus on people living in conditions of disadvantage. Indeed, it was specific in selecting the schools in the intervention according to socio-economic criteria. These stipulated that 10-32% of the schoolchildren had to be from an immigrant background, 36-54% had to be receiving free or subsidised school meals and 13-20% had to be receiving free school books and materials.

However, the results showed that the variations in overall KAH score were related to parental socio-economic variables (p for interaction < 0.05). Children whose parents had at least a high school diploma had a higher KAH score on average (p for interaction < 0.001) (Peñalvo et al., 2015[5]). This was also the case for children whose parents earned more than the minimum annual wage in Spain (p for interaction < 0.001) and who were of European origin ($p < 0.001$) (Peñalvo et al., 2015[5]). No significant variations were observed according to parental age.

Evidence-base

The trial of the SI! intervention was set up as a cluster-RCT open label intervention (where information is not withheld from trial participants). These types of studies are generally preferable as the randomisation element reduces the possibility of bias. The selected 24 schools were allocated on a random basis to the intervention or control group. Moreover, the schools were randomised on a stratified basis by immigration and scholarship percentage in order to guarantee an overall cultural and socio-economic balance amongst the groups (Peñalvo et al., 2015[5]).

Using the *Quality Assessment Tool for Quantitative Studies,* the design of the study to evaluate SI! was rated as “strong” in several areas: selection, bias, study design, confounders and data collection methods (Effective Public Health Practice Project, 1998[13]). However, similar to many public health interventions, neither researchers nor participants were blinded therefore the study was rated as “weak” against this section. Details of the assessment are in Table 11.3.

Table 11.3. Evidence-based assessment, SI!

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	Less than 60%
Selection bias score: Moderate		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	Yes
	Was the method of randomisation described?	Yes
	Was the method appropriate?	Yes

Assessment category	Question	Score
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	Can't tell
	What percentage of potential confounders were controlled for?	80-100%
Confounders score: Strong		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	Yes
Withdrawals and dropouts score: Strong		

Source: Effective Public Health Practice Project (1998[13]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

Information on participation rates is not publically available and has therefore not been possible to assess. However, if scaled-up to a national level, this type of intervention has the potential to cover a large part of the target population. Indeed, it focuses on children who are of age to be in compulsory education, and in EU27 and OECD countries, in general, school participation rates are virtually universal.

Policy options to enhance performance

The design of SI! fits many of the overarching success factors in terms of school-based childhood obesity prevention interventions (Box 11.2). The trial was a multidimensional intervention aimed at generating long-term lifestyle behaviour change amongst schoolchildren. It provided training and support for teachers, parental activities and promoted healthy diet and PA behaviours within schools by positively impacting the school community. Moreover, the content of the intervention was integrated into the curriculum to minimise the burden on schools.

Box 11.2. Example success factors for school-based obesity interventions

This box lists several success factors related to obesity interventions in schools. The list draws upon the WHO's Nutrition Friendly Schools Initiative, however, it is not exhaustive. For further details on WHO's Nutrition Friendly Schools Initiative, see: https://apps.who.int/iris/handle/10665/338781

- **Long duration:** a systematic review of school-based nutrition education programs found interventions that last longer than one year were more likely to demonstrate effectiveness (Silveira et al., 2011[14]). These results are supported by an earlier meta-analysis which found school-based obesity interventions implemented for longer than a year reduced obesity levels (Gonzalez-Suarez et al., 2009[15]).
- **Holistic approach involving the community:** given the complexity of childhood obesity, schools are increasingly moving towards holistic approaches to reducing BMI (often referred to as "comprehensive school health" or "health promoting schools") (Okely and Hammersley, 2018[16]). Holistic approaches to reducing obesity aim to change the school and community environment in order for the easy choice to be the healthy choice.
- **Parental involvement**: obesity is a complex health issue and requires initiatives implemented in both the school and home environment. The importance of transferring knowledge and skills regarding healthy eating and exercise in schools to the home is supported by a recent article published in the Lancet which found nearly all successful school-based obesity interventions promoted family involvement (Waters et al., 2011[17]; Okely and Hammersley, 2018[16]; Ash et al., 2017[18]).
- **Training and support for teachers**: to successfully implement school-based obesity interventions all staff involved must receive the appropriate training and professional development support and as well as ongoing capacity building and support (Jones et al., 2014[19]).

Enhancing effectiveness

Literature on best practices in this field emphasise the importance of changes within the school. In upscaling or adapting this intervention, consideration could be given to monitoring the food environment, in order to *enhance effectiveness*. Other policies for intervention administrators to consider include further regulation and improvement of the nutritional quality of foods onsite (e.g. school meals, vending machines, children's packed lunches). Additional emphasis could also be placed on exercise within schools (e.g. by integrating additional obligatory and voluntary PA sessions throughout the school week). A school-based intervention in Australia, for instance, integrated PA activities into the school framework, which resulted in significantly more moderate-intensity and vigorous-intensity PA (MVPA) amongst the children (27 min more MVPA per week) (Sutherland et al., 2015[20]), and an average decline in BMI by –0.28 kg at 24 months (Hollis et al., 2016[21]). Finally, in line with WHO's Nutrition-Friendly Schools Initiative (NFSI), SI! administrators should continue (WHO, 2021[22]):

- Focusing on increasing parental involvement, for example by promoting face-to-face interaction
- Engaging the community, for example, by procuring healthy fruit and vegetables from local suppliers (in line with EU's Farm to Fork Strategy)
- To ensure that teachers receive appropriate training and education to deliver obesity prevention activities.

Enhancing efficiency

Policy makers and programme administrators should prioritise an efficiency study of SI! given this information isn't currently available. Example efficiency indicators include incremental cost effectiveness ratios using BMI units avoided, reduction in waist circumference (in centimetres) and/or reduction in BMI z-scores as outcomes of interest. For example, ToyBox – another school-based obesity prevention case study (see Chapter 8) – assessed efficiency using incremental cost-effectiveness ratios, specifically the cost per quality-adjusted life year gained.

Enhancing equity

A review of publically available information indicates the SI! Intervention is implemented homogenously. To *enhance equity*, to the extent possible, SI! administrators are encouraged to undertake a review to determine whether the intervention should be adapted to meet the needs of different vulnerable groups.

Enhancing the evidence base

In order to better understand how different groups of students benefit from the intervention, future evaluations should break down key indicators, for example, by family SES and ethnicity. A richer dataset will ultimately *enhance the evidence-base* and allow administrators to adapt the intervention to better meet the needs of disadvantaged students.

Future evaluations would benefit from including additional diet-related outcome indicators such as fruit and vegetable consumption (e.g. the proportion of children who consume fruits/vegetables at least once per day).

Enhancing extent of coverage

Information on participation rates are not publically available, nevertheless, high-level policies to boost participation rates in school-based activities are summarised below:

- Promoting the intervention with support from government organisations to enhance trust amongst parents. For example, the *Good for Kids, Good for Life* intervention in New South Wales (Australia) was promoted using a support letter from the State's Chief Health Officer. Policy makers however should first consider if messaging from government organisations may in fact reduce uptake among disadvantaged groups. For example, there is evidence showing those with a low SES and/or lower level of education are more anxious and suspicious of prevention messaging from public health authorities (Peretti-Watel and Constance, 2009[23]).
- Promoting SI! as a healthy behaviour intervention that aims to boost enjoyable physical activity and healthy eating as opposed to obesity prevention. Framing SI! in a positive light may reduce stigma associated with participation.
- Increasing efforts to recruit students whose parents are from culturally or linguistically diverse backgrounds given consent may be harder to obtain (for example, by including staff members who are knowledgeable about relevant cultural characteristics).
- Promoting the intervention over a sufficiently long time period using colourful, "eye-grabbing" material in conjunction with frequent digital and face-to-face follow-up with parents.

Transferability

This section explores the transferability of SI! is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring SI!.

Previous transfers

SI! has not been transferred outside of Spain, however, school-based interventions targeting obesity are common across OECD and non-OECD European countries.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Several indicators to assess the transferability of SI! were identified (Table 11.4). Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 11.4. Indicators to assess the transferability of SI!

Indicator	Reasoning	Interpretation
Sector specific context (early childhood education)		
Enrolment rate in early childhood education (children aged 3-5 years)	SI! targets children aged 3-5 who attend early childhood education (i.e. kindergarten). Therefore, SI! will have a greater extent of coverage in countries with higher enrolment rates.	↑ = "more transferable"
Student to teacher ratio in early childhood education	SI! will be more successful in countries with a low student to teacher ratios given a reduced workload.	↓ = "more transferable"
% of teachers who are highly motivated*	SI! will be more successful in countries whose teachers are highly motivated	↑ = "more transferable"
Political context		
Childhood obesity strategy	SI! will be more transferable to countries that prioritise childhood obesity	"Yes" = more transferable
Economic context		
Annual expenditure on early childhood education and care per child in USD, converted to purchasing power parities (PPP)	SI! will be more successful in countries who spend more on early childhood education and care	↑ = "more transferable"

* This indicator represents the proportion of teacher who report that influencing the development of children and young people is of moderate or high importance in deciding to become a better teacher.
Source: WHO (n.d.[24]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[25]), "OECD data: Education", https://data.oecd.org/education.htm.

Results

Data from publically available sources indicate SI! is transferable based on data related to the economic, sector (i.e. early childhood education) and political contexts (Table 11.5). For example, SI! is likely to have political support given most governments have set out a national strategy addressing childhood obesity.

Further, spending on early childhood education and care (ECEC) is higher, on average, amongst OECD and non-OECD EU countries compared to Spain (USD PPP 9 729 versus USD PPP 7 759). However, SI! may have a lower extent of coverage in other countries given enrolment rates in ECEC are relatively high in Spain (97% versus 83%, on average, amongst OECD and non-OECD EU countries).

Table 11.5. Transferability assessment by country, SI! (OECD and non-OECD European countries)

A darker shade indicates SI! is more suitable for transferral in that particular country

	Enrolment rate by age – 3-5 years (%)	Ratio of students to teaching staff in educational institutions, primary	Teacher motivation level (%)*	Childhood obesity strategy	Funding for early childhood education, USD PPP
Spain	**97**	**14**	**89**	**Yes**	**7 759**
Australia	57	15	96	No**	7 863
Austria	90	12	96	Yes	11 009
Belgium	98	13	95	Yes	n/a
Bulgaria	n/a	n/a	95	Yes	n/a
Canada	n/a	17	99	Yes	n/a
Chile	79	19	97	Yes	6 727
Colombia	64	23	98	Yes	n/a
Costa Rica	60	12	n/a	No	n/a
Croatia	n/a	n/a	95	No	n/a
Cyprus	n/a	n/a	n/a	Yes	n/a
Czech Republic	87	19	93	Yes	6 109
Denmark	99	12	94	Yes	18 502
Estonia	91	13	88	Yes	8 137
Finland	82	14	83	Yes	13 186
France	1.00	19	92	No	8 894
Germany	94	15	n/a	Yes	12 817
Greece	n/a	9	n/a	No	n/a
Hungary	92	10	93	Yes	7 401
Iceland	97	11	79	Yes	17 310
Ireland	60	15	n/a	Yes	4 568
Israel	1.00	15	97	Yes	5 049
Italy	91	12	79	Yes	8 780
Japan	n/a	16	89	Yes	7 609
Latvia	93	12	93	Yes	6 222
Lithuania	86	11	91	Yes	6 677

	Enrolment rate by age – 3-5 years (%)	Ratio of students to teaching staff in educational institutions, primary	Teacher motivation level (%)*	Childhood obesity strategy	Funding for early childhood education, USD PPP
Spain	**97**	**14**	**89**	**Yes**	**7 759**
Luxembourg	85	9	n/a	Yes	19 326
Malta	n/a	n/a	96	Yes	n/a
Mexico	73	26	99	Yes	2 570
Netherlands	89	16	86	Yes	6 959
New Zealand	n/a	17	96	Yes	9 599
Norway	97	10	89	Yes	19 663
Poland †	n/a	10	n/a	Yes	7 164
Portugal	91	12	94	No	n/a
Republic of Korea	n/a	17	n/a	Yes	n/a
Romania	n/a	n/a	98	Yes	n/a
Slovak Republic	78	18	93	Yes	6 123
Slovenia	91	10	89	Yes	9 329
Sweden	94	14	94	Yes	15 442
Turkey	38	17	98	Yes	n/a
United Kingdom	72	20	n/a	Yes	5 971
United States	n/a	15	99	Yes	n/a

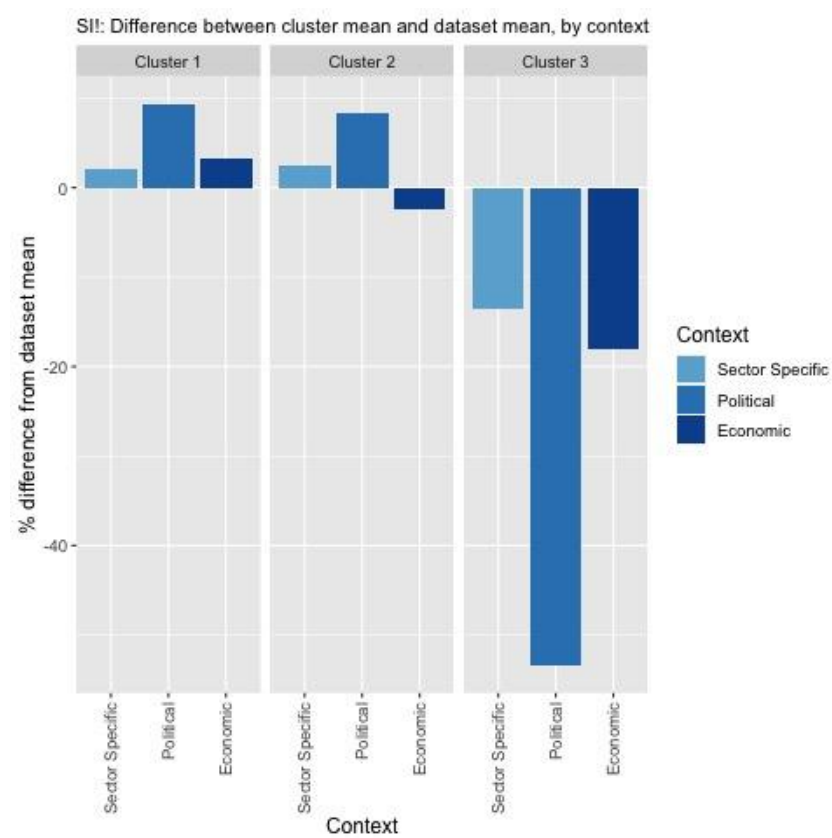
Note: The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). *Results in Canada and the United Kingdom represents Alberta and England only, respectively. Further, results for Belgium are an average of the Belgium Flemish and Belgium French teachers. ** There are a number of strategies focusing on children and young people within the proposed National Obesity Prevention Strategy (2022-2032). n/a = no data available; PPP = purchasing power parity.
Source: WHO (n.d.[24]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[25]), "OECD data: Education", https://data.oecd.org/education.htm.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 11.4. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 11.1 and Table 11.6:

- Countries in cluster one have political, economic and sector specific arrangements in place to transfer SI!. Countries in this cluster are therefore less likely to experience issues associated with implementing and operating SI! in their local context.
- Countries in cluster two have political and sector specific arrangements in place to transfer this intervention indicating they are also good transfer candidates. However, before transferring the intervention, countries in this cluster would benefit from increasing spending on early childhood education and care (ECEC) to ensure long-term affordability. It is important to note that Spain, which operates SI!, falls under this cluster indicating high levels of ECEC spending, although ideal, is not a pre-requisite.
- Remaining countries are in cluster three, which before transferring SI! would benefit from undertaking further analysis to ensure the intervention is affordable and aligns with overarching political priorities.

Figure 11.1 Transferability assessment using clustering, SI!



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: WHO (n.d.[24]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2022[25]), "OECD data: Education", https://data.oecd.org/education.htm.

Table 11.6. Countries by cluster, SI!

Cluster 1	Cluster 2	Cluster 3
Austria	Canada	Australia
Belgium	Estonia	Costa Rica
Bulgaria	Finland	Croatia
Chile	Iceland	France
Colombia	Italy	Greece
Czech Republic	Japan	Portugal
Denmark	Malta	
Germany	Netherlands	
Hungary	New Zealand	
Ireland	Republic of Korea	
Israel	Romania	
Latvia	Slovak Republic	
Lithuania	Spain	
Luxembourg	Turkey	
Mexico	United States	
Norway		
Poland		
Slovenia		
Sweden		
Switzerland		
United Kingdom		

Note: Due to high levels of missing data, Cyprus is not included in the analysis.

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of SI!, for example, the level of parental engagement in schools. Therefore, Box 11.3 outlines several new indicators policy makers should consider before transferring SI!.

Box 11.3. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators, as well as those outlined within WHO's "Making every school a health-promoting school" report (WHO, 2021[26]).

Population context

- What is the ethnicity and cultural diversity of the target population?
- What is the level of acceptability of the intervention amongst parents?
- What is the level of health literacy amongst parents? (e.g. knowledge regarding what constitutes health eating, and the impact of healthy eating and exercise on overall health and well-being)
- What is the level of parental engagement with schools and teachers?

Sector specific context (early childhood education)

- What is the level of acceptability of the intervention amongst teachers and the Head of School?
- Does the school have an overarching policy/framework in place to promote healthy lifestyles amongst students?

- What is the level of health literacy amongst teachers? (e.g. how comfortable do teachers feel activities part of the intervention?)
- Does the school already include healthy lifestyle lessons in the formal curricula?
- What types of infrastructure is available in schools for children to be active? (e.g. playgrounds)
- How much greenspace is there for children to be physically active in the school environment?
- Do kindergartens have access to a canteen on site? Or is food provided by parents?
- What are the regulations/legislation regarding data collection from young children?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target setting?

Conclusion and next steps

Over the course of the past three decades, there has been a significant increase in the prevalence of overweight and obesity worldwide. The adoption of inadequate lifestyle behaviours leading to situations of obesity or overweight takes place in early childhood (Peñalvo et al., 2013[27]). The SI! Intervention aims to prevent such habits from forming through a school-based multicomponent intervention.

The results from the study show that intervention has been successful in positively impacting schoolchildren's healthy lifestyle knowledge, attitude and habits, notably in terms of physical activity, but also in terms of diet. The intervention also achieved reductions in anthropometric measurements in the children, even though these were at times minimal. Although data surrounding cost was not available, comparable interventions have been shown to be cost-effective, and even cost-saving. The quality of evidence used to evaluate the intervention can be considered to be of moderate quality. Furthermore, the coverage of the intervention in its entirety is relatively extensive (children aged 3-16), but its scope was perhaps limited in the initial trial by its focus on children aged 3-5 in the Madrid area. Moreover, the SI! intervention was specific in selecting intervention and control schools according to socio-economic criteria, although the results from the trial highlighted a need to focus more on these variables in the design of the intervention. Finally, the study fit the majority of best practice criteria for obesity prevention interventions in schools, however, further changes, such as incorporating physical activity, could be considered to achieve the intervention's core objective: reducing obesity and improving overall health among school-aged children.

Based on available information, SI! is considered broadly transferable. For example, the SI! intervention addresses obesity amongst children, which is a top public health priority across a range of OECD and European countries. However, prior to implementation, policy makers in the target setting should collect information on other important indicators, including those outlined in Box 11.4.

Box 11.4. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance SI! are listed below:

- Provide funding support to SI! administrators to implement policies outlined in this case study, for example, to expand the intervention to include physical activity
- Ensure funding for future scale-up and transfer efforts
- Promote findings from the SI! case study to better understand what countries/regions are interested in transferring the intervention.

References

Ash, T. et al. (2017), *Family-based childhood obesity prevention interventions: A systematic review and quantitative content analysis*, BioMed Central Ltd., https://doi.org/10.1186/s12966-017-0571-2. [18]

Benziger, C., G. Roth and A. Moran (2016), *The Global Burden of Disease Study and the Preventable Burden of NCD*, Elsevier B.V., https://doi.org/10.1016/j.gheart.2016.10.024. [1]

De Craemer, M. et al. (2014), "The effect of a kindergarten-based, family-involved intervention on objectively measured physical activity in Belgian preschool boys and girls of high and low SES: The ToyBox-study", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 11/1, https://doi.org/10.1186/1479-5868-11-38. [9]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [13]

Foster, G. et al. (2008), "A Policy-Based School Intervention to Prevent Overweight and Obesity", *PEDIATRICS*, Vol. 121/4, pp. e794-e802, https://doi.org/10.1542/peds.2007-1365. [6]

Gonzalez-Suarez, C. et al. (2009), "School-Based Interventions on Childhood Obesity. A Meta-Analysis", *American Journal of Preventive Medicine*, Vol. 37/5, pp. 418-427, https://doi.org/10.1016/j.amepre.2009.07.012. [15]

Hollis, J. et al. (2016), "Effects of a 'school-based' physical activity intervention on adiposity in adolescents from economically disadvantaged communities: secondary outcomes of the 'Physical Activity 4 Everyone' RCT", *International Journal of Obesity*, Vol. 40/10, pp. 1486-1493, https://doi.org/10.1038/ijo.2016.107. [21]

Jones, R. et al. (2014), "School-based obesity prevention interventions: Practicalities and considerations", *Obesity Research and Clinical Practice*, Vol. 8/5, pp. e497-e510, https://doi.org/10.1016/j.orcp.2013.10.004. [19]

Kesztyüs, D. et al. (2011), "Economic evaluation of URMEL-ICE, a school-based overweight prevention programme comprising metabolism, exercise and lifestyle intervention in children", *The European Journal of Health Economics*, Vol. 14/2, pp. 185-195, https://doi.org/10.1007/s10198-011-0358-3. [11]

Luepker, R. (1996), "Outcomes of a Field Trial to Improve Children's Dietary Patterns and Physical Activity", *JAMA*, Vol. 275/10, p. 768, https://doi.org/10.1001/jama.1996.03530340032026. [7]

Miguel-Berges, M. et al. (2019), "Combined Longitudinal Effect of Physical Activity and Screen Time on Food and Beverage Consumption in European Preschool Children: The ToyBox-Study", *Nutrients*, Vol. 11/5, p. 1048, https://doi.org/10.3390/nu11051048. [8]

OECD (2022), *OECD data: Education*, https://data.oecd.org/education.htm. [25]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [3]

Okely, A. and M. Hammersley (2018), *School–home partnerships: the missing piece in obesity prevention?*, Elsevier B.V., https://doi.org/10.1016/S2352-4642(17)30154-2. [16]

Peñalvo, J. et al. (2015), "The SI! Program for Cardiovascular Health Promotion in Early Childhood", *Journal of the American College of Cardiology*, Vol. 66/14, pp. 1525-1534, https://doi.org/10.1016/j.jacc.2015.08.014. [5]

Peñalvo, J. et al. (2013), "A cluster randomized trial to evaluate the efficacy of a school-based behavioral intervention for health promotion among children aged 3 to 5", *BMC Public Health*, Vol. 13/1, https://doi.org/10.1186/1471-2458-13-656. [4]

Peñalvo, J. et al. (2013), "The Program SI! intervention for enhancing a healthy lifestyle in preschoolers: first results from a cluster randomized trial", *BMC Public Health*, Vol. 13/1, https://doi.org/10.1186/1471-2458-13-1208. [27]

Peretti-Watel, P. and J. Constance (2009), "Comment les fumeurs pauvres justifient-ils leur pratique et jugent-ils la prévention ?", *Déviance et Société*, Vol. 33/2, p. 205, https://doi.org/10.3917/ds.332.0205. [23]

Rodríguez-Artalejo, F. et al. (2002), "Dietary patterns among children aged 6-7 y in four Spanish cities with widely differing cardiovascular mortality", *European Journal of Clinical Nutrition*, Vol. 56/2, pp. 141-148, https://doi.org/10.1038/sj.ejcn.1601296. [2]

Silveira, J. et al. (2011), *Effectiveness of school-based nutrition education interventions to prevent and reduce excessive weight gain in children and adolescents: A systematic review*, J Pediatr (Rio J), https://doi.org/10.2223/JPED.2123. [14]

Sutherland, R. et al. (2015), "Physical Activity 4 Everyone: school-based intervention to prevent decline in adolescent physical activity levels: 12 month (mid-intervention) report on a cluster randomised trial", *British Journal of Sports Medicine*, Vol. 50/8, pp. 488-495, https://doi.org/10.1136/bjsports-2014-094523. [20]

Sutherland, R. et al. (2016), "Cost effectiveness of a multi-component school-based physical activity intervention targeting adolescents: the 'Physical Activity 4 Everyone' cluster randomized trial", *International Journal of Behavioral Nutrition and Physical Activity*, Vol. 13/1, https://doi.org/10.1186/s12966-016-0418-2. [12]

Waters, E. et al. (2011), *Interventions for preventing obesity in children*, John Wiley and Sons Ltd, https://doi.org/10.1002/14651858.CD001871.pub3. [17]

WHO (2021), *Making every school a health-promoting school: Global standards and indicators*, World Health Organization and the United Nations Educational, Scientific and Cultural Organization, https://www.who.int/publications/i/item/9789240025059. [26]

WHO (2021), *Nutrition action in schools: a review of evidence related to the nutrition-friendly schools initiative*, https://www.who.int/publications/i/item/9789241516969. [22]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [24]

Zanganeh, M. et al. (2019), "A Systematic Review of Methods, Study Quality, and Results of Economic Evaluation for Childhood and Adolescent Obesity Intervention", *International Journal of Environmental Research and Public Health*, Vol. 16/3, p. 485, https://doi.org/10.3390/ijerph16030485. [10]

Notes

[1] The SI! intervention in its entirety includes schoolchildren aged 3-16. However, this study focuses exclusively on the pilot trial of the intervention implemented in 2011 amongst children 3-5 years of age, given the lack of available information on other age groups.

[2] Z-scores reflect the number of standard deviations away from the mean in the reference group (i.e. a z-score of -1 indicates the score is 1 standard deviation below the men).

12 Diabetes in Europe: Prevention using lifestyle, physical activity and nutrition

This chapter covers the case study of Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutrition (DE-PLAN), a type 2 diabetes mellitus (T2DM) prevention programme for high-risk individuals operating in several European countries. The case study includes an assessment of DE-PLAN against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

DE-PLAN: Case study overview

Description: the Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutritional Intervention in Greece (DE-PLAN) is a type 2 diabetes mellitus (T2DM) prevention programme for high-risk individuals. The study seeks to prevent T2DM by improving diet and physical activity (PA) levels through a lifestyle, community-based intervention. DE-PLAN has been implemented in 17 countries across Europe.

Best practice assessment:

Table 12.1. OECD best practice assessment of DE-PLAN

Criteria	Assessment
Effectiveness	The intervention successfully impacted participants' anthropometric and clinical measurements, as well as dietary intake, but had no significant effect on levels of PA
Efficiency	Economic evaluations of comparable diabetes prevention interventions conclude they are generally cost-effective
Equity	The intervention does not specifically target vulnerable populations or individuals from lower socio-economic groups,
Evidence-base	The evidence to evaluate outcomes had a "strong" data collection method and also performed well in regards to the study design used
Extent of coverage	The participation rate was 76% and the dropout rate 35%

Enhancement options: to *enhance effectiveness,* further emphasis could be placed on the importance of PA in the bi-monthly meetings, and systematic and brief counselling, as well as information sessions, on smoking cessation and nicotine dependence. Moreover, to *enhance effectiveness*, the families and broader environments of the participants could also be involved. To *enhance equity*, the programme could seek to recruit participants from more vulnerable groups, and adapt the intervention to their specific needs. To *enhance the evidence-base*, a control group could be included, alternatives to food-frequency questionnaires could be considered, and a wider scope of academic literature could be taken into account. To *enhance extent of coverage,* less invasive and time-consuming alternatives to the oral glucose tolerance test (OGTT) could be employed.

Transferability: DE-PLAN is a broadly transferable intervention as evidenced by its implementation in 17 European countries. Further, it is likely to have political support given it address three high priority issues – diabetes, obesity and physical inactivity.

Conclusion: although data was not available to fully assess the intervention in terms of cost-effectiveness, the DE-PLAN study in Greece can be considered a best practice in terms of outcomes. To further enhance implementation, programme administrators could take into consideration policy options laid out in this case study, such as including counselling sessions on smoking cessation.

Intervention description

Cardiovascular diseases (CVD) are a leading cause of death, comprising approximately half of all non-communicable disease (NCD) deaths (Benziger, Roth and Moran, 2016[1]). One of the primary determinants of CVD is obesity, as well as its associated comorbidities (diabetes, hypertension) (Rodríguez-Artalejo et al., 2002[2]). In 2017, over 475 million people were affected by diabetes (Institute for Health Metrics and Evaluation, 2019[3]), and in 2018, almost 60% of people in OECD countries were overweight, and 25% were obese (OECD, 2019[4]). However, obesity and diabetes are largely preventable, highlighting the importance of effective health promotion and disease prevention strategies (World Health Organization, 2020[5]).

The DE-PLAN study is a large-scale, community-based diabetes prevention programme implemented within a primary care setting. The intervention aligns with the WHO's Best Buys report, which supports lifestyle programmes seeking to prevent T2DM in the management of diabetes (WHO, 2017[6]). To date, 17 countries have participated in the intervention, each of which have tailored activities to fit local settings and needs. This analysis assesses the impact of the DE-PLAN study in Greece. This particular intervention was implemented through group-based consultations, but participating countries could also choose to run these as individual sessions. One-hundred and twenty-five participants were recruited in primary care (during one of their visits) and occupational settings based on results from a questionnaire seeking to identify high-risk individuals for T2DM. Throughout the intervention, registered dieticians ran six one-hour sessions across one year at the participants' place of residence or work in groups of 6-10. These provided information and a space for discussion on healthy lifestyles, individual and general risk of disease, diet, and exercise. The programme sought to decrease the intake of saturated fat, trans fatty acids, sugars and refined cereals, to promote the intake of at least five portions of fruits and vegetables per day, as well as to increase physical activity (PA) to 30-40 min of moderate intensity aerobic exercise five times a week. Participants underwent a lipid profile and anthropometric measurements, an oral glucose tolerance test (OGTT) and a clinical evaluation before and after the intervention.

OECD Best Practices Framework assessment

This section analyses DE-PLAN against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 12.1 for a high-level assessment of DE-PLAN). Further details on the OECD Framework can be found in Annex A. Please note, data on the efficiency of DE-PLAN in Greece was not publically available, therefore, this criterion was assessed according to information from the DE-PLAN in Catalonia (CAT) and from comparable interventions, and should only be taken as an indicator of the programme's actual cost-effectiveness.

Box 12.1. Assessment of DE-PLAN T2DM prevention programme in Greece

Effectiveness

- The intervention has been successful in improving participants' anthropometric and clinical measurements, as well as dietary intake, but had no significant impact on levels of PA

Efficiency

- Cost information is not available for the DE-PLAN study in Greece
- Findings from comparable T2DM prevention interventions and from the DE-PLAN CAT (Catalonia) indicate that they are generally cost-effective

Equity

- The intervention did not specifically target a priority population group

Evidence-base

- DE-PLAN was evaluated using a non-randomised, open label interventional clinical trial with no control group

- The study to evaluate DE-PLAN had a "strong" data collection method and also performed well in other areas, such as, the study design and reducing selection bias

Extent of coverage

- Participation rate was 76% and the dropout rate 35%

Effectiveness

Effect of the intervention on anthropometric and clinical measurements

In Greece, the DE-PLAN study had significant outcomes in terms of anthropometric and clinical measurements. On average, participants saw a reduction in:

- weight of 1kg ($p = 0.022$)
- BMI of 0.5 kg/m^2 ($p = 0.014$)
- blood pressure of 6/-1 mmHg ($p < 0.001$)
- total cholesterol of 0.37 mmol/l ($p < 0.0001$)
- LDL cholesterol of 0.39 ($p < 0.0001$) (Makrilakis et al., 2010[7]) (see Table 12.2).

Moreover, there was an increase from baseline in the percentage of individuals with normal glucose tolerance one year after the intervention, from 32.0% to 40.8%, as well as a decrease in the percentage of individuals with any type of dysglycaemia, from 68.0% to 53.6%. However, not all results were significant: there was no important change in waist circumference, 2-h glucose, triglycerides and HDL cholesterol (see Table 12.2).

Table 12.2. Mean anthropometric and clinical data of the participants at baseline and one year after the intervention

Characteristic	Baseline	1 year	Difference	p value
Weight (kg)	89.0	88.0	1.0	0.022
BMI (kg/m^2)	32.0	31.6	0.5	0.014
Waist circumference (cm)	102.9	102.6	0.3	NS
Blood pressure (mmHg)	133/79	127/80	6/-1	< 0.001 (for systolic blood pressure)
Fasting glucose (mmol/l)	5.8	5.7	0.15	0.017
2-h glucose (mmol/l)	6.6	6.6	-0.03	NS
Total cholesterol (mmol/l)	5.9	5.5	0.37	< 0.0001
Triglycerides (mmol/l)	1.4	1.5	-0.03	NS
HDL-C (mmol/l)	1.3	1.3	0.00	NS
LDL-C (mmol/l)	4.0	3.6	0.39	< 0.0001

Note: BMI refers to body mass index; HDL-C to high-density lipoprotein cholesterol; LDL-C to low-density lipoprotein cholesterol; NS to non significant.
A p value < 0.05 is considered statistically significant.
Source: Makrilakis et al. (2010[7]), "Implementation and effectiveness of the first community lifestyle intervention programme to prevent Type 2 diabetes in Greece. The DE-PLAN study", https://doi.org/10.1111/j.1464-5491.2010.02918.x.

Effect of the intervention on lifestyle behaviours

The intervention was relatively successful overall in improving diets, but had no significant effect on levels of PA. Indeed, participants reported fewer weekly servings of whole fat dairy products ($p = 0.018$), processed meats (p = 0.016), sugars and sweets (p = 0.006) and refined cereals (p = 0.045) (Kontogianni et al., 2012[8]) (see Table 12.3). However, there were no important changes in terms of fruit and vegetable intake or weekly PA levels. The former may be due to the fact that most participants already consumed these foods on a daily basis (three servings per day on average), and did not consider it to be substantially different from the intervention goal (five servings per day) (Kontogianni et al., 2012[8]). Nonetheless, by the end of the study, the diets of 58.7% of the participants had improved, 33.9% had worsened and 7.4% were unchanged (Kontogianni et al., 2012[8]). It is also important to note that these results depend on self-reported food diaries, and thus may not accurately reflect participants' food intake. The overall results from this study are, nevertheless, significant. Although the intervention did not impact levels of PA, it had positive outcomes both in terms of anthropometric and clinical measurements, as well as in terms of diet, and can thus be deemed effective.

Table 12.3. Mean changes in dietary and PA variables at baseline and 1 year after the intervention

Variable	Baseline	1 year	p value
Whole fat dairy products (servings/week)	13.4	8.9	0.018
Processed meats (servings/week)	2.30	0.56	0.016
Sugars and sweets (servings/week)	9.6	7.8	0.006
Refined cereals (servings/week)	9.7	7.1	0.045
Vegetables (servings/week)	9.0	9.3	0.623
Fruits (servings/week)	12.1	12.6	0.447
Total minutes of exercise/day (during work and leisure time)	37.2	34.0	0.311

Note: A p value < 0.05 is considered statistically significant.
Source: Kontogianni et al. (2012[8]), "Changes in dietary habits and their association with metabolic markers after a non-intensive, community-based lifestyle intervention to prevent type 2 diabetes, in Greece. The DEPLAN study", https://doi.org/10.1016/j.diabres.2011.09.010.

Efficiency

Although no data on the cost-effectiveness of the study in Greece was available, overall analyses of T2DM prevention programmes, as well as a cost analysis of the DE-PLAN CAT (Catalonia) found these interventions to be generally cost-effective. The former analysis found that the most cost-effective T2DM prevention programmes for high-risk individuals involved a combination of screening for diabetes and impaired glucose tolerance with lifestyle interventions, which amounted to GBP 6 262 (USD PPP 9 204 and EUR PPP 6 296) per QALY gained (Gillies et al., 2008[9]). Moreover, the analysis of the DE-PLAN CAT found that the incremental cost per participant in a group-based intervention setting was of EUR 10 (USD PPP 14.62) per individual, which represents EUR 108 (USD PPP 157.88) per averted case of diabetes (Sagarra et al., 2014[10]). Additionally, the incremental cost-utility ratio was found to be EUR 3 243 (USD PPP 4 741) per quality-adjusted life-year (QALY) gained (Sagarra et al., 2014[10]).

Equity

The literature on adult obesity indicates that those from more vulnerable backgrounds, with lower SES groups and/or with a lower level of education are more likely to be overweight or obese. Through designing and implementing an intervention which addresses a health issue that disproportionally affects adults from lower-SES groups, the DE-PLAN study aims to reduce health inequalities. However, it is unclear whether specific efforts have been made to address other disadvantaged groups, such as children from different ethnic backgrounds and/or who live in remote/regional areas.

It is important to note that obesity interventions delivered in a primary care setting are less likely to reach people with a lower-SES due to access inequalities (OECD, 2019[11]). For example, analysis by OECD estimates that after adjusting for needs, in Greece, 55% of people in the lowest income quintile accessed a GP in the past year compared to 66% in the highest quintile (OECD, 2019[11]).

Evidence-base

Makrilakis et al. (2010[7]) utilised a non-randomised, open label interventional clinical trial (where information is not withheld from trial participants) with no control group to evaluate DE-PLAN. In order to evaluate the programme outcomes, anthropometric and clinical measurements were taken, and self-reporting questionnaires focusing on nutritional and PA habits were filled out before and one year after the study (Makrilakis et al., 2010[7]). These were based on the Diabetes Prevention Study (Tuomilehto et al., 2001[12]). The clinical measurements include an OGTT, weight, height, waist circumference and blood pressure measures, and a record of medical histories. Levels of plasma glucose, total and HDL cholesterol as well as triglycerides were assessed at a central accredited university research laboratory, and levels LDL cholesterol were calculated according to the Friedwald formula (Makrilakis et al., 2010[7]).

Using the *Quality Assessment Tool for Quantitative Studies* (Effective Public Health Practice Project, 1998[13]) the study design scored well in terms of data collection methods, however, several limitations were noted – e.g. confounders were not controlled for and neither researchers not participants were blinded.

Table 12.4 Evidence-based assessment, DE-PLAN

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	76% (the proportion of the eligible population who chose to participate)
Selection bias score: Moderate		
Study design	Indicate the study design	Cohort (one group pre and post)
	Was the study described as randomised?	N/A
Study design score: Moderate		
Confounders	Were there important differences between groups prior to the intervention?	N/A
	What percentage of potential confounders were controlled for?	Can't tell
Confounders score: Weak		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Yes
	Indicate the percentage of participants who completed the study?	35%
Withdrawals and dropouts score: Moderate		

Source: Effective Public Health Practice Project (1998[13]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

Out of the 251 non-diabetic high-risk individuals that were identified from the FINDRISC questionnaires, 191 agreed to participate in the intervention (Makrilakis et al., 2010[7]). However, 66 participants dropped out during the study, leaving only 125 individuals to complete the programme (Makrilakis et al., 2010[7]). The **participation rate was therefore 76% and the dropout rate, 35%.** The dropout rate may be due to the fact that many participants described the OGTT as unpleasant and time-consuming, thus making it unlikely for them to return for a second glucose test at the end of the study (Makrilakis et al., 2010[7]). However, participation rates were nonetheless lower than in the DE-PLAN CAT, where 88.5% of high-risk individuals identified agreed to participate, but whose dropout rates were more comparable, at 41.3% (The DE-PLAN-CAT Research Group, 2012[14]).

Policy options to enhance performance

The DE-PLAN study includes a range of best practice criteria for community-based T2DM prevention lifestyle programmes. Indeed, the study targeted both diet and PA, as well as involving access to ongoing support within a community setting.

Enhancing effectiveness

Literature on best practices in this field emphasise the importance of healthy diets, weight loss and physical activity in reducing diabetes risk (Galaviz et al., 2015[15]). In upscaling or adapting this intervention, more attention could be granted to the PA and weight loss components of the intervention, to *enhance effectiveness.* To date, evidence on the impact of the DE-PLAN study in Greece on levels of PA amongst participants is lacking. The WHO recommends that adults engage in at least 150-300 minutes of moderate-intensity, such as brisk walking, or 75-150 minutes of vigorous-intensity aerobic PA each week (WHO, 2020[16]). This could be emphasised further in the DE-PLAN information sessions, in order to motivate participants to increase their PA levels. In a randomised clinical trial in the United States focusing on diabetes prevention through lifestyle intervention, for instance, a target of 150 minutes of moderate-intensity PA was set and promoted throughout information sessions, in addition to weight loss and dietary objectives. By 24 weeks, 74% of participants had met this goal, and 50% had achieved the weight loss target of 7% or more, with average weight loss at 5.6 kg (The Diabetes Prevention Program Research Group, 2002[17]).

To *enhance effectiveness*, influencing other lifestyle factors such as smoking could also be taken into account in the intervention design and objectives: 30% of the study participants were smokers (Makrilakis et al., 2010[7]), with the Greek national average at 37%, the highest in the EU (Health and Food Safety Directorate General, 2017[18]). Yet actively partaking in this habit increases diabetes risk by 44% (Willi et al., 2007[19]). Systematic and brief motivational counselling, as well as information sessions on smoking cessation and nicotine dependence could be implemented, for example (López Zubizarreta et al., 2017[20]). In addition, intervention administrators could consider involving the participants' wider families and environments, in order to create a wider support network and to foster health-enhancing behaviour.

Enhancing efficiency

Policy makers and programme administrators should prioritise an efficiency study of DE-PLAN in Greece given this information isn't currently available. For example, Sagarra et al. (2014[10]) undertook an efficiency study of DE-PLAN in Catalonia, Spain, which calculated the cost per quality-adjusted life year.

Enhancing equity

To *enhance equity*, consideration could be given to widening the recruitment strategy beyond primary care and occupational settings, for example faith-based and other community events. Further, those responsible for recruitment should represent a diverse range of groups in society. This will ensure other population groups who, for example, are less likely to access primary care or be employed are covered by the recruitment strategy (National Diabetes Prevention Program, n.d.[21]). Finally, to understand how DE-PLAN affects different population groups, data collection efforts should include questions that enable a stratification by vulnerable groups, for example, by family SES and ethnicity. Results from analysis suing stratified data can then be used to adapt DE-PLAN in order to meet the needs of different vulnerable groups.

Enhancing the evidence-base

To *enhance the evidence-base*, future evaluations would benefit from improving the strength of the study design – for example by randomising patients into an intervention and control group, blinding researchers and participants, and controlling for relevant confounders. In addition, new methods to assess dietary intake, such as mobile technologies, could be considered in order to complement the use of food-frequency questionnaires (Béjar Prado and Vázquez-Limón Ozcorta, 2017[22]). Finally, basing the intervention design in a wider scope of academic literature, such as meta-analyses or systematic reviews, might allow for a richer foundation.

Enhancing the extent of coverage

To *enhance extent of coverage,* less invasive and time-consuming alternatives to the OGTT might be considered to decrease the dropout rate.

Transferability

This section explores the transferability of DE-PLAN from Greece to other OECD and non-OECD EU countries and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring DE-PLAN.

Previous transfers

DE-PLAN has been implemented in 17 countries across Europe demonstrating it is highly transferable intervention (for example, in Greece, Lithuania, Poland and Spain). One factor explaining why DE-PLAN can be transferred across a range of courtiers is that it utilises existing resources within the country's primary health care system.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of DE-PLAN are listed in Table 12.5. Note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 12.5. Indicators to assess the transferability of DE-PLAN

Indicator	Reasoning	Interpretation
Population context		
% of the population with access to recreational green space within 10min walking distance	DE-PLAN participants are encouraged to do outdoor activities, therefore DE-PLAN is more likely to be successful in countries where people have better access to green space	↑ = more transferable
Sector specific context (primary care)		
% of people who visited a GP in the last 12 months at least once	DE-PLAN participants are recruited at the primary care level, therefore, DE-PLAN will have a greater extent of coverage in countries where more people access their GP frequently	↑ = more transferable
Health professionals are trained in health-enhancing physical activity	DE-PLAN participants are recruited in primary care, therefore GPs who are accustomed to providing healthy lifestyle advice may be more likely to support DE-PLAN (e.g. encourage patients to access DE-PLAN)	"Yes" = more transferable
Political context		
Operational strategy/action plan/policy to reduce unhealthy eating	DE-PLAN will be more successful in countries who prioritise unhealthy eating	"Yes" = more transferable
Operational strategy/action plan/policy to reduce physical inactivity	DE-PLAN will be more successful in countries who prioritise physical inactivity	"Yes" = more transferable
Operational policy/strategy/action plan for diabetes	DE-PLAN will be more successful in countries who prioritise diabetes prevention	"Yes" = more transferable
Economic context		
Primary health care expenditure as a percentage of current health expenditure	DE-PLAN is a primary care intervention, therefore, it is likely to be more successful in countries that allocate a higher proportion of health spending to primary care	↑ = more transferable

Source: OECD Health Statistics 2021, https://doi.org/10.1787/ae3016b9-en; WHO (n.d.[23]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2020[24]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2017[25]), "Persons visiting a general medical practitioner in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age", https://ec.europa.eu/eurostat; WHO Regional Office for Europe (2021[26]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf.

Results

Data from publically available sources indicate DE-PLAN is likely to have broad political support in most countries given unhealthy eating, physical inactivity and diabetes prevention is a political priority in nearly all countries (Table 12.6). Further, data on the proportion of people who visit a GP is relatively high in OECD and non-OECD countries indicating DE-PLAN will likely reach the target population (i.e. 40% in Greece versus 74% average in remaining countries). However, lower levels of spending on primary care highlight potential affordability issues. Data on remaining indicators shows mixed results, further, for these indicators there are high levels of missing data in non-European countries.

Table 12.6. Transferability assessment by country, DE-PLAN (OECD and non-OECD European countries)

A darker shade indicates DE-PLAN is more suitable for transferral in that particular country

	Access to green space (%)	% people who visited a GP in the last 12 months at least once (2017)	Inclusion of physical activity and health in curriculum of health professionals	Unhealthy eating plan	Physical inactivity plan	Diabetes plan	Primary Health Care Expenditure as percentage Current Health Expenditure
Greece	**93.85**	**40**	**Not Implemented**	**No**	**Yes**	**No**	**45**
Australia	89.5*	83	n/a	Yes	Yes	Yes	37
Austria	98.41	84	Implemented	Yes	Yes	No	37
Belgium	94.89	87	Implemented	Yes	Yes	Yes	40
Bulgaria	n/a	48	Foreseen*	Yes	Yes	Yes	47
Canada	n/a	n/a	n/a	Yes	Yes	Yes	48
Chile	n/a	n/a	n/a	Yes	Yes	Yes	n/a
Colombia	n/a	n/a	n/a	Yes	Yes	Yes	n/a
Costa Rica	n/a	n/a	n/a	Yes	Yes	Yes	33
Croatia	n/a	68	Not Implemented	Yes	Yes	Yes	38
Cyprus	n/a	68	Not Implemented	No	No	Yes	41
Czech Republic	97.72	86	Implemented	Yes	Yes	Yes	33
Denmark	89.18	86	Implemented	Yes	Yes	Yes	38
Estonia	97.25	73	Implemented	Yes	Yes	No	44
Finland	99.85	68	Implemented	Yes	Yes	Yes	46
France	93.03	85	Implemented	Yes	Yes	Yes	43
Germany	95.93	89	Implemented	Yes	Yes	Yes	48
Hungary	91.49	71	Implemented	Yes	Yes	No	40
Iceland	61.34	n/a	n/a	Yes	Yes	No	35
Ireland	94.47	76	Implemented	Yes	Yes	Yes	47
Israel	n/a	n/a	n/a	Yes	Yes	Yes	n/a
Italy	88.11	71	Not Implemented	Yes	Yes	Yes	n/a
Japan	n/a	n/a	n/a	Yes	Yes	Yes	52
Latvia	95.23	80	Implemented	Yes	Yes	Yes	39
Lithuania	94.82	76	Implemented	Yes	Yes	Yes	48

	Access to green space (%)	% people who visited a GP in the last 12 months at least once (2017)	Inclusion of physical activity and health in curriculum of health professionals	Unhealthy eating plan	Physical inactivity plan	Diabetes plan	Primary Health Care Expenditure as percentage Current Health Expenditure
Greece	**93.85**	**40**	**Not Implemented**	**No**	**Yes**	**No**	**45**
Luxembourg	98.72	89	Implemented	Yes	Yes	No	38
Malta	n/a	83	Implemented	Yes	Yes	Yes	62
Mexico	n/a	n/a	n/a	Yes	Yes	Yes	44
Netherlands	97.00	71	Implemented	Yes	Yes	No	32
New Zealand	n/a	n/a	n/a	No	Yes	Yes	n/a
Norway	95.40	79	n/a	Yes	Yes	Yes	39
Poland	92.63	64	Implemented	Yes	Yes	Yes	47
Portugal	83.33	81	Implemented	Yes	Yes	Yes	58
Republic of Korea	n/a	n/a	n/a	Yes	Yes	Yes	57
Romania	n/a	57	Implemented	Yes	Yes	Yes	35
Slovak Republic	95.63	82	Not Implemented	Yes	Yes	Yes	n/a
Slovenia	93.50	76	Implemented	Yes	Yes	Yes	43
Spain	93.26	80	Not Implemented	Yes	Yes	Yes	39
Sweden	99.14	62	Implemented	No	Yes	No	n/a
Switzerland	97.31	n/a	n/a	Yes	Yes	Yes	40
Turkey	n/a	n/a	n/a	Yes	Yes	Yes	n/a
United Kingdom	91.43	74	Implemented	Yes	Yes	Yes	53
United States	n/a	n/a	n/a	Yes	Yes	Yes	n/a

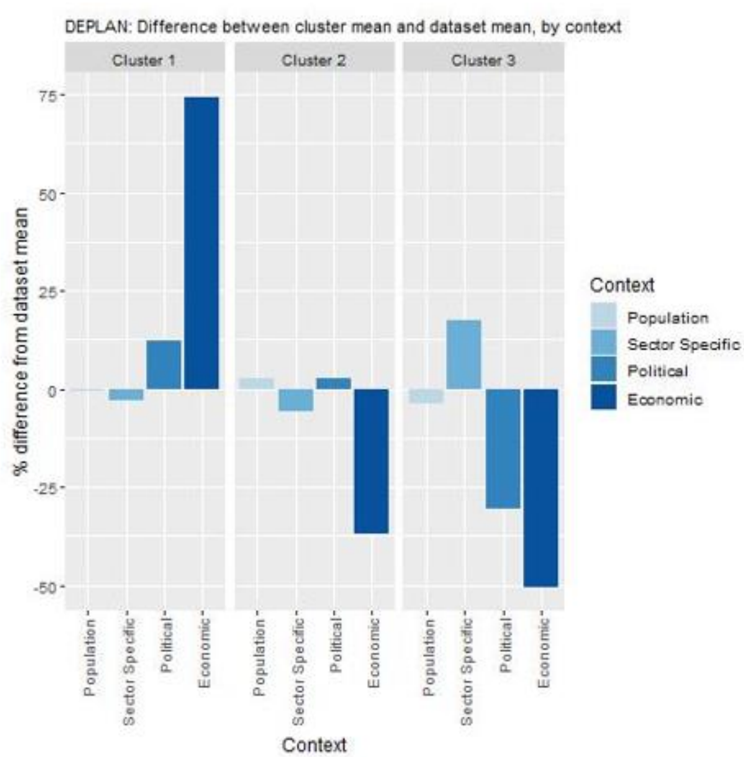
* The figure for Australia represent the average cross each major city and refer to access to green space within 400m. The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). n/a = data not available.
Source: OECD Health Statistics 2021, https://doi.org/10.1787/ae3016b9-en; WHO (n.d.[23]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2020[24]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2017[25]), "Persons visiting a general medical practitioner in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age", https://ec.europa.eu/eurostat; WHO Regional Office for Europe (2021[26]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 12.5. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 12.1 and Table 12.7:

- Countries in cluster one have political and economic arrangements in place to transfer DE-PLAN. These countries could experience implementation barriers if health professionals feel they do not have the appropriate skills to deliver the intervention. Further, the programme may have limited effect if a relatively low number of eligible patients visit a GP (and are therefore not recruited into the programme).
- Countries in cluster two also have political arrangements supportive of DE-PLAN but would benefit from increasing expenditure on primary care before transferring the intervention to ensure long-term affordability. It is important to note that Greece, which currently operates DE-PLAN, is in this cluster indicating although ideal, such conditions are not necessarily pre-requisites for transferring DE-PLAN.
- Countries in cluster three would benefit from ensuring DE-PLAN aligns with overarching political priorities, as well as ensuring long-term affordability by increasing expenditure on primary care.

Figure 12.1. Transferability assessment using clustering, DE-PLAN



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: OECD Health Statistics 2021, https://doi.org/10.1787/ae3016b9-en; WHO (n.d.[23]), "Global Health Observatory", https://www.who.int/data/gho; OECD (2020[24]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2017[25]), "Persons visiting a general medical practitioner in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age", https://ec.europa.eu/eurostat; WHO Regional Office for Europe (2021[26]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf.

Table 12.7. Countries by cluster, DE-PLAN

Cluster 1	Cluster 2	Cluster 3
Bulgaria	Australia	Austria
Canada	Belgium	Estonia
Finland	Costa Rica	Hungary
Germany	Croatia	Iceland
Ireland	Cyprus	Luxembourg
Italy	Czech Republic	Netherlands
Japan	Denmark	Sweden
Lithuania	France	
Malta	Greece	
Poland	Latvia	
Portugal	Mexico	
Republic of Korea	Norway	
Slovak Republic	Romania	
United Kingdom	Slovenia	
	Spain	
	Switzerland	

Note: Due to high levels of missing data, the following countries were omitted from the analysis: Chile, Colombia, Israel, New Zealand, Turkey, and the United States.

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of DE-PLAN. For example, information on existing diabetes prevention interventions in primary care. Therefore, Box 12.2 outlines several new indicators policy makers should consider before transferring DE-PLAN.

Box 12.2. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators:

Population context

- What is the ethnicity and cultural diversity of the target population?
- What is the level of acceptability amongst potential patients: a) of lifestyle interventions; and b) collection of patient data, such as weight?
- What is the level of health literacy amongst the population? (e.g. on the impact of diet and exercise)
- How easily can potential participant's access group sessions? (e.g. urban versus regional area, public transport links etc.)

Sector specific context (primary care)

- What, if any, lifestyle interventions exist for patients at risk of diabetes?
- What is the level of self-efficacy amongst health professionals to deliver lifestyle interventions?
- What is the level of acceptability amongst health professionals of lifestyle interventions?
- What availability do health professionals have to deliver a lifestyle intervention?
- What proportion of the population access primary care as the entry point to receiving health care?
- Is there a culture of health promotion and disease prevention within the health care system?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing and operating the intervention in the target setting?

Conclusion and next steps

The prevalence of T2DM is growing to epidemic proportions throughout the population (Makrilakis et al., 2010[7]). Diabetes is one of the primary determinants of CVD, a leading cause of death (Rodríguez-Artalejo et al., 2002[2]). The DE-PLAN programme seeks to prevent the onset of diabetes through a screening and lifestyle intervention.

The results from the study show that the intervention has been successful in positively impacting participants' anthropometric and clinical measurements, as well as their dietary intake, but did not have any significant impact on levels of PA. Although data on costs was not available for the DE-PLAN in Greece, comparable programmes have been shown to be cost-effective. Furthermore, evidence used to develop the programme is of medium- to high-quality, and to evaluate the intervention can be deemed medium quality. The extent of coverage of the study in terms of participation and dropout rates was similar to other implementations of the DE-PLAN study in Europe. In terms of equity, the programme did not target a priority population group and thus did not seek to advance equality for a particular priority population group. Finally, the study did include best practice criteria overall for community-based T2DM prevention lifestyle programmes, such as targeting both diet and PA. However, further changes, such as additional emphasis on PA and smoking, could be considered to achieve the intervention's primary outcome: to prevent the development of type 2 diabetes in Greece.

Based on the available information, DE-PLAN is a broadly transferable intervention as evidenced by its implementation in 17 European countries. Further, it is likely to have political support given it address three high priority issues – diabetes, unhealthy eating and physical inactivity. Nevertheless, prior to transferral, policy makers must consider other indicators such as acceptability among health care professionals.

Next steps for policy makers and funding agencies regarding the DE-PLAN intervention are outlined in Box 12.3.

Box 12.3. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance DE-PLAN are listed below:

- Providing support to DE-PLAN administrators to implement policies outlined in this case study, for example, funding more in-depth evaluations of DE-PLAN which would allow researchers to assess the impact of DE-PLAN across different priority population groups
- Ensure funding for future scale-up and transfer efforts
- Promote findings from the DE-PLAN case study to better understand what countries/regions are interested in transferring the intervention
- Promote "lessons learnt" from regions that have transferred DE-PLAN to their local setting

References

Béjar Prado, L. and E. Vázquez-Limón Ozcorta (2017), “Is there any alternative to traditional food frequency questionnaire for evaluating habitual dietary intake?”, *Nutrición Hospitalaria*, Vol. 34/4, https://doi.org/10.20960/nh.650. [22]

Benziger, C., G. Roth and A. Moran (2016), *The Global Burden of Disease Study and the Preventable Burden of NCD*, Elsevier B.V., https://doi.org/10.1016/j.gheart.2016.10.024. [1]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [13]

Eurostat (2017), *Persons visiting a general medical practitioner in the last 12 months by medical speciality, number of visits, educational attainment level, sex and age*. [25]

Galaviz, K. et al. (2015), “Lifestyle and the Prevention of Type 2 Diabetes: A Status Report”, *American Journal of Lifestyle Medicine*, Vol. 12/1, pp. 4-20, https://doi.org/10.1177/1559827615619159. [15]

Gillies, C. et al. (2008), “Different strategies for screening and prevention of type 2 diabetes in adults: cost effectiveness analysis”, *BMJ*, Vol. 336/7654, pp. 1180-1185, https://doi.org/10.1136/bmj.39545.585289.25. [9]

Health and Food Safety Directorate General (2017), *Public Health*, https://ec.europa.eu/newsroom/sante/newsletter-specific-archive-issue.cfm?newsletter_service_id=327&newsletter_issue_id=3764&pdf=true&fullDate=&lang=default. [18]

Institute for Health Metrics and Evaluation (2019), *GBD Results Tool | GHDx*, http://ghdx.healthdata.org/gbd-results-tool (accessed on 19 September 2019). [3]

Kontogianni, M. et al. (2012), “Changes in dietary habits and their association with metabolic markers after a non-intensive, community-based lifestyle intervention to prevent type 2 diabetes, in Greece. The DEPLAN study”, *Diabetes Research and Clinical Practice*, Vol. 95/2, pp. 207-214, https://doi.org/10.1016/j.diabres.2011.09.010. [8]

López Zubizarreta, M. et al. (2017), “Tabaco y diabetes: relevancia clínica y abordaje de la deshabituación tabáquica en pacientes con diabetes”, *Endocrinología, Diabetes y Nutrición*, Vol. 64/4, pp. 221-231, https://doi.org/10.1016/j.endinu.2017.02.010. [20]

Makrilakis, K. et al. (2010), “Implementation and effectiveness of the first community lifestyle intervention programme to prevent Type 2 diabetes in Greece. The DE-PLAN study”, *Diabetic Medicine*, Vol. 27/4, pp. 459-465, https://doi.org/10.1111/j.1464-5491.2010.02918.x. [7]

National Diabetes Prevention Program (n.d.), *Recruiting participants for your type 2 diabetes prevention lifestyle change program*, https://coveragetoolkit.org/wp-content/uploads/2018/03/NDPP_Recruiting_Participants_Tipsheet.pdf (accessed on 11 December 2020). [21]

OECD (2020), *How’s Life? 2020: Measuring Well-being*, OECD Publishing, Paris, https://doi.org/10.1787/9870c393-en. [24]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [11]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [4]

Rodríguez-Artalejo, F. et al. (2002), “Dietary patterns among children aged 6-7 y in four Spanish cities with widely differing cardiovascular mortality”, *European Journal of Clinical Nutrition*, Vol. 56/2, pp. 141-148, https://doi.org/10.1038/sj.ejcn.1601296. [2]

Sagarra, R. et al. (2014), “Coste-efectividad de la intervención sobre el estilo de vida para prevenir la diabetes tipo 2”, *Revista Clínica Española*, Vol. 214/2, pp. 59-68, https://doi.org/10.1016/j.rce.2013.10.005. [10]

The DE-PLAN-CAT Research Group (2012), “Delaying progression to type 2 diabetes among high-risk Spanish individuals is feasible in real-life primary healthcare settings using intensive lifestyle intervention”, *Diabetologia*, Vol. 55/5, pp. 1319-1328, https://doi.org/10.1007/s00125-012-2492-6. [14]

The Diabetes Prevention Program Research Group (2002), “The Diabetes Prevention Program (DPP): Description of lifestyle intervention”, *Diabetes Care*, Vol. 25/12, pp. 2165-2171, https://doi.org/10.2337/diacare.25.12.2165. [17]

Tuomilehto, J. et al. (2001), “Prevention of Type 2 Diabetes Mellitus by Changes in Lifestyle among Subjects with Impaired Glucose Tolerance”, *New England Journal of Medicine*, Vol. 344/18, pp. 1343-1350, https://doi.org/10.1056/nejm200105033441801. [12]

WHO (2020), *WHO Guidelines on Physical Activity and Sedentary Behaviour*, https://www.who.int/publications/i/item/9789240015128. [16]

WHO (2017), *Best buys and other recommended interventions for the prevention and control of noncommunicable diseases*, WHO, Geneva, https://apps.who.int/iris/bitstream/handle/10665/259232/WHO-NMH-NVI-17.9-eng.pdf;jsessionid=3E76AC01272E9377F8382B8BC19545AF?sequence=1 (accessed on 10 September 2019). [6]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [23]

WHO Regional Office for Europe (2021), *2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region*, https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf. [26]

Willi, C. et al. (2007), “Active Smoking and the Risk of Type 2 Diabetes”, *JAMA*, Vol. 298/22, p. 2654, https://doi.org/10.1001/jama.298.22.2654. [19]

World Health Organization (2020), *Obesity and overweight*, https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (accessed on 25 June 2020). [5]

13 Personalised Approach to Obesity Management in Children

This chapter covers the case study of the Personalised Approach to Obesity Management in Children (PAOMC), a comprehensive, clinical, family-based and personalised childhood obesity intervention targeting children aged seven to 17 years. The case study includes an assessment of PAOMC against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Personalised Approach to Obesity Management in Children: Case study overview (PAOMC)

Description: the Personalised Approach to Obesity Management In Children (PAOMC) intervention in Estonia is a comprehensive, clinical, family-based and personalised childhood obesity intervention targeting children aged 7 to 17 years. The intervention is delivered in a hospital outpatient clinic setting.

Best practice assessment:

Table 13.1. OECD best practice assessment of PAOMC

Criteria	Assessment
Effectiveness	The intervention successfully impacted participants' anthropometric measurements and physical activity levels
Efficiency	Evidence on PAOMC's efficiency is not available, but, previous analysis by OECD indicates obesity management interventions for children may be cost-effective
Equity	The intervention addresses a health issue that disproportionally affects poorer children, however, these children are less likely to access PAOMC due to access inequalities
Evidence-base	PAOMC was evaluated using data collection methods that are reliable and validated, further, the study was designed to reduce selection bias. However, similar to many public health interventions, neither researchers not participants were blinded.
Extent of coverage	There is not publically available information on participation or dropout rates, however, a high level analysis estimated that nearly 20 000 children could be referred to PAOMC if scaled-up across the country

Enhancement options: to *enhance effectiveness*, programme administrators could consider incorporating additional obesity counselling sessions, education and behavioural therapy. To *enhance the evidence-base*, a control group and a longer-term follow-up could also be included, and more objective evaluation methods could be employed. To *enhance equity*, the programme could seek to recruit participants from more vulnerable groups, and adapt the intervention to their specific needs. Finally, to enhance *extent of coverage*, a larger sample size of participants could be recruited in upscaling or adapting this intervention.

Transferability: PAOMC addresses childhood obesity, which is of key political interest in most countries. Further, most countries with available data have either implemented or foresee implementing programs to support physical activity counselling by health professionals indicating greater levels of workforce acceptability of PAOMC. Nevertheless, the success of PAOMC in the target setting will depend on a range of contextual factors, in particular, the willingness and ability of GPs and paediatricians to provide children and their parents with obesity related advice.

Conclusion: although data was not available to assess the intervention fully in terms of costs, evidence-base, equity and extent of coverage, the PAOMC study in Estonia can be considered a best practice in terms of outcomes. To further enhance implementation, programme administrators could take into consideration policy options laid out in this case study, such as including additional behavioural therapy and obesity counselling sessions.

Intervention description

Cardiovascular diseases (CVDs) are a leading cause of death, comprising approximately half of all non-communicable disease (NCD) deaths (Benziger, Roth and Moran, 2016[1]). One of the primary determinants of CVD is obesity, as well as its associated comorbidities (diabetes, hypertension). In 2018, almost 60% of people in OECD countries were overweight, and 25% were obese (OECD, 2019[2]). The adoption of unhealthy behaviours leading to the development of CVD risk factors takes place in early childhood (Peñalvo et al., 2013[3]). However, obesity is largely preventable, highlighting the importance of effective health promotion early on in the life course.

The PAOMC intervention in Estonia is a family-based paediatric obesity intervention targeting children aged 7-17 years with pre-obesity (i.e. overweight) or obesity. The study included 58 children in Tallinn and the surrounding Harju County, and largely took place in the Tallinn Children's Hospital outpatient clinic. During the intervention, families received education materials, and a personalised assessment of both the parents' and children's lifestyle behaviours, as well as of their willingness to change. Moreover, the children received personal counselling, physical activity (PA) assessments and sessions (such as hikes, outdoor exercise activities and gym training), attended bi-weekly education sessions (PA and diet), and set lifestyle goals for a 12 month period.

Children were referred to PAOMC through their family doctor (general practitioner (GP)), general paediatricians, and endocrinologists or by other family initiatives.

OECD Best Practice Framework assessment

This section analyses PAOMC against the five criteria within OECD's Best Practice Identification Framework – Effectiveness, Efficiency, Equity, Evidence-base and Extent of coverage (see Box 13.1 for a high-level assessment of PAOMC). Further details on the OECD Framework can be found in Annex A.

Box 13.1. Assessment of PAOMC family-based paediatric obesity intervention

Effectiveness

- The intervention was successful in improving participants' anthropometric measurements and physical activity levels

Efficiency

- Results from an economic evaluation are not publically available, however, previous economic analysis by OECD indicates obesity management programs for school-aged children may be cost-effective

Equity

- The intervention addresses a health issue that disproportionally affects poorer children – in Estonia 26% of children in the poorest quintile live with pre-obesity or obesity compared to 18% in the highest quintile
- Despite being in greater need of obesity prevention programs, children in the lowest income quintile are less likely to see general practitioner compared to the higher income quintile (64% versus 72%)
- It is unclear whether specific efforts were made to address other disadvantaged groups (e.g. ethnic minorities)

Evidence-base

- PAOMC was evaluated using a cross-sectional, observational study that collected data using reliable and validated tools, further, the study was designed to reduce selection bias
- However, similar to many public health interventions, neither researchers not participants were blinded

Extent of coverage

- Information on participation rates are not publically available, however, a high level analysis indicated nearly 20 000 children could be referred to PAOMC by their GP if it were scaled-up across the whole country

Effectiveness

PAOMC reduces BMI levels and increases physical activity at rates greater than similar family-based clinical childhood obesity interventions

The PAOMC intervention was generally successful in improving participants' anthropometric measurements and PA levels. Prior to the intervention, 93% of the children selected for the intervention lived with obesity (BMI ≥ 95 percentile) and 7% with pre-obesity (BMI 85-95 percentile) (Suurorg et al., 2017[4]). Two years after the intervention, 42% had decreased their BMI category, 58% had experienced weight loss, 70% had shown participation in PA sessions, 94% had seen improvements in their sit-up tests and 65% in their six-minute walking test. Nonetheless, 27% did not experience any weight change and 15% saw an increase in weight (Suurorg et al., 2017[4]).

While a comparison can only be carried out at the high-level, given that studies may have used different methodologies and that, across studies, target populations an activities within the intervention may not be fully comparable, the results from the PAOMC intervention seem to be greater than those of similar family-based clinical childhood obesity interventions. Indeed, the *Families for Health* trial in the United Kingdom, a family-based childhood obesity treatment intervention in a primary care setting, did not result in significant differences in BMI z-score at 12 months between the intervention and control groups (Robertson et al., 2017[5]). Moreover, the *High Five for Kids* study (also a primary care-based childhood obesity prevention intervention) in the United States was shown to have non-significant change in participants' BMI ($p = 0.15$) (Wright et al., 2014[6]). These results point to the potential of the PAOMC programme and underline the importance of comprehensive, family-based and personalised obesity interventions in childhood.

Drawing upon OECD analysis, the potential impact of expanding PAOMC to the national level can be estimated. Specifically, OECD's 2019 obesity report shows that PA and nutrition interventions targeting school-children could avoid over 65 cases of CVD and 149 cases of diabetes in Estonia between years 2020-50 (OECD, 2019[2]). An additional 0.11 life years (LYs) and 0.98 disability-adjusted life years (DALYs) could also be gained in Estonia per 100 000 people annually from 2020-50. These figures might provide an indication of the potential of the PAOMC programmed if scaled-up in Estonia to a national level. However, the results focus on school-based obesity programmes, rather than on family-based, clinical paediatric obesity interventions, and therefore a range of precautions must be taken in interpreting results.

Efficiency

Analysis by OECD finds obesity management programs targeting school-aged children are cost-effective

Publically available information on the costs of operating PAOMC show the intervention's overall budget is approximately EUR 25 000 (USD PPP 36 547) per year (Kramer and Suurgorg, 2017[7]). However, it is unclear how many children this covers, therefore a cost per participant is not available.

An analysis of school-based programs designed to reduce rates of overweight and obesity by the OECD can shed light on the potential effect of interventions such as PAOMC. OECD estimates that heathy lifestyle programs targeting school-aged children lead to health expenditure savings of USD PPP 0.01 (EUR 0.01) per capita in health expenditure annually, during the first 30 years after implementation (OECD, 2019[2]). The main reason behind this result is that health care expenditure for NCDs is small in children and young adults due to low incidence rates. Across the whole population, this translates into annual health expenditure savings of USD PPP 12 113. It is expected that in the long term, when children targeted by the intervention reach their 50s', the impact of the intervention may become larger. Finally, caution should be taken when interpreting these results given PAOMC is implemented in a primary-care setting while OECD analysis relies on findings from school-based interventions.

Equity

PAOMC addresses a health issue that disproportionately affects poorer children, however, it is less likely to reach these children due to access inequalities

PAOMC does not directly target a priority population group however it addresses a health issue that disproportionately affects children from lower-income households. In Estonia, the proportion of children with pre-obesity or obesity was 26% for those in the poorest quintile compared to 18% in the highest quintile (OECD/European Union, 2018[8]). Nevertheless, obesity interventions delivered in a primary care setting may be less likely to reach children living in less affluent families which risks widening existing health inequalities (OECD, 2019[9]). For example, analysis by OECD estimates that after adjusting for needs, in Estonia, 64% of people in the lowest income quintile accessed a GP in the past year compared to 72% in the highest quintile (OECD, 2019[9]).[1]

It is unclear from the available information whether specific efforts were made to ensure other disadvantaged groups, such as children from different ethnic backgrounds or with a low socio-economic status, accessed PAOMC.

Evidence-base

Strong data collection methods were used to evaluate PAOMC

A cross-sectional, observational study was used to evaluate PAOMC. Measures were taken for anthropometric markers (BMI, height, weight, waist circumference) and physical fitness levels (6-minute walking test and sit-up test), although no information is available on the mediums used. The childrens' and parents' desire for behavioural lifestyle change was assessed by the WHO Visual Analogue Scale (VAS) and self-reported questionnaires. Dietary and PA behaviours were determined through assessments led by physicians, surveys and the Yale food addiction scale, a self-reported questionnaire (Suurorg et al., 2017[4]). The use of these tools by qualified health professionals increase the reliability and validity of the evaluation results. For these reasons, the data collection methods used to evaluate PAOMC are considered "strong" against the *Quality Assessment Tool for Quantitative Studies* framework (see Table 13.2) (Effective Public Health Practice Project, 1998[10]).

The method used to evaluate PAOMC also performed well in regard to the study design as well as reducing selection bias. However, similar to many public health interventions, neither participants nor researchers were blinded, therefore the study is considered "weak" in this area. Further, it was unclear if researchers controlled for confounders.

Table 13.2. Evidence-based assessment, PAOMC

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Somewhat likely
	What percentage of selected individuals agreed to participate?	Can't tell
Selection bias score: Moderate		
Study design	Indicate the study design	Cohort (one group pre and post)
	Was the study described as randomised?	No
Study design score: Moderate		
Confounders	Were there important differences between groups prior to the intervention?	Can't tell
	What percentage of potential confounders were controlled for?	N/A
Confounders score: Weak		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	Yes
	Were the study participants aware of the research question?	Yes
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	Yes
	Were data collection tools shown to be reliable?	Yes
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	Can't tell
	Indicate the percentage of participants who completed the study?	Can't tell
Withdrawals and dropouts score: Weak		

Source: Effective Public Health Practice Project (1998[10]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

Nearly 20 000 children could be referred to PAOMC by their GP if it were scaled-up across the whole country

There is no publically available evidence to measure participation or dropout rates for PAOMC. However, data on the probability of visiting a GP in the last 12 months is available, which provides a conservative insight into how many children could access PAOMC if it were scaled-up across the whole of Estonia (given children and adolescents can be referred by their GP to PAOMC).

By multiplying the probability of a GP visit in the last year[2] by the number of children aged 7-17 years with pre-obesity or obesity, it is estimated that **18 776 children could be referred to PAOMC** via their GP if it were scaled-up across the country (out of 30 285 who are eligible) (Statistics Estonia, 2020[11]; WHO, 2016[12]; Eurostat, 2019[13]).[3]

Policy options to enhance performance

The PAOMC intervention fits many of the overarching best practice criteria in terms of clinical, family-based childhood obesity programmes. The trial is a comprehensive programme involving the family and wider support networks, which strongly targets both diet and PA. Moreover, it focuses on behaviour change at the family and individual level.

Enhancing effectiveness

Literature on best practices in this field underlines the importance of obesity counselling, education and behavioural therapy in addition to nutrition and exercise (Mead et al., 2017[14]). However, it is important to note that many of these policies fall outside the responsibilities of programme administrators and instead require input from higher-level policy makers (e.g. at the national level). Nonetheless, in upscaling or adapting this intervention, further emphasis on motivational interviewing (MI), positive reinforcement, monitoring, and cognitive restructuring could be considered to *enhance effectiveness* (Davis et al., 2007[15]). Indeed, a systematic review of the treatment of paediatric obesity found that multicomponent interventions targeting not only diet and PA, but which also included a strong emphasis on behavioural therapy and education achieved the most significant outcomes in terms of reductions in systolic and diastolic blood pressure, BMI, and triglycerides (Rajjo et al., 2017[16]). Moreover, a meta-analysis of the effectiveness of MI concluded that this practice could lead to up to 51% improvement rates in the treatment of problem behaviours (Burke, Arkowitz and Menchola, 2003[17]). MI can help induce behaviour change through guiding individual reflection, as participants are more likely to accept and act on opinions, which they have voiced themselves. Furthermore, shifting participants' thinking patterns and managing their expectations can lead to higher adherence to dietary change (Burke, Arkowitz and Menchola, 2003[17]).

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

To *enhance equity*, to the extent possible, programme administrators are encouraged to undertake a review to determine whether the intervention should be adapted to meet the needs of priority population groups. In order to better understand how different groups of participants benefit from the intervention, future evaluations should break down key indicators, for example, by family socio-economic status and ethnicity. Finally, additional effort to recruit families and children from groups which have lowers level of access to health care is important, particularly if these groups have higher rates of obesity (as outlined under "Efficiency", nearly 40% of children in the lowest income quintile won't access a GP and therefore have the opportunity to be referred to PAOMC).

Enhancing the evidence-base

To *enhance the evidence-base*, future evaluations could consider using a blinded randomised study design if considered ethical in order to better understand the true effect of PAOMC. A longer follow-up would also improve the validity of evaluation results, for example, by collecting data 12 months after the intervention has finished. Moreover, alternatives to questionnaires could be considered to assess dietary and PA habits, as well as behaviour change willingness. Indeed, in order to assess the long-term impact (e.g. after 10 years) of PAOMC on rates of obesity and overweight, it is necessary to gather data according to the same measures, and when possible, with the same individuals (i.e. panel data). Longitudinal panel data is deemed to be the “gold standard”, given that it reduces bias by accounting for differences amongst individuals. However, as this requires long-term funding and support, responsibility for this option lies with high-level policy makers, rather than with the PAOMC study group.

Enhancing the extent of coverage

Given limited information on the extent of coverage for PAOMC, specific polices to boost uptake have not been included. However, in general, efforts to boost health literacy amongst children and parents are likely to increase motivation to participate in programs such as PAOMC.

Transferability

This section explores the transferability of PAOMC and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring PAOMC.

Previous transfers

To date, PAOMC has not been transferred outside of Estonia, however various personalised obesity intervention targeting children and adults exist. For example, Sweden’s Prescription on Physical Activity (see Chapter 4) intervention is in the process of being transferred to several EU countries.

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A. Indicators from publically available datasets to assess the transferability of PAOMC are listed in Table 13.3. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 13.3. Indicators to assess the transferability of PAOMC

Indicator	Reasoning	Interpretation
Population context		
% of the population with access to recreational green space within 10min walking distance	PAOMC participants are encouraged to do outdoor activities, therefore PAOMC is more likely to be successful in countries where children have better access to green space	↑ = “more transferable”
Sector specific context (primary care)		
% children (15-19) who saw a GP in the last 12 months	PAOMC participants are recruited at the primary care level, therefore, DE-PLAN will have a greater extent of coverage in countries where more people access their GP frequently	↑ = “more transferable”
Health professionals are trained in health-enhancing physical activity	PAOMC is more likely to be successful in countries where health professionals have the skills to provide physical activity and health advice	“Yes” = more transferable
Programme or scheme to promote counselling on physical activity by health professionals	PAOMC is more likely to be successful in countries where health professionals are accustomed to providing counselling on physical inactivity	“Yes” = more transferable

Indicator	Reasoning	Interpretation
Political context		
Childhood obesity strategy	PAOMC will be more transferable to countries that prioritise childhood obesity	"Yes" = more transferable
Economic context		
Primary health care expenditure as a percentage of current health expenditure	PAOMC is a primary care intervention, therefore, it will be more successful in countries that allocate a higher proportion of health spending to primary care	↑ = "more transferable"

Source: WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; WHO Regional Office for Europe (2021[19]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; OECD (2020[20]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2014[21]), "Self-reported time elapsed since last visit to a medical professional by sex, age and educational attainment level (from 15 to 19 years)", https://ec.europa.eu/eurostat.

Results

Results from the transferability assessment of PAOMC in Estonia to OECD and non-OECD EU countries are in Table 13.4. Overall, PAOMC is likely to have political support from countries given nearly all countries have a specific strategy targeting childhood obesity. In addition, most countries with available data (77%) have either implemented or foresee implementing programs to support physical activity counselling by health professionals indicating greater levels of workforce acceptability of PAOMC (i.e. given the health profession will be more accustomed to providing this service). Data on remaining indicators shows mixed results, further, for these indicators there are high levels of missing data in non-European countries.

Table 13.4. Transferability assessment by country, PAOMC (OECD and non-OECD European countries)

A darker shade indicates PAOMC is more suitable for transferral in that particular country

	Access to green space (%)	Self-reported time elapsed since last visit to a medical professional, percentage less than one year	Inclusion of physical activity and health in curriculum of health professionals	Programme or scheme to promote counselling on physical activity by health professionals	Childhood obesity strategy	Primary Health Care Expenditure as percentage Current Health Expenditure
Estonia	**97.25**	**62.10**	**Implemented**	**Foreseen**	**Yes**	**44**
Australia	89.5*	n/a	n/a	n/a	No***	37
Austria	98.41	80.10	Implemented	Implemented	Yes	37
Belgium	94.89	62.80	Implemented	Implemented	Yes	40
Bulgaria	n/a	59.10	Foreseen**	Foreseen	Yes	47
Canada	n/a	n/a	n/a	n/a	Yes	48
Chile	n/a	n/a	n/a	n/a	Yes	n/a
Colombia	n/a	n/a	n/a	n/a	Yes	n/a
Costa Rica	n/a	n/a	n/a	n/a	No	33
Croatia	n/a	52.50	Not Implemented	Implemented	No	38
Cyprus	n/a	9.20	Not Implemented	Foreseen	Yes	41
Czech Republic	97.72	71.00	Implemented	Foreseen	Yes	33
Denmark	89.18	74.20	Implemented	Foreseen	Yes	38
Finland	99.85	59.50	Implemented	Implemented	Yes	46
France	93.03	87.20	Implemented	Implemented	No	43
Germany	95.93	76.60	Implemented	Implemented	Yes	48
Greece	93.85	49.80	Not Implemented	n/a	No	45
Hungary	91.49	76.20	Implemented	Implemented	Yes	40
Iceland	61.34	69.90	n/a	n/a	Yes	35
Ireland	94.47	65.50	Implemented	Implemented	Yes	47
Israel	n/a	n/a	n/a	n/a	Yes	n/a
Italy	88.11	54.10	Not Implemented	Implemented	Yes	n/a
Japan	n/a	n/a	n/a	n/a	Yes	52
Latvia	95.23	72.70	Implemented	Implemented	Yes	39

	Access to green space (%)	Self-reported time elapsed since last visit to a medical professional, percentage less than one year	Inclusion of physical activity and health in curriculum of health professionals	Programme or scheme to promote counselling on physical activity by health professionals	Childhood obesity strategy	Primary Health Care Expenditure as percentage Current Health Expenditure
Estonia	**97.25**	**62.10**	**Implemented**	**Foreseen**	**Yes**	**44**
Lithuania	94.82	85.90	Implemented	Implemented	Yes	48
Luxembourg	98.72	79.80	Implemented	Not Implemented	Yes	38
Malta	n/a	72.80	Implemented	Foreseen	Yes	62
Mexico	n/a	n/a	n/a	n/a	Yes	44
Netherlands	97.00	61.60	Implemented	Implemented	Yes	32
New Zealand	n/a	n/a	n/a	n/a	Yes	n/a
Norway	95.40	64.60	n/a	n/a	Yes	39
Poland	92.63	73.30	Implemented	Not Implemented	Yes	47
Portugal	83.33	62.90	Implemented	Implemented	No	58
Republic of Korea	n/a	n/a	n/a	n/a	Yes	57
Romania	n/a	27.50	Implemented	Foreseen	Yes	35
Slovak Republic	95.63	58.50	Not Implemented	Implemented	Yes	n/a
Slovenia	93.50	55.70	Implemented	Implemented	Yes	43
Spain	93.26	70.90	Not Implemented	Implemented	Yes	39
Sweden	99.14	54.00	Implemented	Implemented	Yes	n/a
Switzerland	97.31	n/a	n/a	n/a	Yes	40
Turkey	n/a	50.70	n/a	n/a	Yes	n/a
United Kingdom	91.43	62.40	Implemented	Implemented	Yes	53
United States	n/a	n/a	n/a	n/a	Yes	n/a

* The figure for Australia represent the average cross each major city and refer to access to green space within 400m. **Foreseen = in the next two years. ***There are a number of strategies focusing on children and young people within the proposed National Obesity Prevention Strategy (2022-2032). The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). n/a = no data was available.

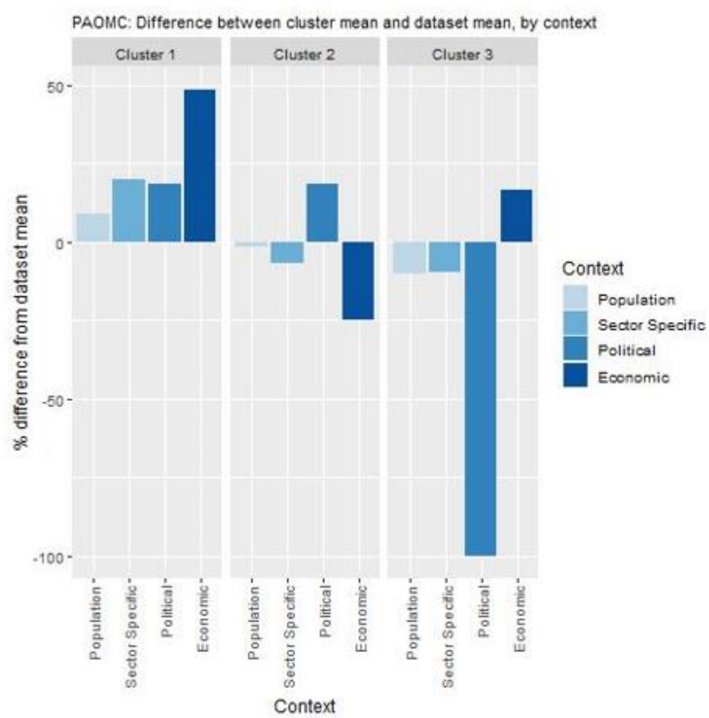
Source: WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; WHO Regional Office for Europe (2021[19]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; OECD (2020[20]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2014[21]), "Self-reported time elapsed since last visit to a medical professional by sex, age and educational attainment level (from 15 to 19 years)", https://ec.europa.eu/eurostat.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of three groups, based on indicators reported in Table 13.3. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 13.1 and Table 13.5:

- Countries in cluster one have population, sector specific, economic and political arrangements in place that support transferring PAOMC, and therefore are less likely to experience implementation barriers.
- The majority of countries fall under cluster two, which have political policies in place that support PAOMC. However, prior to transferring PAOMC, countries may wish to consider increasing funding for primary care to ensure the intervention is affordable in the long term. It is important to note that Estonia, which currently operates PAOMC, is in this cluster, indicating although ideal, high levels of spending on primary care is not a pre-requisite for transferring PAOMC.
- Remaining countries are in cluster three, where spending on primary care is high, yet changes to the population, sector specific and political contexts may need to be addressed to ensure a successful transfer. For example, by ensuring health professionals receive training on how to lead a healthy lifestyle in countries such as Greece.

Figure 13.1. Transferability assessment using clustering, PAOMC



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: WHO (n.d.[18]), "Global Health Observatory", https://www.who.int/data/gho; WHO Regional Office for Europe (2021[19]), "2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region", https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf; OECD (2020[20]), *How's Life? 2020: Measuring Well-being*, https://dx.doi.org/10.1787/9870c393-en; Eurostat (2014[21]), "Self-reported time elapsed since last visit to a medical professional by sex, age and educational attainment level (from 15 to 19 years)", https://ec.europa.eu/eurostat.

Table 13.5. Countries by cluster, PAOMC

Cluster 1	Cluster 2	Cluster 3
Finland	Austria	Australia
Germany	Belgium	Croatia
Lithuania	Bulgaria	France
Malta	Cyprus	Greece
Netherlands	Czech Republic	Portugal
Slovenia	Denmark	
Sweden	Estonia	
United Kingdom	Hungary	
	Iceland	
	Ireland	
	Italy	
	Latvia	
	Luxembourg	
	Norway	
	Poland	
	Romania	
	Slovak Republic	
	Spain	
	Switzerland	

Note: Due to high levels of missing data, the following countries were omitted from the analysis: Canada, Chile, Colombia, Costa Rica, Israel, Japan, Mexico, New Zealand, Republic of Korea, Turkey, and the United States.

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of PAOMC. Therefore, Box 13.2 outlines several new indicators policy makers should consider before transferring PAOMC.

Box 13.2. New indicators to assess transferability

In addition to the indicators from secondary sources of data outlined above, the following primary source indicators to measure transferability are recommended.

Population context

- What is the ethnicity and cultural diversity of the target population?
- What is the level of acceptability of PAOMC amongst parents?
- What is the level of health literacy amongst parents? (e.g. knowledge regarding what constitutes health eating, and the impact of healthy eating and exercise on overall health and well-being)
- What proportion of school-aged children access primary care services? (Does this figure differ between children with a normal weight and those who are overweight or obese?)

Sector specific context (primary care)

- What other obesity management interventions exist for school-aged children?
- Have GPs and paediatricians received appropriate training for treating children with obesity?
- Do GPs and paediatricians feel comfortable prescribing obesity treatment for children?
- Do GPs and paediatricians feel it is their responsibility for prescribing obesity treatment to children?
- What proportion of the population access primary care as the entry point to receiving health care?
- Is there a culture of health promotion and disease prevention within the health care system?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target setting?

Conclusion and next steps

Over the course of the past three decades, there has been a significant increase in the prevalence of overweight and obesity worldwide. The adoption of inadequate lifestyle behaviours leading to situations of obesity or overweight takes place in early childhood (Peñalvo et al., 2013[3]).The PAOMC intervention seeks to counter such behaviours through a personalised, family-based, paediatric obesity programme in a primary care setting.

The results from this study show that the intervention was successful in positively impacting anthropometric measurements and PA levels amongst children. Details on the intervention's efficiency were not publically available, however, previous OECD analysis indicates obesity management interventions targeting school-aged children are cost-effective, but produce a population-level impact only in the long-term. The data used to evaluate the effectiveness of PAOMC was derived from a cross-sectional, observational study, which is rated as weak evidence. PAOMC did not directly target a priority population group, nevertheless, it has the potential to reduce health inequalities given it targets a risk factor which disproportionately affects lower-SES children.

PAOMC includes many characteristics considered essential for a successful family-based, clinical obesity interventions in primary care settings. However, further changes, such as incorporating additional behaviour therapy and obesity counselling sessions, could be considered to achieve the intervention's core objective: reducing obesity and overweight, and improving overall lifestyle behaviours among children in Estonia.

Finally, PAOMC addresses childhood obesity, which is of key political interest, further, it is likely to be supported by health professionals as they are accustomed to providing this type of treatment. Nevertheless, the success of PAOMC in the target setting will depend on a range of contextual factors, in particular, the willingness and ability of GPs and paediatricians to provide children and their parents with obesity related advice.

Box 13.3 outlines next steps for policy makers and funding agencies regarding the PAOMC intervention.

Box 13.3. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance PAOMC are listed below:

- Support future evaluations of PAOMC for example by providing funding to collect participant data beyond the end of the intervention (e.g. 1 year after). By collecting longitudinal (panel) data, policy makers will gain a better understanding of the long-term impact of PAOMC.
- Support multipronged policy efforts to boost levels of population health literacy.
- Ensure funding to continue the implementation of the intervention as well as for future scale-up and transfer efforts.
- Promote findings from the PAOMC case study to better understand what countries/regions are interested in transferring the intervention.

References

Benziger, C., G. Roth and A. Moran (2016), *The Global Burden of Disease Study and the Preventable Burden of NCD*, Elsevier B.V., https://doi.org/10.1016/j.gheart.2016.10.024. [1]

Burke, B., H. Arkowitz and M. Menchola (2003), "The efficacy of motivational interviewing: A meta-analysis of controlled clinical trials.", *Journal of Consulting and Clinical Psychology*, Vol. 71/5, pp. 843-861, https://doi.org/10.1037/0022-006x.71.5.843. [17]

Davis, M. et al. (2007), "Recommendations for Prevention of Childhood Obesity", *Pediatrics*, Vol. 120/Supplement 4, pp. S229-S253, https://doi.org/10.1542/peds.2007-2329e. [15]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [10]

Eurostat (2019), *Self-reported time elapsed since last visit to a medical professional by sex, age and educational attainment level*. [13]

Eurostat (2014), *Self-reported time elapsed since last visit to a medical professional by sex, age and educational attainment level (from 15 to 19 years)*. [21]

Kramer, I. and L. Suurgorg (2017), *Personalized approach in child obesity management*, https://janpa-toolbox.eu/files/Estonia-PERSONALIZED APPROACH IN CHILD OBESITY MANAGEMENT.pdf. [7]

Mead, E. et al. (2017), "Diet, physical activity and behavioural interventions for the treatment of overweight or obese children from the age of 6 to 11 years", *Cochrane Database of Systematic Reviews*, https://doi.org/10.1002/14651858.cd012651. [14]

OECD (2020), *How's Life? 2020: Measuring Well-being*, OECD Publishing, Paris, https://doi.org/10.1787/9870c393-en. [20]

OECD (2019), *Health for Everyone?: Social Inequalities in Health and Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/3c8385d0-en. [9]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [2]

OECD/European Union (2018), *Health at a Glance: Europe 2018: State of Health in the EU Cycle*, OECD Publishing, Paris/European Union, Brussels, https://doi.org/10.1787/health_glance_eur-2018-en. [8]

Peñalvo, J. et al. (2013), "A cluster randomized trial to evaluate the efficacy of a school-based behavioral intervention for health promotion among children aged 3 to 5", *BMC Public Health*, Vol. 13/1, https://doi.org/10.1186/1471-2458-13-656. [3]

Rajjo, T. et al. (2017), "Treatment of Pediatric Obesity: An Umbrella Systematic Review", *The Journal of Clinical Endocrinology & Metabolism*, Vol. 102/3, pp. 763-775, https://doi.org/10.1210/jc.2016-2574. [16]

Robertson, W. et al. (2017), “Randomised controlled trial evaluating the effectiveness and cost-effectiveness of ‘Families for Health’, a family-based childhood obesity treatment intervention delivered in a community setting for ages 6 to 11 years”, *Health Technology Assessment*, Vol. 21/1, pp. 1-180, https://doi.org/10.3310/hta21010. [5]

Statistics Estonia (2020), *RV021: Population, 1 January by Sex, Year and Age group (5-9, 10-14 and 15-19)*. [11]

Suurorg, L. et al. (2017), *Overview of the project: personalized approach to obesity management in children (Supplement 1)*, Tallinn Children’s Hospital, Tallinn, Estonia, https://janpa-toolbox.eu/files/Supplementes_Suurorg_web Jan 17th 2017.pdf. [4]

WHO (2016), *Prevalence of overweight among children and adolescents, BMI > +1 standard deviations above the median (crude estimate) (%)*. [12]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [18]

WHO Regional Office for Europe (2021), *2021 Physical Activity Factsheets for the European Union Member States in the WHO European Region*, https://apps.who.int/iris/bitstream/handle/10665/345335/WHO-EURO-2021-3409-43168-60449-eng.pdf. [19]

Wright, D. et al. (2014), “The cost of a primary care-based childhood obesity prevention intervention”, *BMC Health Services Research*, Vol. 14/1, https://doi.org/10.1186/1472-6963-14-44. [6]

Notes

[1] Data is for the adult population, parents and non-parents. Nevertheless, it has been used as it is assumed parents, in most cases, are responsible for their child’s health care appointments.

[2] Data is only available for those aged 15-19 years.

[3] Estimated population aged 7-17 in Estonia = **156 106** * proportion of children with pre-obesity or obesity in Estonia = **19.4%** * the probability of visiting a GP in the past year = **62%.** Population data is only available by age groups which don’t identically align with 7-17, therefore the average was used.

14 Let Food Be Your Medicine

This chapter covers the case study of Let Food Be Your Medicine (LFYM), a web- and mobile-based intervention providing consumers with personalised nutrition advice. The case study includes an assessment of LFYM against the five best practice criteria, policy options to enhance performance and an assessment of its transferability to other OECD and EU27 countries.

Let Food Be Your Medicine: Case study overview

Description: Let Food Be Your Medicine (LFYM) is a web- and mobile-based intervention providing consumers with personalised nutrition (PN) advice. It is currently being piloted in Romania. Nutritional advice is based off a consumer's dietary intake (and genetic tests, if provided) compared to recommended levels outlined by the European Food Safety Agency. The app is designed for both preventative and treatment purposes and can cost up between EUR 0-5/month (USD PPP 0-7.3), depending on application features.

Best practice assessment: LFYM is currently in its infancy therefore data to quantitatively assess the intervention against the OECD Framework was not possible. Based on evidence for similar digital PN interventions, LFYM is likely to perform well against most criteria (see Table 14.1).

Table 14.1. OECD best practice assessment of LFYM

Criteria	Assessment
Effectiveness	PN interventions have found to be effective in improving dietary habits including a reduction in fat intake and high-energy snacks, and an increase in fruit and vegetable consumption
Efficiency	Economic evaluations of PN interventions conclude they are generally cost-effective
Equity	Interventions requiring users to be digitally literate and have access to the internet or smartphone can potentially exclude disadvantage groups such as the elderly
Evidence-base	The quality of evidence to evaluate LFYM is not available as the intervention is in its infancy The evidence to support personalised nutrition interventions more broadly is strong in areas such the study design and data collection methods
Extent of coverage	Mobile apps have an uptake of approx. 2% and a dropout rate of up to 20% with certain groups more prone to exiting

Enhancement options: to *enhance effectiveness and efficiency*, targeted online forums to discuss progress with those facing similar health issues could be established alongside frequent motivational messages. In addition, users could be given the option of uploading information on other risk factors such as tobacco consumption. To *enhance equity*, options to improve access to vulnerable groups are encouraged to boost uptake, for example through targeted promotion. To enhance the *evidence-base*, future evaluations using objective measures of body-mass index (BMI) are important given they are considered a final outcome and therefore of key interest to policy makers. Finally, to *enhance extent of coverage,* LFYM administrators are encouraged to actively promote how data will be used and stored to alleviate privacy concerns.

Transferability: a contextual review of Romania, where LFYM is being piloted, and OECD and non-OECD European countries, indicates the intervention is broadly transferable. For example, compared to Romania, most countries have higher levels of internet use and access among the public and health profession. However, before determining transferability, it is important to collect new types of information including regulation regarding the collection and use of genetic information.

Conclusion: LFYM is in its infancy therefore an in-depth assessment of the intervention against the OECD Framework was not possible, However, given the impact of similar PN digital interventions on health outcomes, LFYM can be considered a "promising" best practice intervention that may be broadly transferable. To further enhance implementation, LFYM administrators could consider options outlined in this case study such as frequent motivational messages.

Intervention description

The majority of interventions to change dietary behaviours are normally applied homogenously across different population groups (e.g. "eat five servings of fruits and vegetables a day"), and, have had limited success (Ordovas et al., 2018[1]; Marsaux et al., 2015[2]; Fallaize et al., 2013[3]). However, in recent years, there has been a growth in personalised nutrition (PN) which uses "individual specific information, founded in evidence-based science, to promote dietary behaviour change resulting in better health outcomes" (Adams et al., 2019[4]). The rise in the use of PN is a result of (Ordovas et al., 2018[1]; Forster et al., 2016[5]):

- A better understanding of how diets impact overall health, including at the individual level
- Advances in technology that enable people to record and measure their dietary intake with relative ease
- Developments in data analytics enabling information to be readily converted into useful information.

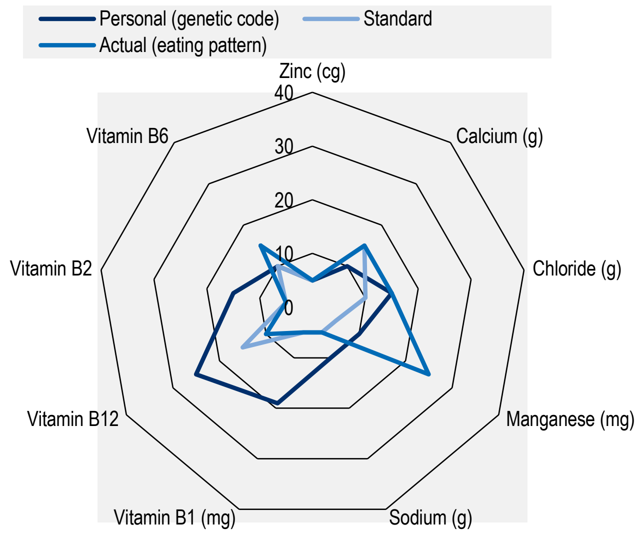
Let Food be Your Medicine (hereafter, LFYM) is a privately run mobile- and web-based online tool designed to provide personalised nutritional advice for both prevention and treatment purposes. To operate the tool, users upload information regarding:

- *Diet*: information on diet is collected using the Food4Me food frequency questionnaire covering 157 food items divided into 11 groups (e.g. "meat and fish", "dairy products", and "sweets and snacks"). Against each food time, users are asked to report how often the item was consumed using a nine-point scale ranging from "never" to "6+ a day", as well as portion size based on a series of pictures (Forster et al., 2014[6]).
- *Genetic information*: participants have the option to purchase a nutrigenetic test, which includes a swab tests. Results from the swab are then analysed with results provide online (Nutricare, 2020[7]). Alternatively, genetic information can be collected from a blood or urine sample.
- *Medical history*: users have the opportunity to directly upload information regarding medical conditions.
- *Calories, body composition and physical activity*: users have the option of uploading information from wearable and other digital devices to track performance. Key examples including physical activity and calorie trackers, as well data from smart scales.[1]

Using this information, the tool compares nutritional intake with recommended levels provided by the European Food Safety Agency (see Figure 14.1 for example output). Findings from the comparative assessment are used to develop recommendations on how to address any identified nutritional deficiencies or above standard nutrient amounts through a change in diet (i.e. what foods to eat more/less of) and/or supplements (NutriCare, 2019[8]).[2] Recommendations provided by the tool are supported by clinical studies published within the academic literature (NutriCare, 2019[8]). Alternatively, upon receiving results, users can book an appointment with their health care provider or nutritionist to discuss changes to their diet.

LFYM is currently undergoing a testing phase where it has been made available to 300 people in Romania. Once publically available, the standard version will be made available for free and the premium version at a cost between EUR 1-5/month (USD PPP 1.5-7.3) for individuals and EUR 5-10/month (USD PPP 7.3-14.6) for nutritionists (NutriCare, 2019[8]).

Figure 14.1. Diet assessment example



Source: Adapted from NutriCare (2019[8]), "Let Food Be Your Medicine".

OECD Best Practices Framework assessment

Data from the LFYM isn't available given the intervention is currently in its testing phase. For this reason, the OECD Best Practice Identification Framework (OECD Framework) was used to assess digital PN interventions more broadly (see Box 14.1 for a high-level assessment of digital PN interventions). Consequently, results from the assessment should only be taken as an indication of how LFYM may perform once rolled-out nationally. Further details on the OECD Framework can be found in Annex A.

Box 14.1. Best practice assessment overview: Personalised nutrition interventions

Effectiveness

- Let Food Be Your Medicine is in its testing phase, therefore no data on outcomes is currently available
- Analysis of similar digital interventions highlight the potential gains associated with personalised nutrition advice, such as an increase in fruit and vegetable consumption

Efficiency

- Economic evaluations of personalised nutrition interventions conclude they are generally cost-effective. For instance, OECD modelling work estimated mobile phone apps targeting diet and exercise will lead to labour cost savings of USD 4 PPP per capita (EUR 3.64), per year in Romania (the country where LFYM is being implemented)

Equity

- Once the intervention is rolled-out nationally, it will be made available to everyone with a smartphone or the internet at a monthly cost
- Evidence shows mHealth can widen existing health inequalities by restricting access to lower socio-economic groups, older populations and those living in rural areas

Evidence-base

- The quality of evidence to evaluate LFYM is not available as the intervention is in its infancy
- The evidence to support personalised nutrition interventions more broadly is strong in areas such the study design and data collection methods

Extent of coverage

- Based on OECD analysis, participation rates for mobile phone diet and exercise apps are approximately 2.2%
- Analysis of similar digital PN interventions indicate the dropout rate is around 20%

Effectiveness

> *Mobile apps and PN interventions have found to be effective in improving dietary habits including a reduction in fat intake and high-energy snacks, and an increase in fruit and vegetable consumption*

Smartphone penetration is growing across the world. As of 2017, 80% of the population in high-income countries owned a smartphone with this figure increasing to 82% for low and middle-income countries (Deloitte, 2017[9]). Mobile phone apps therefore present a promising opportunity to promote healthy lifestyles on a large scale. For example, modelling work by OECD estimated mobile apps targeting diet and physical activity over the period 2020-2050 will lead to an additional 3.38 life years gained per 100 000 people in Romania (where LFYM is implemented), which was second highest amongst the 36 countries analysed (OECD, 2019[10]). In terms of specific diseases, over the same time period, the model estimates mobile apps could avoid 760 CVDs and 121 diabetes cases in Romania (OECD, 2019[10]).

Advances in technology (e.g. machine learning) partnered with the growing use of smartphone has led to a growth in the use of PN advice. The evidence on PN dates back many years with Kroeze et al., in (2006[11]), summarising key findings from a systematic review of computer-tailored interventions targeted physical activity and dietary behaviour. Their analysis revealed that of the 26 randomised control trials (RCTs) regarding PN, 20 showed statistically significant, positive effects, in particular regarding a reduction in fat intake (Kroeze, Werkman and Brug, 2006[11]). More recently, Forster and colleagues (2016[5]) reviewed the evidence on the impact of PN tools delivered online (web-based), via mobiles as well as through wearable sensor technologies. In total, results from seven RCTs were summarised, four of which recorded significant effects associated with PN:

- Sternfeld et al. (2009[12]) found individuals participating in a 16-week tailored healthy eating and physical exercise plan offered online led to a reduction in consumption of trans-fats and saturated fats, and an increase in fruit and vegetable consumption, when compared to the control group. Specifically, four-months post the intervention, the intervention group consumed 0.29 and 0.75 grammes less of trans-fats and saturated fats, and 0.35 additional cups of fruits and vegetables per day (Sternfeld et al., 2009[12]). Individuals, who, at baseline, did not meet recommended dietary targets, saw the greatest improvement.

- Springvloet et al. (2015[13]) evaluated the short- and medium-term efficacy of a web-based programme offering tailored nutrition education based on self-reported consumption of fruits, vegetables, high-energy snacks and fat intake. Results from the study found when compared to the provision of generic nutrition information, those who received PN reduced their fat intake and high-energy snacks by more (-0.28 fat points and -0.20 high-energy snacks per day, four-months post the intervention) (Springvloet et al., 2015[13]).
- Maes et al. (2011[14]) evaluated the impact of Food-O-Meter, an online tool offering tailored nutritional advice to those aged between 12-17 years. The study reported modest findings, with fat intake falling for those who are overweight in the intervention group compared to those in the control group.
- Ambeba et al. (2015[15]) examined the impact of daily-feedback-messages (DFM) to changes in dietary intake using a two-year RCT involving obese participants. Findings from the RCT indicate those who receive DFM, compared to those who do not, reduce their mean percentage energy intake (-22.8% versus -14%, respectively) and fat intake (-10.4% versus -4.7%, respectively) after 24-months.

Forster et al. (2016[5]) also included the Food4Me study, which represents the most comprehensive PN RCT, to date (Celis-Morales et al., 2017[16]). The Food4Me "proof of principle" study was an internet-based 6-month RCT to assess the impact of PN compared to standard population advice. Participants in the study were divided into one of four groups: group 1) general dietary advice based on European population guidelines; group 2) PN based on individual dietary intake data; group 3) PN based on individual dietary intake and phenotypic data;[3] and group 4) PN based on individual dietary intake, and phenotypic and genotypic data (Celis-Morales et al., 2017[16]).

Results from the study found those who received PN (i.e. groups 2-4) saw improvements in salt and folate intake when compared to group 1. Specifically, the difference in mean change of salt intake for group 2-4 and group 1 was 0.65 grammes/day, and 29.6µg/day regarding folate consumption (Celis-Morales et al., 2017[16]). The impact of the intervention on other indicators such as fruit and vegetable consumption, waist circumference and BMI also showed positive effects, however, these were not statistically significant (Celis-Morales et al., 2017[16]).

Effectiveness information outlined in this section is largely based on interventions offering PN using self-reported food frequency questionnaires (FFQs). Conversely, LFYM uses genetic information as well as FFQs, therefore, the effectiveness of the LFYM may differ.

Efficiency

Economic evaluations of digital PN interventions found they are generally cost-effective

The economic impact of mobile apps promoting healthy lifestyles (through improved diet and physical activity) was recently modelled by OECD (2019[10]). Overall, the analysis concluded mHealth apps are efficient given they reduce labour costs such as absenteeism and presenteeism. For example, in Romania, it is estimated mHealth apps will lead to labour cost savings of USD 4 PPP per capita (EUR 3.64) annually (OECD, 2019[10]).

Regarding PN interventions specifically, a number of studies evaluated efficiency exist, however, few specifically refer to interventions offering tailored dietary advice based on genetic information (Laddu and Hauser, 2019[17]). Dalziel and Segal (2007[18]) evaluated the economic performance of 10 nutrition interventions, two of which offered PN advice ("Intensive Lifestyle Change to Prevent Diabetes", considered to have "high-quality evidence" and "Nurse Counselling in GP [General Practice]" with "intermediate quality evidence"). Results from their analysis found both interventions were cost-effective, specifically, Intensive Lifestyle Change to Prevent Diabetes was highly cost-effective with a cost per QALY of USD 1 410 (or EUR 1 283[4]). Results for Nurse Counselling in GP were expressed as an incremental cost-effectiveness ratio with one additional percentage point of participants eating more than five servings of fruits and vegetables per day costing USD 4 300 (or EUR 3 914). More recently, a systematic review of the cost-effectiveness of personalised interventions with a nutrition component found of the 49 studies analysed, over 70% were cost-effective (Milanne Galekop, 2019[19]).

Equity

> *Interventions requiring users to be digitally literate and have access to the internet or smartphone can potentially exclude disadvantage groups such as the elderly*

LFYM is offered online or via a mobile-based app at a cost of between EUR 1-5 (USD PPP 1.5-7.3) per month (a pared-down version offering standard as opposed to personalised advice is available for free). When the programme is rolled-out nationally, it will be available to everyone with access to a smartphone or the internet.

Previous analyses of mHealth users indicate they are popular among younger, higher-educated populations (Bol, Helberger and Weert, 2018[20]; Azzopardi-Muscat and Sørensen, 2019[21]), therefore, they potentially exacerbate existing health inequities by restricting access to groups in society that would benefit most (Oliveira Hashiguchi, 2020[22]; Jarke, 2018[23]). For example, research undertaken by OECD estimated adults in the highest income quartile are 50% more likely to use the internet to research health information, compared to adults in the lowest income quartile (OECD, 2019[24]). Other groups less likely to use digital health interventions include older populations and those living in rural areas due to factors such as cost (e.g. pay for a smartphone), lower e-health literacy skills and limited broadband access (Bol, Helberger and Weert, 2018[20]; Azzopardi-Muscat and Sørensen, 2019[21]; Oliveira Hashiguchi, 2020[22]).

Evidence-base

> *Evidence to support personalised nutrition interventions are generally strong in terms of study design and data collection methods*

The impact of LFYM has not been evaluated as the intervention is in its infancy. Therefore an assessment of the quality of evidence used to evaluate LFYM is not possible. Instead, the evidence-based section assesses the quality of the Food4Me Study, which represents the most comprehensive research into PN to date (see Table 14.2) (Celis-Morales et al., 2017[16]).

The Food4Me proof-of-principle study utilised a four-arm, web-based RCT across seven European countries to evaluate the impact of different levels of PN on a range of health outcomes. Specifically, the 1 607 eligible participants were randomly allocated into one of the four groups: 1) general dietary advice based on European population guidelines; 2) PN based on individual dietary intake data; 3) PN based on individual dietary intake and phenotypic data;[5] or 4) PN based on individual dietary intake, and phenotypic and genotypic data (Celis-Morales et al., 2017[16]).

Using the *Quality Assessment Tool for Quantitative Studies*, the Food4Me study is rated as having a strong study design (i.e. RCT) and data collection methods (i.e. the Food Frequency Questionnaire was used to measure to dietary intake which was the primary outcome). However, the study was not blinded and seemingly did not adequately control for potential confounders (e.g. socio-economic status), therefore the study was rated as “weak” in these areas (Effective Public Health Practice Project, 1998[25]).

Table 14.2. Evidence-based assessment, LFYM

Assessment category	Question	Score
Selection bias	Are the individuals selected to participate in the study likely to be representative of the target population?	Very likely
	What percentage of selected individuals agreed to participate?	N/A
Selection bias score: Moderate		
Study design	Indicate the study design	RCT
	Was the study described as randomised?	36 123
	Was the method of randomisation described?	36 123
	Was the method of randomisation appropriate?	36 123
Study design score: Strong		
Confounders	Were there important differences between groups prior to the intervention?	1.65
	What percentage of potential confounders were controlled for?	Can't tell
Confounders score: Weak		
Blinding	Was the outcome assessor aware of the intervention or exposure status of participants?	36 123
	Were the study participants aware of the research question?	36 123
Blinding score: Weak		
Data collection methods	Were data collection tools shown to be valid?	36 123
	Were data collection tools shown to be reliable?	36 123
Data collection methods score: Strong		
Withdrawals and dropouts	Were withdrawals and dropouts reported in terms of numbers and/or reasons per group?	36 123
	Indicate the percentage of participants who completed the study?	60-79%
Withdrawals and dropouts score: Moderate		

Source: Effective Public Health Practice Project (1998[25]), "Quality assessment tool for quantitative studies", https://www.nccmt.ca/knowledge-repositories/search/14.

Extent of coverage

Mobile apps have an uptake of approximately 2% and a dropout rate of up to 20% with certain groups more prone to exiting

At this stage, the extent of coverage of LFYM is unknown. Estimates of potential participation and dropout rates therefore rely on previous studies of similar interventions.

Research undertaken by OECD revealed around 2.2% of the adult population (15-64 years) use mobile apps to improve their health (Goryakin et al., 2017[26]). Regarding dropout rates, previous research from the Food4Me study in Europe revealed a dropout rate of approximately 20%, depending on user demographics (e.g. the Food4Me study reported female and participants with obesity were 38% and 125% more likely to dropout, respectively) (Livingstone et al., 2017[27]).

Based on the research summarised above, LFYM could expect a participation rate of approximately 2% and a dropout rate of 20%, depending on the population group.

Policy options to enhance performance

LFYM is an evidence-based PN intervention aimed at preventing as well as addressing current health problems using latest available technology. The intervention is in its infancy having only been trialled with 300 participants based in Romania. Therefore, data on best practice indicators such as effectiveness, efficiency and equity are not yet available. For this reason, policy options to enhance implementation have been developed based on a "gap analysis" comparing facilitators and barriers to success of similar interventions compared to the design of LFYM.

Enhancing effectiveness

A review of digital PN and other lifestyle interventions revealed a number of key success factors for enhancing effectiveness, many of which are already adopted by LFYM. These include a range of behavioural change techniques and social support mechanisms (see Box 14.2 for further details). Based on a gap analysis comparing these factors against the design of LFYM, several options to enhance effectiveness could be considered:

- A new feature being launched in 2021 allowing users to interact with one another online[6] is highly encouraged given the proven benefits associated with people feeling supported and part of a community (Hwang et al., 2010[28]). Since a wide range of users will access the online forum (i.e. with different health issues and goals), to maximise the potential of an forum/discussion group, a feature allowing users to more readily connect with others "in the same boat" may be beneficial (e.g. a filtering system allowing users to identify others aiming to lose weight).
- The types of information uploaded by participants into the app/web-based portal could be extended to include other risk factors such as alcohol and tobacco consumption (data on physical activity is already allowed through wearable technologies). By self-monitoring consumption of alcohol and tobacco, participants may be more motivated to reduce consumption. However, there are risks associated with uploading personal information, which must be considered. This topic is discussed in further detail under "Enhancing extent of coverage".
- Users who upload information from their wearable device (e.g. smart scales, and calorie and physical activity trackers) can track their performance in meeting specific goals on a frequent basis. To further motivate users, consideration could be given to providing users with either tailored or generic messages to maintain motivation, including to those who do not have access to wearable devices. For example, providing email or text messages to users when they reach a milestone towards achieving their set goal or when they have recorded improvement in their behaviour such as a consistent increase in daily physical activity. The literature indicates messaging should be frequent and be updated regularly, however, it is important that users have the option to reduce messaging as it may cause fatigue (Livingstone et al., 2017[27]).

Box 14.2. Factors impacting digital PN and other lifestyle intervention effectiveness

A summary of evidence regarding PN and other lifestyle interventions revealed the following key success factors:

- Content that is frequently "refreshed" limits the possibility of participants becoming desensitised from key messages (Forster et al., 2016[5])
- Interventions targeting multiple lifestyle behaviours – e.g. diet, physical activity, tobacco/alcohol consumption – tend to be more successful in changing health outcomes when compared to those targeting a single lifestyle factor (Browne et al., 2019[29]; Schulz et al., 2014[30])
- Participants who receive social support (e.g. through an online community group) are more likely to engage with digital lifestyle interventions (Jane et al., 2018[31]; Sharpe, Karasouli and Meyer, 2017[32])
- Frequent interaction, such as through daily messages, can help maintain participant motivation levels (Livingstone et al., 2017[27]; Ambeba et al., 2015[15]; Sharpe, Karasouli and Meyer, 2017[32])
- Behaviour change techniques such as goal setting, planning, self-monitoring, and feedback are associated with better health outcomes (Browne et al., 2019[29]; Janssen et al., 2013[33]; Forster et al., 2016[5]; Celis-Morales, Lara and Mathers, 2015[34])
- The online tool used to access information should be user friendly and therefore easy to navigate, further, it should include easy-to-understand instructions on how to impute data used to develop PN recommendations to minimise error (Adams et al., 2019[4]).

Higher levels of population health literacy (HL) will enhance the effectiveness of mHealth apps, such as LFYM. HL refers to an "individual's knowledge, motivation and skills to access, understand, evaluate and apply health information" (Moreira, 2018[35]). When people are health literate they are more likely to act on health information they receive, take greater responsibility for their own health, as well as engage in shared decision-making. Example strategies to boost HL have been outlined in a recent OECD report and include specific actions such as encouraging HL in schools and workplaces, as well as broader efforts to better measure and monitor changes in HL levels (Moreira, 2018[35]).

Improving digital HL, for users and health professionals, will also enhance the effectiveness of LFYM. For health professionals, this can be achieved by: developing digital health competency frameworks; developing concrete guidelines on how to integrate digital health topics into educational and training; and integrating digital skills into continuous professional development programs (OECD, 2019[24]).

Enhancing efficiency

Efficiency is calculated by obtaining information on effectiveness and expressing it in relation to inputs used. Therefore policies to boost effectiveness without significant increases in costs will have a positive impact on efficiency.

Enhancing equity

Overarching policies aimed at reducing barriers to access for disadvantaged groups, such as improving access to broadband, fall outside the scope of responsibilities of LFYM administrators. Nevertheless, policies that could be considered include: targeted promotion campaigns; provision of detailed, tailored, advice on how to use the app and its benefits to disadvantaged groups; as well as piloting LFYM in low-SES communities.

Given NCDs disproportionality affect lower-SES groups, ensuring access to digital PN interventions should be of interest to relevant policy makers given this group stands to benefit most.

Enhancing the evidence-base

Studies to evaluate the impact of digital PN interventions, to date, have largely relied on intermediate outcomes[7] such as changes in fruit and vegetable consumption and fat intake (see assessment of "Effectiveness"). Given LFYM plans to collect data on a final outcome measure – specifically, objective measures of BMI using smart scales – findings from a future evaluation of the intervention should be of high interest to policy makers. However, it is important when evaluating BMI data (and any other outcomes) to control for a range of socio-economic demographic variables such as education, employment and income, given users of PN are typically wealthier (for example, only a small subset of the population can afford to purchase a smart scale) (Adams et al., 2019[4]). Controlling for gender, age and ethnicity will also be of high interest. Failing to control for individual characteristics may lead to bias results by presenting findings for a specific group as opposed to the wider population.

The ability to control for individual characterises will ultimately depend on the data collection process. For this reason, LFYM administrators could consider additional socio-demographic and health-related questions when signing up to the intervention.

Details on outcome indicators of interest to LFYM and how to collect this data is provided in Box 14.3.

Further details on how to undertake an evaluation can be found in OECD's Guidebook on Best Practices in Public Health (OECD, 2022[36]).

Box 14.3. Indicators to measure outcomes

Potential indicators to measure the impact of LFYM are listed in Table 14.3, which includes both final and intermediate outcomes. Outcome indicators should be collected at different points in time, in particularly before and after the intervention. However, given LFYM is an ongoing intervention, collection of data during specific stages of the intervention may be more appropriate (e.g. once a year):

- **Start**: Collect data when activities start to take place to get an accurate baseline – for both the intervention and the control group (given a control group is available)
- **During**: Collect data throughout the intervention period instead of only at the end, to understand when the intervention is effective and observe trends such as participation levels
- **After**: Collect data at the end of the intervention and, ideally, some time after, to observe the longer-term impact and determine whether there is a lasting effect once the intervention has ended (this may be possible if participants who drop out of LFYM agree to have their data collected at specific follow-up points in time).

Indicators considered high-priority have been highlighted in Table 14.3. These indicators are universally recognised thereby making it easier to compare the impact of similar interventions implemented in different contexts (e.g. countries).

Table 14.3. Recommended final and intermediate outcome measures

	Indicators
Final outcomes	***Change in body-mass index*** **(= weight / height^2)** ***Relative reduction in raised blood pressure*** Change in waist circumference Change in waist-to-hip ratio Change in perceived health status (% of participants in good or very good health)
Intermediate outcomes	***Percentage of users who consume recommended daily amount of fruits and vegetables*** **(i.e. *5 portions*)** Percentage of users consuming fruit at least once per day Percentage of users consuming vegetables at least once per day Percentage of population whose free sugar intake is less than 10% of total calorie intake Percentage of the population who consume less than 5grams of salt per day Percentage of the population whose saturated fatty acid intake is less than 10% of total calorie intake (less than 1% for trans fatty acids) ***Percentage adults (18+) reporting doing at 150min of moderate-intensity physical activity in a week OR 75min or vigorous-intensity (or a combination of the two)**** Percentage population who engage in performance enhancing physical activity at least once a week (aerobic and/or muscle strengthening) Number of steps taken per day Self-efficacy for healthy eating** Self-efficacy for physical activity

Note: Indicators which are bolded and italicised are considered to be of high priority. *An indicator for physical activity has been included given LFYM offers users the option to upload activity data from wearable technologies. **Self-efficacy refers to an individual's belief they are capable of changing a certain behaviour (in this example, healthy eating and/or physical activity) – this type of data is collected through self-reported questionnaires (WHO, n.d.[37]).

Enhancing extent of coverage

Policies to enhance the extent of coverage are outlined according to individuals and health professionals.

Individuals

A key component of the LFYM intervention is the use of genetic testing to provide tailored nutritional advice. However, potential participants may be wary of uploading genetic information to a digital device operated by a private company due to potential risks (for example, concerns regarding how data may "be used and abused" by different stakeholders such as insurers and employers) (see Box 14.4 for further details) (Stewart-Knox et al., 2009[38]). A survey of 6 000 individuals across eight European countries found just 28% of participants were willing to undertake genetic testing for PN purposes, with rates lower for younger, healthier individuals (Stewart-Knox et al., 2009[38]). Further, less than a quarter (22%) of participants would not be willing to have a genetic test. For this reason, it is recommended that LFYM administrators provide extensive information and actively promote how genetic data is used and stored in order to alleviate concerns (e.g. keeping abreast of developments in the standard required to collect, protect, share and use genetic data will be important – such as the Future of Privacy Forum) (Adams et al., 2019[4]).

Once the intervention is rolled-out and sufficient data on participant demographics is available, an analysis of participation rates across population groups is encouraged to identify key trends (e.g. higher dropout in certain population groups). Further analysis into key participation trends may be necessary, for example, through stakeholder interviews and surveys, to identify why certain groups are less engaged than others.

Box 14.4. Risks associated with sharing personal health information

Drawing upon two recent OECD reports, key risks associated with uploading personal information are summarised below, with a specific focus on genetic information (OECD, 2019[24]; OECD, 2020[39]). These risks should be considered when rolling out interventions such as LFYM.

- **Data security threats**: health care data has a high economic value, for this reason, it is prone to leakages and hacks.
- **Monetisation of health data**: monetisation of health data is an area of ethical concern, for example, custodians of data may use this information to develop products and/or license access to data to third parties.
- **Interpretation of results**: the use of direct-to-consumer genetic testing to develop tailored treatments (or lifestyle behaviour recommendations) risks presenting individuals with information: they do not understand; is difficult to interpret; or which requires further contextual information. Low levels of understanding can therefore lead to unnecessary emotional distress.
- **Understanding of how data is used:** there is a risk people upload personal health information without realising how their data will be used – for example, due to lengthy terms and conditions and disclaimers. As a result, there is a risk will people upload information for purposes they are not comfortable with.

Health professionals (including dieticians)

A recent study by Chen et al. (2017[40]) examining the use of mHealth apps amongst dieticians in Australia, New Zealand and the United Kingdom revealed 62% of respondents use mHealth apps within their practice. Dieticians not using mHealth apps highlighted the following factors for this choice: 1) no access to a smartphone at work (51% indicated this as a barrier); lack of infrastructure in their practice, such as poor Wi-Fi (42%); and lack of time with patients to recommend apps (26%) (Chen et al., 2017[40]).

Responsibility for addressing these barriers lies with higher-level policy makers (e.g. state/national level), however, barriers that could be addressed by LFYM include “lack of awareness of the best apps to recommend” and “apps [being] too hard to use” (Chen et al., 2017[40]). For example, LFYM administrators could engage with dietetic associations in countries it hopes to launch in as a way to promote the app and its uses. LFYM could also use this opportunity to offer dieticians a free trial in which to get used to the app, which would also provide an opportunity for LFYM administrators to gather feedback on the app’s usability.

Transferability

This section explores the transferability of LFYM from Romania to other OECD and non-OECD EU countries and is broken into three components: 1) an examination of previous transfers; 2) a transferability assessment using publically available data; and 3) additional considerations for policy makers interested in transferring LFYM.

Previous transfers

The LFYM mHealth intervention has, to date, not been transferred to other countries or regions outside Romania, however, mHealth healthy lifestyle apps are common in most developed countries. For example, the WHO as part of its “Be He@lthy, Be Mobile” initiative has developed a series of handbooks to help policy makers implement mHealth interventions (WHO, 2021[41]).

Transferability assessment

The following section outlines the methodological framework to assess transferability and results from the assessment.

Methodological framework

Details on the methodological framework to assess transferability can be found in Annex A.

Indicators from publically available datasets to assess the transferability of LFYM are listed in Table 14.4. Please note, the assessment is intentionally high level given the availability of public data covering OECD and non-OECD European countries.

Table 14.4. Indicators to assess the transferability of LFYM

Indicator	Reasoning	Interpretation
Population context		
% of individuals using the internet for seeking health information in the last 3 months	LFYM is more likely to be successful in a population comfortable seeking health information online	↑ value = more transferable
ICT Development Index*	LFYM is more likely to be successful in digitally advanced countries	↑ value = more transferable
Sector specific context (digital health sector)		
Legislation exists to protect the privacy of personally identifiable data of individuals, irrespective of whether it is in paper or digital format	mHealth apps work in settings where users feel their personal data is safe. Therefore, LFYM is more likely to be successful in countries in countries with legislation to protect patient data.	“ 36 123 ” = more transferable
eHealth composite index of adoption amongst GPs**	LFYM users can share results from the app with their GP, therefore, LFYM is more likely to be successful in countries where GPs are comfortable using eHealth technologies	↑ value = more transferable
Entity providing incentives and guidance for mHealth apps	LFYM is more likely to be successful in countries where there is an entity responsible for promoting mHealth apps	“ 36 123 ” = more transferable

Indicator	Reasoning	Interpretation
Political context		
A national eHealth policy or strategy exists	LFYM is more likely to be successful if the government is supportive of eHealth	“ 36 123 ” = more transferable
Operational strategy/action plan/policy to reduce unhealthy eating	LFYM will be more successful in countries which prioritise unhealthy eating	“ 36 123 ” = more transferable
Economic context		
Gross national income per capita (purchasing power parity, international dollars)	Users have to pay out-of-pocket for LFYM, therefore, LFYM is more likely to be successful in more wealthy countries	↑ value = more transferable

* The ICT development index represents a country's information and communication technology capability. It is a composite indicator reflecting ICT readiness, intensity and impact (ITU, 2020[42]). **The eHealth composite index of adoption amongst GPs is made up of adoption in regards to electronic health records, telehealth, personal health records and health information exchange (European Commission, 2018[43]). Source: ITU (2020[42]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; WHO (2015[44]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; WHO (n.d.[45]), "Global Health Observatory", https://www.who.int/data/gho; World Bank (2017[46]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; European Commission (2018[43]), "Benchmarking Deployment of eHealth among General Practitioners (2018)", https://op.europa.eu/en/publication-detail/-/publication/d1286ce7-5c05-11e9-9c52-01aa75ed71a1.

Results

LFYM is broadly transferable across OECD and non-OECD European countries based on publically available data (Table 14.5). Compared to Romania (the owner setting), most countries have higher internet use and access as measured by the proportion of people accessing health information online, eHealth adoption amongst GPs and the ICT development index – for example, 33% of people in Romania seek health information online compared to an average of 54% in other countries. Further, most countries have legislation to protect digital patient data, as well as eHealth and unhealthy eating plans indicating political support for the intervention (64% and 90%, respectively).

Table 14.5. Transferability assessment by country, LFYM (OECD and non-OECD European countries)

A darker shade indicates Let Food Be Your Medicine may be more suitable for transferral in that particular country

	% individuals seeking health information online	ICT Development Index value	Legislation to protect digital patient data	eHealth adoption amongst GPs	Entity promoting mHealth apps	National eHealth policy	Unhealthy eating action plan	GNI per capita (PPP Int $)
Romania	**33**	**5.9**	**36 123**	**1.65**	**1.65**	**36 123**	**36 123**	**29 549**
Australia	42	8.2	2.05	2.05	2.05	36 123	36 123	48 007
Austria	53	Yes	36 123	1.91	1.65	1.65	36 123	56 304
Belgium	49	1.65	36 123	2.07	1.65	36 123	36 123	52 562
Bulgaria	34	6.4	36 123	1.81	1.65	36 123	36 123	22 883
Canada	59	7.6	36 123	2.05	2.05	36 123	36 123	48 384
Chile	27	6.1	36 123	2.05	2.05	36 123	36 123	24 131
Colombia	41	5	36 123	2.05	2.05	2.05	36 123	14 163
Costa Rica	44	6	36 123	2.05	2.05	36 123	36 123	19 094
Croatia	53	6.8	36 123	2.18	36 123	36 123	36 123	28 388
Cyprus	58	6.3	2.05	1.93	1.65	36 123	1.65	38 207
Czech Republic	56	7.2	36 123	2.06	36 123	1.65	36 123	38 326
Denmark	67	8.8	36 123	2.86	1.65	36 123	36 123	57 449
Estonia	60	8	36 123	2.79	36 123	36 123	36 123	36 123
76	76	47 065	36 123	2.05	2.05	36 123	36 123	
50	50	8	2.05	2.05	2.05	2.05	36 123	47 065
66	66	47 065	2.05	1.65	2.05	2.05	36 123	
50	50	1.65	36 123	1.65	1.65	36 123	1.65	
60	60	1.65	36 123	1.65	1.65	1.65	36 123	
65	65	1.65	36 123	2.05	1.65	36 123	36 123	
57	57	1.65	36 123	#N/A	2.05	36 123	36 123	
50	50	1.65	36 123	2.05		1.65	36 123	
35	35	1.65	36 123	Yes	1.65	36 123	36 123	
Yes	2.05	1.65	36 123	2.05	2.05	36 123	36 123	
48	48	1.65	36 123	Yes	1.65	36 123	36 123	
61	61	7	36 123	1.65	36 123	36 123	36 123	35 989

	% individuals seeking health information online	ICT Development Index value	Legislation to protect digital patient data	eHealth adoption amongst GPs	Entity promoting mHealth apps	National eHealth policy	Unhealthy eating action plan	GNI per capita (PPP Int $)
Romania	**33**	**5.9**	**36 123**	**1.65**	**1.65**	**36 123**	**36 123**	**29 549**
58	58	1.65	36 123	Yes	1.65	36 123	36 123	
59	59	Yes	36 123	2.05	36 123	1.65	36 123	
50	50	Yes	36 123	2.05	2.05	2.05	36 123	
74	74	Yes	36 123	2.05	36 123	36 123	36 123	
n/a	2.05	47 065	36 123	2.05		36 123	1.65	41 672
Norway	69	Yes	36 123	2.05	1.65	36 123	36 123	67 563
Poland	47	1.65	36 123	1.84	1.65	36 123	36 123	31 913
Portugal	49	1.65	36 123	2.12	36 123	1.65	36 123	34 154
Republic of Korea	50	8.8	2.05	2.05	2.05	2.05	36 123	43 240
Slovak Republic	53	6.7	2.05	1.76	2.05	2.05	36 123	29 622
Slovenia	48	7.1	36 123	2.00	1.65	1.65	36 123	38 411
Spain	60	Yes	36 123	2.37	36 123	1.65	36 123	41 046
Sweden	62	8.5	36 123	2.52	36 123	36 123	1.65	53 928
Switzerland	67	8.5	36 123	2.05	1.65	36 123	36 123	65 821
Turkey	51	5.5	36 123	2.05	36 123	1.65	36 123	27 814
United Kingdom	67	8.5	36 123	2.52	36 123	36 123	36 123	45 851

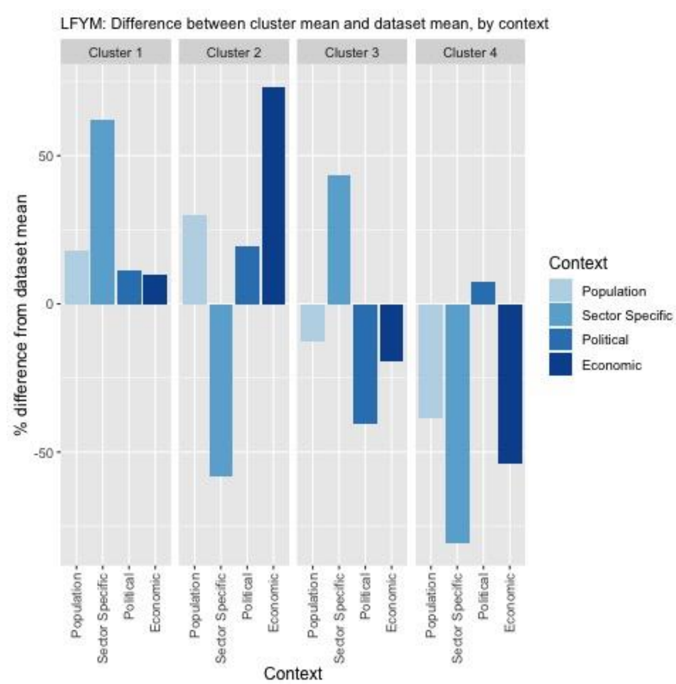
Note: The shades of blue represent the distance each country is from the country in which the intervention currently operates, with a darker shade indicating greater transfer potential based on that particular indicator (see Annex A for further methodological details). n/a = data not available; GNI = gross national income; PPP = purchasing power parity.
Source: ITU (2020[42]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; WHO (2015[44]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; WHO (n.d.[45]), "Global Health Observatory", https://www.who.int/data/gho; World Bank (2017[46]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; European Commission (2018[43]), "Benchmarking Deployment of eHealth among General Practitioners (2018)", https://op.europa.eu/en/publication-detail/-/publication/d1286ce7-5c05-11e9-9c52-01aa75ed71a1.

To help consolidate findings from the transferability assessment above, countries have been clustered into one of four groups, based on indicators reported in Table 14.4. Countries in clusters with more positive values have the greatest transfer potential. For further details on the methodological approach used, please refer to Annex A.

Key findings from each of the clusters are below with further details in Figure 14.2 and Table 14.6:

- Countries in cluster one have population, political, economic and sector specific arrangements in place to transfer LFYM. Countries in this cluster are therefore less likely to experience issues associated with implementing and operating LFYM in their local context.
- Countries in cluster two have population, political and economic arrangements in place to transfer LFYM, but may wish to introduce policies that ensure the sector is ready for LFYM.
- Countries in cluster three have a sector that supports LFYM. However, before transferring LFYM, countries in this cluster may want to consider increasing uptake of digital health technologies among the population, ensure LFYM aligns with political priorities and undertake further analysis to assess if LFYM is affordable among the population.
- Countries in cluster four would likely support LFYM as it aligns with overarching political priorities. However, before transferring LFYM, countries in this cluster may also want to increase uptake of digital technologies, implement policies to ensure the sector is ready for this type of intervention, and assess overall affordability. It is important to note that Romania, which currently operates LFYM, is in this cluster, indicating although ideal, such conditions are not necessarily pre-requisites for transferring LFYM.

Figure 14.2 Transferability assessment using clustering, LFYM



Note: Bar charts show percentage difference between cluster mean and dataset mean, for each indicator.
Source: ITU (2020[42]), "The ICT Development Index (IDI): conceptual framework and methodology", https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx; WHO (2015[44]), "Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage", https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage; WHO (n.d.[45]), "Global Health Observatory", https://www.who.int/data/gho; World Bank (2017[46]), "GNI per capita, PPP (constant 2017 international $)", https://data.worldbank.org/indicator/NY.GNP.PCAP.PP.KD; European Commission (2018[43]), "Benchmarking Deployment of eHealth among General Practitioners (2018)", https://op.europa.eu/en/publication-detail/-/publication/d1286ce7-5c05-11e9-9c52-01aa75ed71a1.

Table 14.6. Countries by cluster, LFYM

Cluster 1	Cluster 2	Cluster 3	Cluster 4
Australia	Denmark	Austria	Bulgaria
Belgium	Germany	Czech Republic	Chile
Canada	Iceland	Hungary	Colombia
Croatia	Ireland	Israel	Costa Rica
Estonia	Luxembourg	Malta	Cyprus
Finland	1.65rway	Mexico	Greece
France	Switzerland	Portugal	Latvia
Italy	United States	Slovenia	Poland
Japan		Spain	Romania
Lithuania		Turkey	Slovak Republic
Netherlands			
New Zealand			
Republic of Korea			
Sweden			
United Kingdom			

New indicators to assess transferability

Data from publically available datasets is not ideal to assess the transferability of LFYM, for example, there is no publically available data set on whether a country has regulations in place that forbid direct-to-consumer genetic testing. Therefore, Box 14.5 outlines several new indicators policy makers should consider before transferring LFYM.

Box 14.5. New indicators to assess transferability

In addition to the indicators within the transferability assessment, policy makers are encouraged to collect data for the following indicators:

Population context

- How acceptable are digital personalised health interventions? (e.g. are they an appropriate response high obesity rates? Does the public understand the intervention and its purpose?)
- What is the population's willingness to share medical data with a private company?
- Does the population trust their personal health information will be used, stored and managed appropriately?
- What proportion of the population has access to a smartphone?

Sector specific context (digital health sector)

- What, if any, compatible interventions exist?
- What, if any, competing interventions exist? (e.g. other nutrition health apps)
- How acceptable are apps and/or PN to improve diets amongst the health care profession?
- What are the regulations regarding the use of genetic information?

Political context

- Has the intervention received political support from key decision-makers?
- Has the intervention received commitment from key decision-makers?

Economic context

- What is the cost of implementing the intervention in the target context? (e.g. how do infrastructure costs differ between the primary and target context?)

Conclusion and next steps

LFYM is a promising mobile and web-based PN intervention with the potential to prevent as well as treat existing health care conditions. Given the intervention is currently in its infancy, data to evaluate the intervention against the OECD Framework was not available. Instead, this case study reviewed similar digital PN interventions which revealed many meet best practice criteria, for example, a recent systematic review found over 70% of studies conclude PN is cost-effective (Milanne Galekop, 2019[19]). However, similar to other digital health interventions, LFYM has the potential to widen social inequalities given mHealth apps are less accessible to certain priority population groups (e.g. lower SES).

A review of the literature highlighted several high-level policy options LFYM administrators could consider to enhance effectiveness, the evidence-based, equity and extent of coverage. These include, but are not limited to, offering users targeted social support and motivational messages; additional promotion of the service to disadvantaged groups such as those with a lower socio-economic status; as well as boosting public acceptability by ensuring transparency in regard to how data, genetic data in particular, is used and stored.

A transferability assessment comparing Romania, where LFYM is being piloted, and OECD and non-OECD European countries indicates the intervention is broadly transferable. For example, compared to Romania, most countries have higher levels of internet use and access among the public and health profession. However, before determining transferability, it is important to collect new types of information including regulation regarding the collection and use of genetic information.

Box 14.6 outlines next steps for policy makers and funding agencies regarding the LFYM intervention.

Box 14.6. Next steps for policy makers and funding agencies

Next steps for policy makers and funding agencies to enhance LFYM are listed below:

- Support policies to enhance the use of mHealth apps such as boosting digital health literacy and ensuring health professionals have access to the necessary digital infrastructure at work
- Support policies to improve access to mHealth apps by disadvantaged groups such as people living in regional/rural areas and elderly population
- Closely follow LFYM developments in particular evaluation findings which can be used to develop subsequent policies (e.g. funding to scale-up or transfer the intervention)
- Promote findings from the LFYM case study to better understand what countries/regions are interested in transferring the intervention.

References

Adams, S. et al. (2019), "Perspective: Guiding Principles for the Implementation of Personalized Nutrition Approaches That Benefit Health and Function", *Advances in Nutrition*, https://doi.org/10.1093/advances/nmz086. [4]

Ambeba, E. et al. (2015), "The use of mHealth to deliver tailored messages reduces reported energy and fat intake", *Journal of Cardiovascular Nursing*, Vol. 30/1, pp. 35-43, https://doi.org/10.1097/JCN.0000000000000120. [15]

Azzopardi-Muscat, N. and K. Sørensen (2019), "Towards an equitable digital public health era: promoting equity through a health literacy perspective", *European journal of public health*, Vol. 29/3, pp. 13-17, https://doi.org/10.1093/eurpub/ckz166. [21]

Bol, N., N. Helberger and J. Weert (2018), "Differences in mobile health app use: A source of new digital inequalities?", *The Information Society*, Vol. 34/3, pp. 183-193, https://doi.org/10.1080/01972243.2018.1438550. [20]

Browne, S. et al. (2019), "Effectiveness of interventions aimed at improving dietary behaviours among people at higher risk of or with chronic non-communicable diseases: an overview of systematic reviews", *Eur J Clin Nutr*, Vol. 73, pp. 9-23, https://doi.org/10.1038/s41430-018-0327-3. [29]

Celis-Morales, C., J. Lara and J. Mathers (2015), *Personalising nutritional guidance for more effective behaviour change*, Cambridge University Press, https://doi.org/10.1017/S0029665114001633. [34]

Celis-Morales, C. et al. (2017), "Effect of personalized nutrition on health-related behaviour change: evidence from the Food4Me European randomized controlled trial", *International Journal of Epidemiology*, Vol. 46/2, https://doi.org/10.1093/ije/dyw186. [16]

Chen, J. et al. (2017), "The use of smartphone health apps and other mobile health (mHealth) technologies in dietetic practice: a three country study", *Journal of Human Nutrition and Dietetics*, Vol. 30/4, pp. 439-452, https://doi.org/10.1111/jhn.12446. [40]

Dalziel, K. and L. Segal (2007), "Time to Give Nutrition Interventions a Higher Profile: Cost-Effectiveness of 10 Nutrition Interventions", *Health Promotion International*, Vol. 22/4. [18]

Deloitte (2017), *Global mobile consumer trends, 2nd edition Mobile continues its global reach into all aspects of consumers' lives*, https://www2.deloitte.com/content/dam/Deloitte/us/Documents/technology-media-telecommunications/us-global-mobile-consumer-survey-second-edition.pdf. [9]

Effective Public Health Practice Project (1998), *Quality assessment tool for quantitative studies*, https://www.nccmt.ca/knowledge-repositories/search/14. [25]

European Commission (2018), *Benchmarking Deployment of eHealth among General Practitioners (2018)*, https://op.europa.eu/en/publication-detail/-/publication/d1286ce7-5c05-11e9-9c52-01aa75ed71a1. [43]

Fallaize, R. et al. (2013), “An insight into the public acceptance of nutrigenomic-based personalised nutrition”, *Nutrition Research Reviews*, Vol. 26/1, pp. 39-48, https://doi.org/10.1017/S0954422413000024. [3]

Forster, H. et al. (2014), “Online dietary intake estimation: The food4me food frequency questionnaire”, *Journal of Medical Internet Research*, Vol. 16/6, https://doi.org/10.2196/jmir.3105. [6]

Forster, H. et al. (2016), *Personalised nutrition: The role of new dietary assessment methods*, Cambridge University Press, https://doi.org/10.1017/S0029665115002086. [5]

Goryakin, Y. et al. (2017), *The Role of Communication in Public Health Policies - The case of obesity prevention in Italy*, OECD, Paris, http://www.salute.gov.it/imgs/C_17_pubblicazioni_2647_allegato.pdf. [26]

Hwang, K. et al. (2010), “Social support in an Internet weight loss community”, *International Journal of Medical Informatics*, Vol. 79/1, pp. 5-13, https://doi.org/10.1016/j.ijmedinf.2009.10.003. [28]

ITU (2020), *The ICT Development Index (IDI): conceptual framework and methodology*, https://www.itu.int/en/ITU-D/Statistics/Pages/publications/mis/methodology.aspx (accessed on 26 February 2021). [42]

Jane, M. et al. (2018), “Social media for health promotion and weight management: A critical debate”, *BMC Public Health*, Vol. 18/1, https://doi.org/10.1186/s12889-018-5837-3. [31]

Janssen, V. et al. (2013), “Lifestyle modification programmes for patients with coronary heart disease: a systematic review and meta-analysis of randomized controlled trials”, *European Journal of Preventive Cardiology*, Vol. 20/4, pp. 620-640, https://doi.org/10.1177/2047487312462824. [33]

Jarke, H. (2018), “mHealth – Friend or Foe in Reducing Inequality? A Systematic Literature Review”, https://doi.org/10.31237/OSF.IO/W8QGJ. [23]

Kroeze, W., A. Werkman and J. Brug (2006), “A systematic review of randomized trials on the effectiveness of computer-tailored education on physical activity and dietary behaviors”, *Annals of Behavioral Medicine*, Vol. 31/3, pp. 205-223, https://doi.org/10.1207/s15324796abm3103_2. [11]

Laddu, D. and M. Hauser (2019), *Addressing the Nutritional Phenotype Through Personalized Nutrition for Chronic Disease Prevention and Management*, W.B. Saunders, https://doi.org/10.1016/j.pcad.2018.12.004. [17]

Livingstone, K. et al. (2017), “Characteristics of European adults who dropped out from the Food4Me Internet-based personalised nutrition intervention”, *Public Health Nutrition*, Vol. 20/1, pp. 53-63, https://doi.org/10.1017/S1368980016002020. [27]

Maes, L. et al. (2011), “Pilot evaluation of the HELENA (Healthy Lifestyle in Europe by Nutrition in Adolescence) Food-O-Meter, a computer-tailored nutrition advice for adolescents: A study in six European cities”, *Public Health Nutrition*, Vol. 14/7, pp. 1292-1302, https://doi.org/10.1017/S1368980010003563. [14]

Marsaux, C. et al. (2015), "Effects of a Web-Based Personalized Intervention on Physical Activity in European Adults: A Randomized Controlled Trial.", *Journal of medical Internet research*, Vol. 17/10, p. e231, https://doi.org/10.2196/jmir.4660. [2]

Milanne Galekop (2019), *A systematic review of the cost-effectiveness of personalized interventions with a nutritional component*, Erasmus School of Health Policy and Management, https://preventomics.eu/wp-content/uploads/2020/02/Milanne-Galekop_ISPOR_2019_2.pdf. [19]

Moreira, L. (2018), "Health literacy for people-centred care: Where do OECD countries stand?", *OECD Health Working Papers*, No. 107, OECD Publishing, Paris, https://doi.org/10.1787/d8494d3a-en. [35]

NutriCare (2019), *Let Food Be Your Medicine*, https://www.nutricare.life/. [8]

Nutricare (2020), *Improve your Destiny!*, https://www.nutricare.life/ (accessed on 9 June 2020). [7]

OECD (2022), *Guidebook on Best Practices in Public Health*, OECD Publishing, Paris, https://doi.org/10.1787/4f4913dd-en. [36]

OECD (2020), *OECD Reviews of Public Health: Korea: A Healthier Tomorrow*, OECD Reviews of Public Health, OECD Publishing, Paris, https://doi.org/10.1787/be2b7063-en. [39]

OECD (2019), *Health in the 21st Century: Putting Data to Work for Stronger Health Systems*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/e3b23f8e-en. [24]

OECD (2019), *The Heavy Burden of Obesity: The Economics of Prevention*, OECD Health Policy Studies, OECD Publishing, Paris, https://doi.org/10.1787/67450d67-en. [10]

Oliveira Hashiguchi, T. (2020), "Bringing health care to the patient: An overview of the use of telemedicine in OECD countries", *OECD Health Working Papers*, No. 116, OECD Publishing, Paris, https://doi.org/10.1787/8e56ede7-en. [22]

Ordovas, J. et al. (2018), "Personalised nutrition and health", *BMJ (Online)*, Vol. 361, https://doi.org/10.1136/bmj.k2173. [1]

Schulz, D. et al. (2014), "Economic evaluation of a web-based tailored lifestyle intervention for adults: Findings regarding cost-effectiveness and cost-utility from a randomized controlled trial", *Journal of Medical Internet Research*, Vol. 16/3, https://doi.org/10.2196/jmir.3159. [30]

Sharpe, E., E. Karasouli and C. Meyer (2017), "Examining Factors of Engagement With Digital Interventions for Weight Management: Rapid Review", *JMIR Research Protocols*, Vol. 6/10, p. e205, https://doi.org/10.2196/resprot.6059. [32]

Springvloet, L. et al. (2015), "Short-and medium-term efficacy of a web-based computer-tailored nutrition education intervention for adultsincluding cognitive and environmental feedback: Randomized controlled trial", *Journal of Medical Internet Research*, Vol. 17/1, p. e23, https://doi.org/10.2196/jmir.3837. [13]

Sternfeld, B. et al. (2009), "Improving Diet and Physical Activity with ALIVE. A Worksite Randomized Trial", *American Journal of Preventive Medicine*, Vol. 36/6, pp. 475-483, https://doi.org/10.1016/j.amepre.2009.01.036. [12]

Stewart-Knox, B. et al. (2009), "Attitudes toward genetic testing and personalised nutrition in a representative sample of European consumers", *British Journal of Nutrition*, Vol. 101/7, pp. 982-989, https://doi.org/10.1017/S0007114508055657. [38]

WHO (2021), *Addressing mobile health*, https://www.who.int/activities/Addressing-mobile-health (accessed on 14 March 2021). [41]

WHO (2015), *Atlas of eHealth country profiles: The use of eHealth in support of universal health coverage*, Global Observatory for eHealth, https://www.afro.who.int/publications/atlas-ehealth-country-profiles-use-ehealth-support-universal-health-coverage. [44]

WHO (n.d.), *Global Health Observatory*, https://www.who.int/data/gho (accessed on 25 August 2021). [45]

WHO (n.d.), *Interventions on diet and physical activity: what works - summary report*, https://www.who.int/dietphysicalactivity/summary-report-09.pdf?ua=1. [37]

World Bank (2017), *GNI per capita, PPP (constant 2017 international $)*. [46]

Notes

[1] A smart scale measures weight and other body composition metrics and automatically records and uploads this information to an app or other online service.

[2] The dietary assessment covers: Carbohydrates, Fibre, Protein, Omega 3, Omega 6, Calcium, Chloride, Copper, Iron, Iodine, Potassium, Magnesium, Manganese, Sodium, Phosphorus, Selenium, Zinc, Vitamin A, Vitamin B1, Vitamin B2, Vitamin B3, Vitamin B5, Vitamin B6, Vitamin B7, Folate, Vitamin B12, Vitamin C, Vitamin D, Vitamin E, and Vitamin K.

[3] Phenotypic data includes information such as age, sex, ethnicity and disease profile,

[4] For contextual purposes, the National Institute of Heath and Care Excellence (NICE) applies a cost per QALY threshold of between GBP 20 000-30 000 (EUR 24 010-36 016) when developing advice on which health interventions to fund or not.

[5] Phenotypic data includes information such as age, sex, ethnicity and disease profile,

[6] A forum allowing users to interact with one another is planned for Q1 of 2021.

[7] Intermediate outcomes that are known to relate directly to the final outcome – for example HbA1c levels to diabetes prevalence, cholesterol levels to heart attacks, or calorie intake to obesity prevalence.

Annex A. Methodology

Selecting case studies

OECD assessed several case study interventions targeting poor diets and/or physical inactivity (Table A A.1). Together, the case studies cover several OECD and non-OECD European countries.

Selected case studies represent strategic, high-priority interventions among policy makers in the OECD and EU27. A full description of the selection process is in Box A A.1.

Table A A.1. Overview of selected case study interventions

Intervention	Description	Targeted risk factors	Country*
Nutri-Score**	Front-of-pack labelling intervention to address unhealthy eating	Diet	Various European countries
Physical Activity on Prescription (PAP) **	Intervention to prescribe patients physical activity in a primary care setting	Physical activity (PA)	Sweden
Combined Lifestyle Intervention (CLI) **	Primary care intervention offered to those who are overweight or obese. Patients are guided on how to improve diet, exercise and overall health.	Diet and PA	Netherlands
Young People at a Healthy Weight (JOGG) **	Community-based intervention designed to improve diets and boost physical activity among those aged 0-19 years	Diet and PA	Netherlands
Multimodal Training Intervention (MTI) **	Physical activity and healthy eating programme targeting those aged 65 years and older.	Diet and PA (primarily PA)	Iceland, Spain and Lithuania
ToyBox	Kindergarten intervention to improve healthy eating and physical activity	Diet and PA	Various European countries
Personalised Approach to Obesity Management in Children (PAOMC)	Clinical, family-based and personalised childhood obesity programme targeting children aged 7 to 17 years	Diet and PA	Estonia
Diabetes in Europe – Prevention using Lifestyle, Physical Activity and Nutrition (DE-PLAN)	Type 2 diabetes prevention intervention aimed at improving diet and physical activity levels through a lifestyle, community-based intervention	Diet and PA	Various European countries
SI! intervention	Multidimensional school-based obesity prevention intervention, which targets lifestyle behaviour changes in 3-5 year-olds	Diet and PA	Spain
Let Food Be Your Medicine	Personalised nutrition mHealth app	Diet	Romania
Whole Grain Partnership	A front-of-pack labelling intervention to boost wholegrain consumption	Diet	Denmark
StopDia Pilot for the Somali population	Lifestyle intervention for the Somali population who are at-risk of developing type 2 diabetes (adapted from the nation-wide StopDia intervention)	Diet and PA	Finland

* The case study may operate across the country or in specific regions within that country. **Interventions evaluated using OECDs Strategic Public Health Planning for NCDs model (described in Box A A.2).

Box A A.1. Process for selecting case study interventions

Case studies were selected using the following hierarchical process:

- Case studies submitted by delegates to OECD's Expert Group on the Economics of Public Health, which includes representatives from all 38 member countries
- Case studies involved in European Joint Actions that aim to improve health outcomes across Member States
- Case studies previously defined as "Best Practice" by member countries, such as those listed on the EU Best Practice Portal (European Commission, 2021[1]).

Assessing the performance and transferability of case studies

This section outlines two complementary frameworks used to assess case studies, both of which were developed by the OECD – the Best Practice Framework and the Transferability Framework. Limitations associated with the analysis are also discussed.

Best Practice Framework

The Best Practice Framework outlines five criteria to assess whether an intervention is "best practice" – namely **E**ffectiveness, **E**fficiency, **E**quity, **E**vidence-base, and **E**xtent of coverage (Table A A.2). A review of the academic and grey literature, existing best practice frameworks and feedback from delegates to OECD's expert Group on the Economics of Public Health informed the selection of criteria.

Table A A.2. OECD's Best Practice Framework – the 5 E's

Criteria	Definition
1. Effectiveness	Extent to which intervention objectives were achieved
2. Efficiency	Extent to which inputs were used to achieve desired outcomes
3. Equity	Extent to which the intervention reduced inequalities in society
4. Evidence-base	The strength and validity of evidence used to develop or evaluate the intervention
5. Extent of coverage	Extent to which the intervention reached the target population

An intervention can be awarded a "stamp of approval" against one or multiple criteria if it performs particularly well relative to similar interventions.

Up and coming interventions (i.e. those that show promise but have not yet collected any of their own data) can be awarded a "promising best practice" stamp of approval for relevant criteria.

For a selection of case studies, effectiveness and efficiency were measured using OECD's Strategic Public Planning for NCDs (SPHeP-NCD) microsimulation model. An overview of the model is provided in Box A A.2 with further technical information available at: http://oecdpublichealthexplorer.org/ncd-doc/.

Box A A.2. OECD's Strategic Public Health Planning for NCDs microsimulation model

The OECD SPHeP-NCDs model is an advanced systems modelling tool for public health policy and strategic planning. It is used to predict the health and economic outcomes of the population of a country or a region up to 2050. The model consolidates previous OECD modelling work into a single platform to produce a comprehensive set of key behavioural and physiological risk factors, including obesity and physical activity, and their associated NCDs and other medical conditions. The model covers 52 countries, including OECD member countries, G20 countries, EU27 countries and OECD accession countries. *For the purpose of this project, the model only covered OECD and non-OECD EU countries*.

For each of the 52 countries, the model uses demographic and risk factor characteristics by age- and sex-specific population groups from international databases (see Figure A A.1). These inputs are used to generate synthetic populations, in which each individual is assigned demographic characteristics and a risk factor profile. Based on these characteristics, an individual has a certain risk of developing a disease each year. Individuals can develop 12 categories of disease, including seven directly related with alcohol (i.e. alcohol dependence, cirrhosis, injuries, cancer, depression, diabetes and CVDs). Therefore, the model takes into account the fact that individuals who do not develop an alcohol-related disease may develop other diseases that affect health care expenditure, workforce productivity and mortality. Incidence and prevalence of diseases in a specific country's population were calibrated to match estimates from international datasets (IHME, 2017[2]; IARC, 2020[3]).

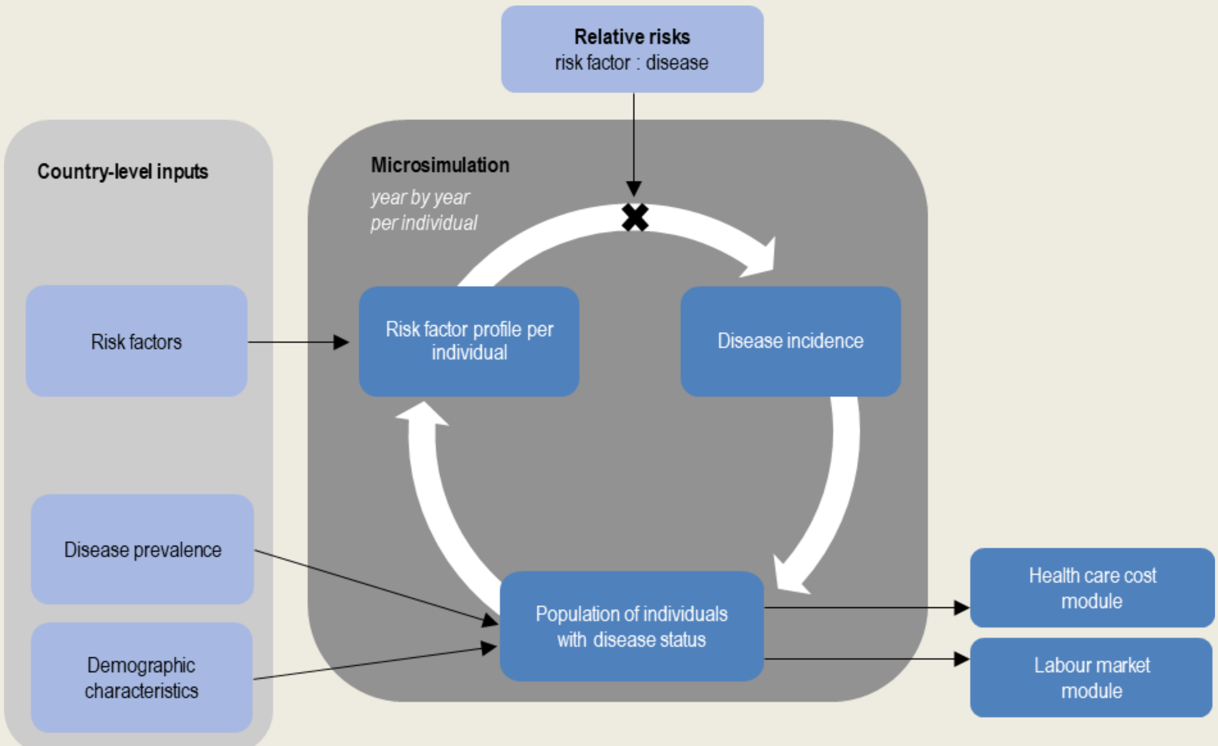
The links between risk factors and diseases are modelled through age- and sex-specific relative risks retrieved from the literature.

For each year, a cross-sectional representation of the population can be obtained, to calculate health status indicators such as life expectancy, disease prevalence and disability-adjusted life years using disability weights. Health care costs of disease treatment are estimated based on a per-case annual cost, which is extrapolated from national health-related expenditure data. The additional cost of multimorbidity is also calculated and applied. The extra cost of end-of-life care is also taken into account. In the model, people not dying from an alcohol-related disease or injury continue to consume medical care for other conditions (e.g. diabetes) and incur medical costs.

The labour market module uses relative risks to relate disease status to the risk of absenteeism, presenteeism (where sick individuals, even if physically present at work, are not fully productive), early retirement and employment. These changes in employment and productivity are estimated in number of full-time equivalent workers and costed based on a human capital approach, using national average wages.

There are two noteworthy limitations associated with using OECD's SPHeP-NCD microsimulation model. First, microsimulation models, such as the one used in this study, are a simplified version of the population they aim to model given they are heavily constrained by data availability. Second, the model does not take into account the interconnecting relationship between different risk factors due to a lack of robust available evidence as well as the effect interventions have on risk factors other than those they directly aim to modify (e.g. an increase in physical activity may reduce pollution due to reduced use of private transport and thus the associated health issues). Due to the second limitation, it is likely the model underestimates the impact an intervention has on disease prevalence.

Figure A A.1. Schematic overview of the modules in the OECD SPHeP-NCDs model



Note: This schematic is highly simplified and focuses on the disease component – it does not reflect some other components of the model (including births, immigration, emigration, death, remission and fatality).
Source: SPHeP-NCDs Technical Documentation, http://oecdpublichealthexplorer.org/ncd-doc.

Transferability Framework

Public health interventions are complex given they involve multiple stakeholders, often target heterogeneous groups, and have outcomes affected by various direct and indirect factors. Therefore, positive outcomes achieved in one setting aren't necessarily transferable to a different setting.

OECD has developed a Transferability Framework to assist policy makers assess whether a best practice intervention can be transferred from where it has been implemented (i.e. best practice "owner setting") to a different country/region (i.e. the "target setting"). Specifically, whether the desired outcomes achieved in the owner setting are achievable in the target setting (Trompette et al., 2014[4]; Burchett, Umoquit and Dobrow, 2011[5]).

The Transferability Framework includes four contextual factors that affect transferability:

- **Population context**: covers population characteristics such as sociodemographic factors as well as broader cultural considerations
- **Sector specific context**: covers governance/regulation, financing, workforce, capital and access arrangements in the sector the intervention operates
- **Political context**: political will from key decision-makers to implement the intervention
- **Economic context**: the affordability of the intervention in the target setting.

In each case study, indicators to assess transferability are grouped under one of these four contextual factors. For the case studies presented in this document, countries are allocated into a group based on how far the indicator's value is from the best practice owner setting. This method is referred to as the "distance from reference country" and is explained in Box A A.3. In addition, OECD developed a clustering methodology to group countries according to their potential to transfer a best practice intervention (Box A A.4).

Indicators were sourced from international databases to maximise coverage across OECD and non-OECD European countries (e.g. OECD Stat, Eurostat, World Bank Indicators, and the WHO). Relevant indicators were excluded if data was missing for the best practice owner setting and could not be identified through desktop research, or, if more than 50% of data was missing across countries.

By using international data, the scope of the analysis was inevitably limited – i.e. indicators from international sources are high-level and don't cover all relevant information for assessing transferability. Therefore, each case study also includes a set of "new indicators" (i.e. those with no publically available information) policy makers should consider before transferring the intervention.

Finally, indicators to measure the risk factor level in each country (e.g. obesity rates) were not included given it is presumed all OECD and non-OECD European countries face challenges caused by growing rates of non-communicable diseases.

Box A A.3. Transferability methodology using distance from reference country

Quantitative indicators

Quantitative indicator values have been normalised using distance to a reference country, that is, the country in which the best practice intervention is currently implemented (also referred to as the best practice "owner" setting) (OECD and European Commission, 2008[6]).

The normalisation equation is below:

$NV_{ci} = \frac{(X_{ci} - X_{oi})}{X_{oi}}$ (Equation 1).

Where:

- NV_{ci} = normalised value for target setting (country c) for indicator i
- X_{ci} = original value for target setting (country c) for indicator i
- X_{oi} = original value in the owner setting for indicator i.

Normalised values for equation (1) can be interpreted as percentage distance each country is from the best practice owner setting, whose value is centred on 0. Normalised values were used to allocate countries into one of five groups for each indicator, with a darker shade indicating greater transferability potential:

Value equal or greater than 0 =

Value less than 0 but greater than -25% = (+25% when a lower value indicates better transferability)

Value less than -25% but greater than -50% = (>+25% but less than <+50%)

Value less than -50% but greater than -75% = (>+50% but less than <+75%)

Value less than -75% = (>75%)

Binary indicators

For binary indicators, countries that respond "Yes" to the indicator are allocated the darkest shade ( ) while countries that respond "No" are allocated the lightest shade ( ).

Categorical indicators

For categorical indicators, any country that responds at least as well as the best practice owner are allocated the darkest shade (), while the remaining countries are allocated a lighter shade based on the number of remaining categories.

Box A A.4. Transferability methodology using clustering

OECD has developed a methodology to cluster countries and to make personalised recommendations on which member states and member countries are more likely to successfully transfer a recognised best practice intervention. A high level summary of the clustering methodology is below.

Cluster analysis helps to identify countries which could successfully be transferred a best practice intervention

Cluster analysis partitions data into homogenous groups, based on similarities in the data. In this case it was used to separate countries into groups with similar characteristics, based on how well adapted or suited they are for transfer of a best practice intervention from a host country. For each cluster, specific recommendations can then be made to address potential obstacles for implementation. This can help guide decision makers and potentially lead to the smoother implementation and increased success of interventions.

K-medoids clustering was found to be the optimal methodology

To select the best methodology four different cluster methods were compared: k-means, k-medoids, hierarchical and DBSCAN (Density-Based Spatial Clustering of Applications with Noise). K-medoids using Gower distance was found to be the most effective method for clustering countries taking into account validation statistics, data characteristics, interpretability of the results and flexibility to use with other datasets. This is because it works with small, imbalanced datasets with missing data, and can accommodate categorical data as well as continuous data.

The K-Medoids Clustering Algorithm

The k-medoids algorithm is based on the medoid: this is the most central observation (country in this case) in the cluster, where the total distance between it and all the other countries in the cluster is smallest. Distance is a quantitative measure of dissimilarity, where the larger the distance between two observations, the more different they are from each other. The number of clusters (k) must be chosen prior to running the algorithm.

The k-medoids algorithm has the following steps:

- Randomly assign k countries as medoids.
- Repeat until there is no change in assignment of medoid:

Assign each country to a cluster, based on distance to the closest medoid.

For each cluster, test whether selecting another country as the medoid decreases the total distance from the medoid to all other points in the cluster. If it does, reassign this country as the new medoid.

Gower Distance is used to measure similarity between countries

Gower distance was chosen because it is able to compute the difference between both categorical and continuous variables. Gower distance is calculated from the mean of the partial pairwise distances between observations (countries). The partial pairwise distance is the difference between two observations at a single variable and is calculated differently depending on whether the variable is continuous or categorical.

Continuous Variables: The partial pairwise distance, $d_{ii'}^{(j)}$, between two observations i and i', for variable j is the difference between the two values x_{ij} and $x_{i'j}$, divided by the maximal range (R_j) of all the values for variable j, as follows:

$$\boldsymbol{d_{ii'}^{(j)}} = \frac{\left|\boldsymbol{x_{ij} - x_{i'j}}\right|}{\boldsymbol{R_j}}$$

Categorical Variables: If two countries have the same value for a categorical variable then the partial pairwise distance is 0 (identical). Otherwise, it is 1.

The Gower distance between two observations is then calculated as the mean of the partial pairwise distances. The partial pairwise distances can be weighted differently. Here, the variables were weighted so that each contextual factor had equal weighting and therefore equal influence on the Gower distance. The resulting value lies between 0 and 1, with values closer to 0 indicating greater similarity between countries and values closer to 1 indicating greater dissimilarity. If one or both values are missing for a given variable in a pair of countries, the partial distance for that variable will not be included in the Gower distance, meaning there is no need for data imputation. However, if a country had over 50% variables missing it led to inaccurate Gower distances and so these countries were removed.

Interpreting and comparing clusters by indicator and by contextual factor

The clusters were compared by calculating the difference between the mean of each cluster and the mean of the dataset, for each indicator. A positive difference meant a higher likelihood of successful transfer for that indicator, allowing the characteristics of each cluster to be identified. To more broadly compare clusters, identifying the contextual factors (or domains) where clusters were stronger or weaker, domain scores were created and used to compare cluster means. Domain scores were created using the following steps:

- Assign categorical variables dummy values (0 = no, 1 = yes).
- Normalise using min-max scaling.
- Aggregate by the mean of the variables in each contextual factor.

Summary of steps in Clustering process

In summary, the following steps are required:

- Remove countries where >50% variables are missing.
- Compute a Gower Distance Matrix, with each contextual factor having equal weighting.
- Determine optimal value of clusters (k) between 3 and 5.
- Run k-medoids clustering using the optimal number of clusters from step 3.

Create domain scores in order to compare cluster means with the dataset means, and identify strength and weakness of each cluster.

Further details will be made available in an upcoming Health Working Paper.

Limitations

Limitations associated with the analysis of case study interventions are summarised in Table A A.3.

Table A A.3. Assessment limitations

Limitation theme	Description
Selecting case studies	Case studies were assessed against the Best Practice Framework after they were selected. For this reason, case studies don't necessarily perform well against the criteria. Case studies analysed using OECD's SPHeP-NCD model were further restricted to those that recorded data on risk factors included in the model.
Diversity of case studies	Given the criteria for selecting cases studies, the majority of interventions analysed target individual lifestyle behaviours as opposed to structural interventions that address society as a whole. Again, due to the selection criteria, all case studies interventions are based in European countries.
Benchmarking performance	The performance of case studies is not benchmarked for two key reasons: 1) heterogeneity in terms of target populations and implementation setting (e.g. schools versus primary care) and 2) lack of comparable data.
Classifying case studies	This report does not classify case studies as "best practice" or not given this is ultimately up to policy makers in each country who may have different priorities. Further, it was not possible to benchmark performance. Case study analyses instead summarise evidence considered relevant for choosing which interventions to fund, scale-up and/or transfer.
Transferability data	The assessment of transferability using the Transferability Framework relied on publically available data at the national level. This poses several limitations – for example, it does not take into account differences within countries, in addition, it limits the extent of the analysis given availability of comparable data. For these reasons, findings should be considered as high-level only.

References

Burchett, H., M. Umoquit and M. Dobrow (2011), *How do we know when research from one setting can be useful in another? A review of external validity, applicability and transferability frameworks*, https://doi.org/10.1258/jhsrp.2011.010124. [5]

European Commission (2021), *Public Health Best Practice Portal*, https://webgate.ec.europa.eu/dyna/bp-portal/ (accessed on 4 October 2021). [1]

IARC (2020), *Global Cancer Observatory*, https://gco.iarc.fr/ (accessed on 9 November 2020). [3]

IHME (2017), *Epi Visualization | IHME Viz Hub*, https://vizhub.healthdata.org/epi/ (accessed on 21 December 2017). [2]

OECD and European Commission (2008), *Handbook on constructing composite indicators: methodology and user guide*, OECD (the Statistics Directorate and the Directorate for Science, Technology and Industry) and the Applied Statistics and Econometrics Unit of the Joint Research Centre (JRC) of the European Commission, https://www.oecd.org/sdd/42495745.pdf. [6]

Trompette, J. et al. (2014), "Stakeholders' perceptions of transferability criteria for health promotion interventions: A case study", *BMC Public Health*, Vol. 14/1, pp. 1-11, https://doi.org/10.1186/1471-2458-14-1134. [4]

Healthy Eating and Active Lifestyles

BEST PRACTICES IN PUBLIC HEALTH

Overweight and obesity affects over half of all men and women in OECD countries. This has significant health and economic consequences. As part of OECD's work on promoting best practices in public health, this report outlines policy recommendations on how to address two leading overweight risk factors: poor diet and lack of physical activity. Policy recommendations are drawn from a review of high-priority interventions implemented in OECD and EU27 countries.

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