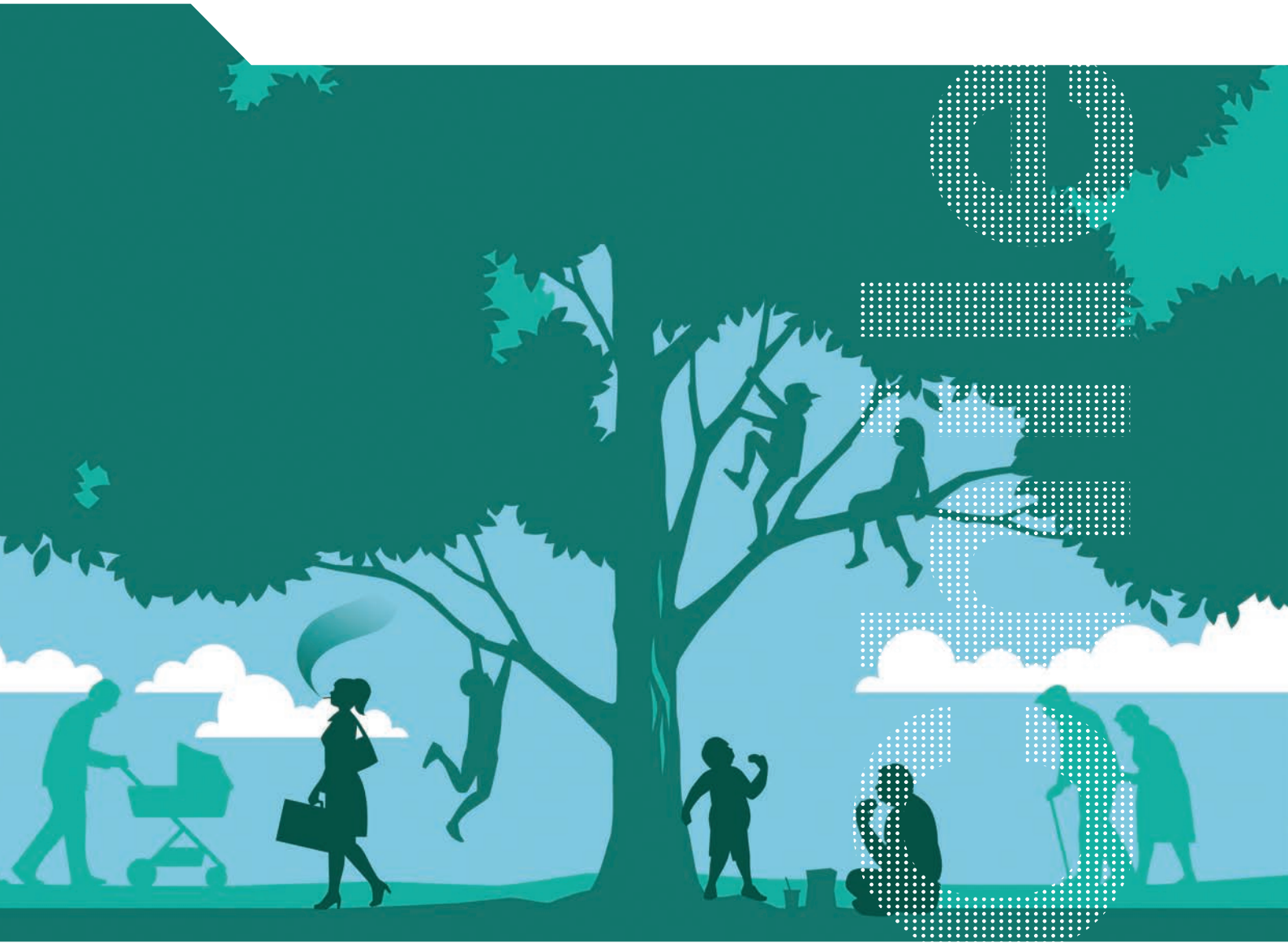
OECD Reviews of Public Health: Chile

A HEALTHIER TOMORROW



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Foreword

This report is the first in a new series of reports reviewing public health policies across selected OECD countries. Health care systems across OECD are increasingly under pressure from social changes – including demographic changes and aging populations – and emerging new health challenges – from a growing burden of chronic disease, to re-emerging and new communicable diseases, or a growing burden of mental ill-health – which demand a strong public health response. The OECD Reviews of Public Health provide in-depth analysis and policy recommendations to strengthen priority areas of countries' public health systems, highlighting best practice examples that allow learning from shared experiences, and the spreading of innovative approaches.

In particular, this series of Reviews of Public Health builds on the OECD's long-standing programme of work on the economics of public health, applying this extensive expertise to country-specific challenges. The OECD Reviews of Public Health are a tool to help countries to strengthen their national public health systems, and help countries to develop and implement innovative public health actions.

This OECD Public Health Review of Chile seeks to assess the current scale of public health challenges, and efficacy of existing public health policies to respond to them, in Chile. The report funds that Chile has a well-functioning, well-organised and effectively governed health system and public health architecture, but that further fine-tuning is needed. Faced with significant public health challenges, significant change is needed, which must happen at scale and at pace.

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Acronyms and abbreviations

ARV	Antiretroviral
AUGE	Acceso Universal con Garantías Explícitas = GES Garantías Explícitas en Salud
BMI	Body mass index
CASEN	Encuesta de Caracterización Socioeconómica Nacional – National Socioeconomic Characterisation Survey
CEMP	Pfizer's Center of Excellence in Precision Medicine
CENABAST	Central Nacional de Abastecimiento
CGG-UDD	Centro de Genética y Genómica at the Universidad del Desarrollo
CONADECUS	Corporación Nacional de Consumidores y Usuarios
CONICYT	Comisión Nacional de Investigación Científica y Tecnológica
COPD	Chronic obstructive pulmonary disease
CORFO	Corporación de Fomento de la Producción
CT and MRI scanners	Computerized tomography scanner ; Magnetic resonance imaging
DALYs	Disability-Adjusted Life Years
DIPLAS	División de Planificación Sanitaria
DIPOL	División de Políticas Públicas Saludables y Promoción
DIPRECE	División de Prevención y Control de Enfermedades
DIPRES	Dirección de Presupuestos
DIVAP	División de Atención Primaria
DMP	Disease Management Programmes
DNA	Deoxyribonucleic acid
EGAPP	Evaluation of Genomics in Practice and Prevention
EMP	Examen de Medicina Preventiva
EMR	Electronic Medical Records
EPES	Educación Popular en Salud
ETESA	Evaluación de TEcnologías SAnitarias
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FAP	Familial adenomatous polyposis
FDA	US Food and Drug Administration
FISH	Fluorescent in-situ hybridization
FONASA	Fondo Nacional de Salud
FONDEF	Fondo de Fomento al Desarrollo Científico y Tecnológico
GDP	Gross domestic product
GES	Garantías Explícitas en Salud = AUGE Acceso Universal con Garantías Explícitas
GMLB-ISP	Genética Molecular, Laboratorio Biomédico, ISP
GP	General Practitioner
HEPA	Health-enhancing physical activity
HIV/AIDS	Human immunodeficiency virus/acquired immunodeficiency syndrome
HNPCC	Hereditary non-polyposis colorectal cancer
HPV	Human papillomavirus
IARC	International Agency for Research on Cancer
IARC GLOBOCAN	International Agency for Research on Cancer Global Cancer Observatory
ICD	Infectious and parasitic diseases
IHD	Ischaemic Heart Disease

IHME	Institute for Health Metrics and Evaluation
ILO	International Labour Organization
INTA-UCH	Instituto de Nutrición y Tecnología de los Alimentos at Universidad de Chile
ISAPRE	Instituciones de Salud Previsional
ISP	Instituto de Salud Pública
JUNAEB	Junta Nacional de Auxilio Escolar y Becas
LBMC-PUC	Laboratorio de Biología Molecular y Citogenética at Pontificia Universidad Católica (
LCBM-HS	Laboratorio Clínico de Biología Molecular, Hospital del Salvador
MEDICHI	Medical faculty at the University of Chile
MLPA	Multiplex ligation-dependent probe amplification
NGO	Non-governmental organization
NGS	Next-generation sequencing
NHS	National Health Service
NP	Nurse Practitioners
OECD	Organisation for Economic Co-operation and Development
ONEMI	National Emergency Office of the Ministry of the Interior and Public Security
PAHO	Pan American Health Organization
PANDA	Programa Adulto Nacional de Drogas Antineoplásicas –
PAP	Papanicolaou test
PLDP	Personal Data Protection Project
PNI	National Immunization Program
PPP	Purchasing Power Parities
PREMs	Patient-reported experiences measures
PROMs	Patient-reported outcome measures
PSCV	Programa de Salud Cardiovascular
RNA	Ribonucleic acid
SEREMIS	Secretaría regional ministerial
SHA	System of Health Accounts
SSB	Sugar-sweetened beverage
STIs	Sexually transmitted infection
UDD	Universidad del Desarrollo
UN	United Nations
US	United States
USD	US Dollar
WGS	Whole genome sequencing
WHO	World Health Organization

Executive summary

Chile has a well-functioning, well-organised and effectively governed health system and public health architecture. The public health challenges that Chile is facing would, however, strain any health system. Smoking rates are relatively high, alcohol consumption is low but rising, and mortality from cancer is high in comparison to cancer incidence. A quarter of Chilean adults, and nearly half of Chilean children, are obese or overweight.

In the face of such considerable public health issues, Chile has introduced a comprehensive package of policies designed to improve Chileans' health status. Leadership from different levels of government, and in particular central government, has been ambitious. In particular, the response to the obesity epidemic has been significant. Chile has introduced a food labelling scheme on packaged food, has made efforts to ensure that food consumed in schools is healthier, and has put in place comprehensive diet counselling services led by primary care. Focus on the effective implementation of these programmes should be maintained, and there is also space for fine tuning and expansion. For example healthy food programmes in schools could be expanded to canteens in all public institutions, and physical activity could be promoted more strongly. Careful monitoring of these schemes is also advisable – for example monitoring the nutritional labelling scheme should be monitored for adherence – as is evaluation to assess effectiveness, so that both Chile and other countries could learn from successes as well as, potentially, ongoing challenges.

Careful attention to detail in policy implementation and monitoring will be critical in other areas, too. When it comes to cancer, Chile has established extensive governance structures for cervical and breast cancers, but screening for these and other cancers do not appear to be reaching all populations. Furthermore, mortality from cancer remains disproportionately high relative to incidence, giving a clear indication that more could be done in terms of prevention, early detection, and rapid treatment at early stages. Chile should look to take a dual approach to strengthening cancer prevention: some strategies should target cancer specifically, for example strengthening screening programmes and ensuring sufficient availability of diagnostic tools, while other approaches with a broader reach – improving health literacy, and improving data systems – ought to also support stronger cancer prevention and screening.

Public health genomics is at an early stage in Chile, but its potential to transform the health care landscape should not be underestimated, and in Chile ambition to be at the cutting edge of research, policy, and clinical implementation around precision medicine appears high. This early stage is the right moment to fully engage with the necessary steps to maximise the contribution of precision medicine to public health goals, balancing potentially rapid advances with the need to preserve privacy, equal access to care, and sustainable use of resources. In particular, alongside a strategic plan for the development of public health genomics, Chile should take steps to ensure that quality assurance of

genetic testing, use of genetic data, appropriate training of health care workers and health care entitlement are covered by appropriate regulation.

Across all areas, there is scope to strengthen engagement across Chilean society. Faced with significant public health challenges, change is needed, which must happen at scale and at pace. Leadership from the government and the Ministry of Health has been commendable in many areas, but other key stakeholders – including patient groups, civil society actors, the food and beverage industry and private health insurers – have been left behind. In other OECD countries government and industry have collaborated, for example on healthy eating campaigns. The private health insurers (ISAPREs) have not become public health innovators of their own accord, and may need to be better incentivised or required to take a more proactive approach to preventive health. Perhaps most vitally, the Chilean population could be more systematically included in public health strategies. Gaps in population health literacy, for example, appear to be holding back early detection of cancer.

Assessment and recommendations

Chile has a well-functioning, well-organised and effectively governed health system and public health architecture. The public health challenges that Chile is facing would, however, strain any health system. Smoking rates are relatively high, alcohol consumption is low but rising, and mortality from cancer is high in comparison to cancer incidence. Chile's biggest challenge, though, is that in Chile 34.4% of adults are obese, and 44.5% of children are obese or overweight.

In the face of these significant public health challenges Chile has introduced a comprehensive package of policies designed to improve Chileans' health status. In particular, the response to the obesity epidemic has been ambitious, with the introduction of a food labelling scheme on packaged food, a move to ensure that food consumed in schools is healthier, and comprehensive weight-loss services led by primary care. The world is now waiting to see whether this strategy can turn the tide of the obesity epidemic. However, the difference between success and failure will lie in the details. Existing programmes must be rigorously implemented – policies such as the nutritional labelling scheme should be monitored for adherence, and evaluated to assess their effectiveness. There is also space for fine tuning, and for expansion: the healthy food programme for school meals should be expanded to cover all the canteens in public institutions; limits should be put on unhealthy products sold around schools; and physical activity should be promoted more vigorously.

In other areas, too, attention to the detail of public health policy implementation will be key – for example, further development of epidemiological surveillance, a rigorous evaluation and costing strategy, stronger data governance, and alignment of incentives for all stakeholders. When it comes to cancer, Chile has built effective mechanisms to screen for cervical and breast cancers, but without sufficient availability of key equipment such as colonoscopes the programmes will not reach as wide a population as they should. Genetic medicine could serve to strengthen public health and preventive care in Chile, but while ambition for genetic medicine is high in Chile, the translation of ambition into policy remains partial. Regulation of genetic testing, health care coverage entitlements and laws governing use of data from genetic tests all need to be carefully developed.

Along with a need for careful attention to the details of public health policy, engagement across the Chilean society is required to make change happen at scale and at pace. Leadership from the government and the Ministry of Health, for instance to tackle obesity, is commendable. Yet, other key stakeholders – including patient groups, civil society actors, the food and beverage industry and private health insurers – have somewhat been left behind. In other OECD countries government and industry have collaborated, for example on healthy eating campaigns. The private health insurers (ISAPREs) have not become public health innovators of their own accord, and may need to be better incentivised or required to take a more proactive approach to preventive health. Perhaps most vitally, the Chilean population could be more systematically included in public health strategies. Gaps in population health literacy, for example, appear to be holding back early detection of cancer.

Policy recommendations for improving public health in Chile

When it comes to tackling obesity and unhealthy diets, improving cancer screening and prevention, and developing genetic medicine to strengthen public health and preventive care, ambition in Chile is high. The public health challenge facing the country is, however, considerable. Meaningful change in the years to come will depend on the Chilean authorities matching this ambition with careful, deliberate, detailed policy making which brings all stakeholders on board.

In order to improve the public health system, Chile should:

- Focus on reducing tobacco consumption by pressing ahead with the bill that has been before drafted for parliament since 2015, which would introduce plain packaging for tobacco products and limit smoking in public places;
- Strengthen epidemiological surveillance, in particular by undertaking the National Health Survey on a more regular basis, and report better prevention spending data;
- Push the private insurance providers (ISAPRES) to play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases;
- Include all stakeholders in efforts to improve Chileans' health, in particular promoting patient participation and improving citizens' health literacy, and building stronger partnerships between government and private actors, including actors involved in the production, distribution and sales processes of food and drinks .

Tackle the significant burden of obesity:

- Strengthen the comprehensive set of prevention policies already in place to tackle unhealthy behaviours associated to obesity:
  - Expand the food labelling system to alcohol products and fast-food restaurants;
  - Expand the healthy food programme for school meals to cover all the canteens in public institutions (e.g. offices, public services and army).
- Target younger generations by putting limits on unhealthy products sold around schools, and promoting physical activity;
- Raise expectations or requirements for the ISAPREs to be more engaged in Chile's efforts to reduce obesity and related health risks;
- Put in place a rigorous monitoring system to assess the effectiveness of individual policies and to measure achievements, alongside improved data availability to monitor population-level obesity rates.

Increase cancer screening coverage and promote early detection of cancer:

- Further develop cancer strategies including cancer screening programmes by involving different key stakeholders such as regional health authorities, providers, insurers and representatives of the civil society;
- Facilitate access to cancer screening tests and diagnosis across regions, and seek innovative ways to overcome geographical barriers such as self-sampling device, mobile screening units and tele-radiology;
- Develop communication strategies to promote the importance of early detection to people with different socio-economic and cultural background;
- Take more systematic and personalised approach in cancer screening invitation, for example by sending personalised screening invitation letters to target populations and fixing the appointment date for screening in the letter;
- Assure and improve the quality of diagnosis for effective detection of cancer based on the evidence available internationally;
- Further develop national registries for different cancers in order to identify and invite people with high risks to cancer screening, and to monitor and evaluate the effectiveness of screening programmes.

Use public health genomics to strengthen public health and preventive care:

- Develop a coherent and comprehensive national precision medicine strategy that sets out a road-map for equitable and sustainable access to genomic medicine, including safeguards against genetic discrimination, workforce development and investment in basic research, ideally chaired at Ministerial level;
- Ensure that a rigorous cost-effectiveness analysis is applied to the continuing development of precision medicine, especially the use of newer technologies such as whole-genome sequencing in specific risk-groups;
- Develop a governance framework that can be applied to personal genetic data, that enables appropriate data sharing for precision medicine services and research, whilst protecting individual privacy;
- Establish quality assurance which guarantees minimum standards across all laboratories undertaking genetic analysis;
- Take a step wise approach to expanding the range of clinical genetic services covered by health insurers, ensuring continuity of individuals' insurance coverage and making treatment options available for any diagnoses that result;
- Increase "genetic literacy" amongst health professionals and the public, for example by promoting the potential of using family histories to inform genetic analysis even without testing.

Chile's public health system

While Chile has seen improvements comparable to those in other OECD countries in recent decades, the health status of the population nonetheless falls fairly consistently below the OECD average. The average life expectancy in Chile has risen faster than the OECD average in the past forty years, and in 2015 was 79.1 years – 76.5 years for men and 81.7 years for women – compared to the OECD average of 80.6 years (77.9 for men and 83.1 for women). Like Chile's OECD peers, the burden of disease is dominated by non-communicable diseases.

Health status in Chile across a number of key public health areas – tobacco consumption, alcohol consumption, obesity – is mixed, but still worrying. Alcohol consumption amongst adults is lower than the OECD average, although consumption is rising, running contrary to the general OECD trend towards lower consumption of alcohol. Prevalence of heavy episodic drinking in the population – wherein at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days were consumed – was at 4.9% in 2010, but men were far more likely to be heavy episodic drinkers (9.8%) than women (0.1%).

Tobacco consumption, particularly amongst younger Chileans, and obesity, are high. Without an important change to these trends, Chile could well expect to see a rise in the burden of chronic diseases in the years and decades to come. Daily smoking rates amongst adults declining, but still relatively high, especially amongst men. Tobacco consumption rates in Chile have declined from 45.3% in 2003 to 39.8% in 2009-2010 to 33.3% in 2016-2017, while exposure in the home decreased from 31% to 15.2% in the same period. OECD-standardised data showed a drop in adult smoking in Chile from 33% of the population as daily smokers in 2000, to 24.5% daily smokers in 2016, a decline of 26%. The daily smoking rate in Chile remains above the OECD average, which is 18.4% of the population, and smoking rates have also declined more slowly. The OECD average rate of decline in smoking rates between 2000 and 2016 was 27%.

As in other OECD countries, male smoking in Chile is higher than female smoking; 28.2 of Chilean males were daily smokers in 2016, compared to 23.3% OECD-wide, and 20.9% of Chilean females were daily smokers, compared to 14.1% OECD-wide. Up to 2009 smoking rates had been falling, albeit more slowly than the OECD average. In particular, high smoking rates among adolescents and young adults, for whom daily smoking reached 50% in the early 2000s, and women aged 26-34 more than 40% of whom were smoking daily. The relatively young age of Chile's smokers means that the full health impacts of the high rates of tobacco consumption may well be seen in the years and decades to come.

Obesity rates, which are discussed in detail in Chapter 2, are amongst the highest in the OECD.

Health care coverage in Chile is provided primarily either by the state-funded National Health Fund - *Fondo Nacional de Salud ,* most commonly known as FONASA, or by the private coverage schemes, *Las Instituciones de Salud Previsional* (ISAPRE). FONASA covers around 78% of the population, ISAPRES cover around 17-18% of the population, while a further 3-4% are covered under an Armed Forces insurance scheme.

Since 2005 the benefit basket under the public health system in Chile has been set under a system of enforceable guarantees. Citizens are guaranteed access to those treatments defined under the '*Acceso Universal con Garantías Explícitas*', or AUGE, which is also

known synonymously as GES (Garantías Explícitas en Salud). Applicable to all Chileans, whether covered by FONASA or ISAPREs, the guarantees cover provisions around access, quality, timeliness and financial protection.

Chile has a robust public health system

In the face of such considerable public health issues, Chile has a robust and well-functioning public health system. Leadership from different levels of government, and in particular central government, is ambitious.

Leadership and accountability at the central and regional levels are clearly defined. The organisation of the Ministry of Health into two sub-secretariats, one for Health Networks and the other for Public Health, in itself elevates the importance of public health issues for the government. The Under-Secretariat for Public Health, which is led by a Vice-Minister for Public Health, has oversight over the Regional Health Authorities – which themselves have an important role in public health – over accreditation for public and private providers, and has oversight over FONASA and the ISAPREs. The leadership of the Ministry of Health on important public health reforms – in particular to reduce obesity rates – are notable. A series of reforms to tackle obesity, detailed in Chapter 2, include school-based interventions, the sugar-sweetened beverage tax, food advertising restrictions, food labelling. Additionally, in 2013, a legal architecture was created for a government-wide approach to promoting healthy living and well-being, under Law 20.670, which created the *"Sistema Elige Vivir Sano"* ('Choose to Live Healthily' system), including promotion of healthy living, of sport, of outdoor activities, of self-care and of family development.

While there is always room for broader and deeper collaboration across government on public health issues, the co-operation between the Ministry of Health and, in particular the Ministry of Education, but also the Ministries of Agriculture, Finance, Social Development, and Sport are effective. Most notably the Ministries of Social Development, Health, Education, Labour and Social Welfare, Housing, Sport and Finance have a common national strategy for promoting healthy living, linked to Law 20.670 under *'Elige Vivir Sano en Comunidad'* ('Choose Healthy Living in the Community'). Launched in 2014, and encompassing a series of strategic objectives, programmes and its own budget, *Elige Vivir Sano en Communidad* aims to promote healthy living and healthy habits, for instance healthy eating and sport, with individual Ministries committing to undertake different activities to promote this overall goal. Collaboration around diet in schools is a particularly successful example of cross-government working to promote better public health. Under the *Contrapeso* ('Against Overweight') programme led by the National Board of School Aid and Scholarships (JUNAEB), the Ministries of Education, Health, Sport and Agriculture introduced 50 measures including restriction on the sales of unhealthy foods in schools, improving the quality of food provided to students, and teaching health cooking to families.

Chile has a decentralised administration, and responsibility for organising education, social services, primary health care, parks and recreation lies with municipalities rather than the central government. At the regional level the Regional Health Authorities in Chile (SEREMIS) – of which there are 15 – have an important role in designing and delivering public health actions. The SEREMIS ensure compliance with the national health norms, plans, programmes and policies established by the authority, and with sanitary and environmental laws and regulations, protect populations from environmental risk, carry on and co-ordinates epidemiological surveillance and outbreaks response, and adapt health strategic plans and programmes to the reality of the respective region. This

role includes, for instance, enforcement of Chile's Law 20.606 on food sales in any space where food is elaborated, dispensed, sold or publicised, for instance, supermarkets and schools. This law also bans the sale of food that exceeds the limits established by the Ministry of Health of sodium, calories, saturated fats and sugar in schools at all levels.

The flow of public health leadership and planning from the central to the regional and local levels appears well thought-out: SEREMIS help to deliver the national *Elige Vivir Sano en Comunidad* approach, and also develop cross-sectoral programmes according to the 'Health in All Policies' (Salud en Todas las Políticas) approach, led by regional health fora (Foros Regionales de Salud Pública). In addition, the Ministry of Health developed the 'Strategy of Healthy Cities and Communities', which is a comprehensive approach integrating health eating and physical activity in schools and neighborhood settings. Structural interventions have included improving the local environment for example by developing parks, bicycle parking and public sports facilities, and local regulations such as public tenders for healthy kiosks, health snacks, or including bike lanes in city planning regulations.

Local actors also appear to have the latitude to take leadership in public health issues when they see it as a priority. For example, in Santiago a multidimensional population health initiative is in place and the Mayor has made tackling childhood obesity a key priority. Under the 2013 *Sistema Elige Vivir Sano* law and associated strategy SEREMIS produced Regional Communication Plans that include actions for the dissemination of health promotion and citizen participation activities in the regional context.

The *Elige Vivir Sano* approach taken since 2013, a national strategy with support from across government departments, guides national public health policy and shapes regional-level action. Whereas building consensus and cross-government working can be difficult, even when issues demand a multisectoral response, *Elige Vivir Sano* has had high-profile buy-in from across the different Ministries. Equally, *Elige Vivir Sano* and *Elige Vivir Sano en Comunidad* have successfully engaged SEREMIS in public health activities.

That said, it may be now timely for a renewed cross-government approach, which includes a mechanism for engaging SEREMIS as the Regional Community Plans did. Public health issues and the need to encourage healthier habits are today no less critical than they were in 2013. Evaluating the impact of *Elige Vivir Sano,* potentially with a view to renewing plans and priorities, across Ministries and across national and local governments, should be a policy priority.

The public health system should give due attention to all public health risks

Ambitious efforts to tackle obesity have been undertaken in Chile, with a comprehensive multi-dimensional strategy in place. This approach, which is further discussed in Chapter 2 of this report, is timely, given the concerning high levels of obesity in Chile. However, greater attention needs to be given to other public health issues. In terms of primary prevention, smoking rates are high, while alcohol consumption is low but rising. In terms of secondary prevention a comprehensive set of screenings are covered, but coverage targets are not being met, suggesting that a reduced and more narrowly focused set of screenings could be a more effective approach.

As Chapter 2 sets out, efforts to address obesity in Chile – arguably the greatest public health threat at present – are impressive, even if room for expansion and improvement remains. Policies around preventing smoking could be approached with similar ambition. Chile is a Party to the WHO Framework Convention on Tobacco Control since

11 September 2005, and does relatively well in terms of following the Convention's guidelines on implementing and managing tobacco control. Smoking is prohibited in the majority of public places, health warnings must cover 50% of all tobacco products, advertising bans are strict and tobacco products cannot be sold or advertised in a certain radius around schools, although tobacco companies can still sponsor events and tobacco products can still be displayed at the point of sale. In 2014 taxes on tobacco products exceeded 75% of the retail price, and for the most-sold brand of cigarettes were estimated at 80.81%.

However, while the range of anti-smoking policies in Chile is adequate, a stronger approach could still be envisaged. In terms of population-wide policies, Chile should press ahead with the bill that has been before drafted for parliament since 2015, which would introduce plain packaging for tobacco products, as well as limit smoking at beaches and parks. Though plain-packaging for tobacco products has only been implemented in Australia, evidence suggests that this policy has had a small but measurable impact on smoking reduction. Having controlled for other variables, plain-packaging combined with graphic health warnings was found to be associated with an estimated 0.55% decline in smoking prevalence between late 2012 and late 2015 in Australia. A ban on menthol cigarettes – which sell particularly well amongst young Chilean women, a high-smoking group – proposed under the 2015 draft bill, would also be a powerful step. Chile could consider further mass media campaigns about the dangers of smoking which could also be tailored to youth populations, both in content and in where and when they are displayed. Chile may also wish to fund smoking cessation programmes, which are amongst the most cost-effective preventive measures available in health care. A number of OECD countries have already introduced coverage for smoking cessation and Chile should begin by following the example of Belgium and France, funding smoking cessation interventions with particularly at-risk groups such as COPD sufferers.

A fairly large range of health checks and diagnostic tests are covered by AUGE in Chile under the *Examen de Medicina Preventiva* or EMP. EMP are in particular targeted at key populations, defined based on age, sex and risk, for example pregnant women, new-borns, or older adults. They include, for example, tests for hypertension and diabetes, cancer screening, as well as recording of tobacco consumption and obesity. However, uptake of the EMS tests is low. FONASA is not meeting the EMP set targets; for example, while the percentage of insured persons who had received an EMP check rose between 2012 and 2016, in 2016 21.1% of the population received an adult blood glucose tests check, still not meeting the 25% goal for coverage.

The explanation for some of the low rates of EMP checks can be expected to be similar to the drivers of low cancer screening coverage explored in Chapter 3, notably low public awareness of availability and importance of the tests, problems with access, and weak monitoring of the rate that the tests are undertaken. The effective approaches for increasing the rate of checks should be focused on improving public health literacy, more targeted attempts to invite high risk groups for screenings, and ensuring good geographical access. However, given the large number of EMP checks for which the targets are missed, it may be that Chile should put particular focus on increasing the uptake of fewer key checks with proven evidence of cost-effectiveness, in line with public health priorities. For example the current approach to diabetes screening, where a high proportion of the population is expected to undergo blood glucose tests, may not be a cost effective approach. The undertaking of these tests could then be encouraged, both amongst health professionals in clinics and primary care settings and the population. A

more focused approach could also mean undertaking some tests on a less regular basis, or targeting only high-risk groups with systematic tests.

Engagement of civil society and the private sector is weak

While the Chilean government, both Ministries at the central government level and local and regional governments appear strongly engaged in public health issues, the private sector is far less present. There is more that the government could do to engage with non-governmental actors. In particular greater engagement with private health insurers – the ISAPRES –, with the food and beverage industry, with workplaces as well as with civil society groups, would be welcome.

There are some notable examples of non-governmental involvement with public health. The involvement of the Ministry of Agriculture in providing a platform for the reformulation of food is notable; the National Federation of Independent Street Markets (*Confederación Gremial Nacional de Organizaciones de Ferias Libres, persas y afines*) has been involved in promoting healthy diets both independently and in partnership with Ministries. *Coalición Mover* (Movement Coalition), founded by Chile's medical societies promotes physical activity amongst the public, and encourages doctors to prescribe exercise to patients. Civil society groups have also been engaged in monitoring food labelling, as well as local cycle schemes. The government has also supported the implementation of voluntary actions to promote healthy living in workplaces; around 200-250 workplaces have implemented interventions such as physical activity courses and bicycle parking spaces. Citizen dialogues have also been promoted by the Chilean government, including 'Healthy Parliaments of Children' in which children discuss health-related topics and vote on issues around them.

However, engagement of civil society and the private sector does not appear to be a main pillar of Chile's efforts to improve public health. In general the voice of civil society organisations also remains relatively weak; civil society in Chile tends to be arranged in small organisations, which limits their ability to influence and support public health objectives. A number of OECD countries have successfully pursued a far more collaborative approach with civil society, and with industry, and Chile could follow their example. For instance in Canada and Denmark healthy eating campaigns have been implemented as a joint venture with the industry, and Ireland's obesity policy includes a voluntary code of practice on food advertising and marketing. In Denmark the government collaborated with several retail chains to promote a food labelling scheme which marked out healthful products, with an evaluation showing that the informational campaign impacted shopping behaviour. In other countries public-private collaboration have led to agreements between government and business stakeholders work to improving health, including through reducing alcohol consumption.

The ISAPREs are key actors in the Chilean health system, covering 17-18% of the population. However, the engagement of the ISAPREs in public health and prevention is weak. According to the Association of ISAPREs, the high rate of turnover in the insured population reduces the incentive for ISAPREs to invest in prevention and public health initiatives. ISAPREs should be playing a greater role in promoting healthy living and prevention strategies, for example by developing prevention and promotion packages as a way to attract enrolees. Insurance providers in other countries have incentivised participation of enrolees in schemes to improve their health. In Japan and the State of Alabama (United States), health insurance discounts have been offered to those who participate in wellness programmes. Well-designed secondary and tertiary prevention

programmes have also been found to be effective in preventing the development of complications, and can produce savings for insurance companies. Above all though there should be an expectation that ISAPREs provide care that is at least equal to provision by FONASA, which is for example covering counselling and diet programmes in primary care. While ISAPREs should see the potential benefits of investing in public health programmes for their enrolees, it may be that more prescriptive requirements by the Ministry are needed, for example through setting minimum prevention requirements across the industry through regulation.

There is scope to strengthen epidemiological surveillance and monitoring

Epidemiological data in Chile is primarily based on the National Health Survey, which was carried out in 2017, and prior to this in 2009 and 2003. The National Health Survey offers a rich source of data on the health status of the Chilean population. For example the National Health Survey includes both measured and self-reported height and weight -- and not many surveys include both dimensions. Other sources of data in Chile such as the WHO Global Information System on Alcohol and Health (GISAH) include data for Chile on alcohol consumption (for 2014) and patterns of consumption (for 2010), while JUNAEB's *El Mapa Nutricional* tracks obesity rates in children and adolescents.

However, given that the National Health Survey is a very important source of key population health data, it needs to be undertaken on a more regular basis. Undertaking the survey every seven years – which is the time elapsed between the most recent two Health Surveys – is not sufficient to effectively monitor changes in non-medical determinants of health, or to assess the impact of public health policies. Many other countries OECD countries, for instance Italy, France, Canada and England, have surveys much more regularly, even annually. Mexico's health survey (ENSANUT) takes place every 4 years (last one was in 2016), and includes measures of height and weight. The survey should not be seen as an ad-hoc undertaking, but rather be a regular part of public health policy. An established timetable for undertaking the survey needs to be set – for example every 2 to 4 years – and/or responsibility for the survey be shifted out to an arm's length institution. For instance the Public Health Institute might include the survey as part of their core business. The survey should be designed to provide data in line with Chile's guidelines and thresholds for public health issues. For example, the recommended frequency for consumption of certain foods (daily, weekly, etc.) does not always match the survey questions, and the survey does not cover all food types, such as pulses, potatoes, meat, and eggs, which are included in the guidelines.

Another weakness is the monitoring of economic data. Overall Chile's data on prevention and public health (and indeed any detail beyond overall health spending) is very poor; no overall estimates of preventive spending or any subcomponents are available, nor can be shared with the OECD under the System of Health Accounts Framework (SHA). To be able to more effectively identify public health and prevention spending, an overall improvement in health accounts is needed. Chile should continue the efforts that have begun, working with the OECD and PAHO, to improve SHA reporting, including the new SHA protocol to produce data by disease.

In addition, greater monitoring of some of the public health and prevention programmes that Chile has introduced is needed. In many respects, a richer and more regularly updated epidemiological surveillance data will help with this monitoring. However, specific efforts to monitor and, particularly to evaluate some programmes, are needed, for

instance cancer screening and early diagnosis as stressed in Chapter 3, and the comprehensive package of obesity prevention measures as Chapter 2 sets out.

Tackling obesity and unhealthy diets in Chile

Obesity and associated unhealthy behaviours are top causes of chronic diseases and burden of disease in Chile, and represent the largest and fastest-growing single risk to health in the country. To address this issue, a package of policies – including fiscal policies, food policies and public information – is needed, as any single measure is unlikely to have a major impact.

In 2016, 39.8% of the Chilean population was overweight, and another 34.4% was obese. This is one of the highest rates observed among OECD countries. The National Health Survey shows that there has been no reduction in the prevalence of overweight and obesity in the last 15 years.

The rate of childhood overweight and obesity in Chile is nearly 45%, which is considerably higher than the OECD average of around 25%. This is a significant public health issue in itself, but also poses risks for the future. Children who are overweight are more likely to be overweight as adults, and are at greater risk of poor health in the future. Chile's high prevalence of childhood overweight and obesity can be considered a 'health time-bomb' .

The rise of obesity in Chile in the past decades can be linked to several factors, such as change in calorie and nutrient availability. Since 1961, total food availability has increased by nearly 20%, from just under 2 500 kcal/capita/day to nearly 3 000 kcal/capita/day in 2013. This increase is almost entirely attributable to an increase in calories from sugar, other sweeteners and meat.

There are inequalities in the distribution of obesity across population groups. A large number of determinants influence lifestyle, including housing, education, gender, the environment, income and age, and these factors are causing differences in obesity rates. For example, women are more likely to be obese than men. It is important to understand how these determinants interact with each other in different population groups, to ensure interventions are targeting the right people.

Chile has implemented a comprehensive set of prevention policies to tackle unhealthy behaviours associated to obesity

Faced with an alarming status of the population, Chile has recently introduced a comprehensive and impressive set of policies and interventions to tackle obesity. Governments can use a wide range of different policies and interventions to tackle obesity, from population-level fiscal policies to individual-level support interventions. Combining different approaches in a multi-intervention strategy, targeting different population groups and settings, significantly enhances the impact on health, which Chile has embraced. Through a wide-ranging portfolio of actions Chile has started to address the main causes of obesity: physical inactivity, and in particular unhealthy diets. These interventions, many of which are still in the early stages, will hopefully help turn the tide on obesity over the years to come.

At the national level, mass media campaigns educate the public on healthy choices. Since 2004, when Chile launched a major campaign to promote the consumption of five portions of fruit and vegetables a day, websites, twitter, TV and radio adverts and

educational material have been used to promote healthy eating. National laws on marketing, labelling and sugar taxes have been implemented in an effort to improve diets, and are particularly important. Chile implemented a total restriction on marketing unhealthy food at children, or when a television audience consists of more than 20% children.

Chile also introduced front-of-package labels in 2016 on packed foods, which indicate whether a certain foodstuff is high in calories, salt, sugar or fat, with threshold values that are among the strictest in the world. It is clear that the policy has already had an impact. An evaluation by the Ministry of Health found that 44% of consumers used the labels to compare products, and 92% of them were encouraged to buy less or to buy different products.

In addition, the food industry has reformulated some products to avoid having to add labels. Chile also introduced a sugar-sweetened beverage (SSB) tax in September 2016; SSBs with more than 6.25gr of sugar/100ml (or 15gr/240ml as stated in the law) are taxed at 18%, while SSBs below this threshold are taxed at 10%.

At the regional level, regional governments and city-wide programmes are bringing together different stakeholders to deliver multifaceted interventions, and transform local spaces. For example, the *Santiago Sano* programme delivers interventions on alcohol, sexual health, activity in the elderly, and childhood obesity, bringing together stakeholders from every municipal department into 40 dedicated committees. *Elige Vivir Sano en Comunidad* (Choose Healthy Living in the Community) includes a number of initiatives that aim to create a healthier environment, which promotes and enables a healthy lifestyle.

A particularly impressive nation-wide portfolio of school-based interventions has been developed to improve diet and exercise in students. The *Contrapeso* programme aims to promote healthy eating and physical activity among school children, including restrictions on the sale of unhealthy products in schools and increasing the healthy food choices available for school meals. While Chile does not have a centrally mandated workplace-based programme, the Chilean government has supported the implementation of voluntary actions in workplaces. So far, about 200 to 250 workplaces have implemented interventions including dedicated walking breaks, physical activity courses, and bicycle parking spaces.

Chile's primary care system plays a key part in the obesity strategy through the *Vida Sana* counselling and physical activity programme. This one-year programme aims to improve physical activity and diet in patients with obesity, or overweight patients with other risk factors. While the sessions take place in primary care centres, the programme is completely independent and run by dedicated councillors, and is covered by FONASA. However, currently the programme covers less than 1% of people with obesity.

Population-based primary prevention actions should be further reinforced and extended to target a larger share of the population

While Chile's comprehensive multi-dimensional policy approach to reducing obesity has been impressive, there are still potential areas where policies should be expanded.

Chile is ahead of the trend with its strict labelling laws. The use of simple front-of-package warning labels, as has been implemented in Chile, prompts a higher response rate from consumers than a list of nutrients, and the scheme has already proven effective in incentivising the reformulation of unhealthy products. Nestle, for example, has

changed the recipe of popular breakfast cereal Chocapic to include artificial sweetener Stevia.

However, there are some technical limitations of the policy that could be addressed: for bottles and other non-square packaging the label can be printed towards the side of the front label, potentially obscuring it if the product is slightly rotated when displayed in store. Including the label on the front and the back of the product could help ensure that it is always visible.

In addition, non-packaged food, for instance in restaurants or fast-food establishments, are not subject to the labelling law (though restrictions on advertising and school sales do apply). Further expansion of the labelling, for instance to alcoholic beverages or fast-food restaurants could be considered. The labelling laws could be expanded to include menus in chain restaurants, as has been done in states and cities in the United States, Canada and Australia, or to prepared, take-away food.

Chile should continue to focus, in particular, on preventing obesity in the younger generations. Building on the school-based programme, Contrapeso, Chile should now work towards creating an environment that favours healthy lifestyle choices. Working with municipalities and privately-owned schools to extend the coverage of the programme and to stop marketing and sales of unhealthy products around schools, as has been done for tobacco, would be the most natural next step. The healthy food procurement policy in schools – led by JUNAEB – could be extended to cover all the canteens in public institutions, notably canteens in offices, public services and the army.

At the same time a renewed focus on policies to promote physical activity would be appropriate; Chile's current policies to reduce obesity are heavily focused on improving Chileans' diets.

Private insurance should play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases

FONASA plays an important role in managing obesity through the Vida Sana counselling and physical activity programme. The private health insurers (ISAPREs) however cover around 17-18% of the Chilean population, but their involvement in promotion and prevention activities is very limited. According to the Association of ISAPREs the mobility of the covered population – 10% of individuals change their insurance scheme each year – reduces the incentive as well as the opportunity for individual providers to invest in prevention and public health initiatives. In addition, as the ISAPREs can unilaterally charge a risk-rated premium, the large majority of elderly patients are covered by the public FONASA. This further reduces the incentive for the ISAPREs to invest in prevention and healthy aging.

For the ISAPREs, efforts to reduce obesity would deliver medium-to-long term health savings, and these efficiencies would be even greater if ISAPREs could act together to introduce a common obesity and overweight prevention approach. In doing this, ISAPREs would be protected from some of the impact changes in their covered population, or at least for those individuals changing between ISAPREs.

One example of a prevention programme managed by a private health insurer is the *Vitality* programme, which is run by South Africa's largest private health insurer, Discovery Health. This incentive-based programme is based on four pillars: assessment and screening, healthy choices, health knowledge, and physical activity. Beneficiaries are encouraged to participate in different activities such as health checks and visits to

dieticians through a points system. In addition, gym memberships are subsidised, and fruit and vegetable purchases are eligible for a 25% cash rebate. The cash rebate has been effective in increasing expenditure on healthy foods by 9.3%, and decreasing spend on less healthy food by 7.2%. The *Vitality* programme has resulted in a reduction in medical claims for Discovery Health, thus providing a direct incentive for private insurers to invest in prevention.

Even in the absence of agreement between the ISAPREs – the Association of ISAPREs has indicated that it would support changes to the required involvement of private insurers in public health – individual ISAPREs should be encouraged to play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases. For the ISAPREs, offering an attractive prevention and promotion package to enrolees – for instance following the Vitality programme model – could give a competitive advantage. If this is insufficient, the Ministry might look for ways to encourage greater engagement by the ISAPREs, for example by setting minimum prevention requirements across the industry through regulation. As coverage providers of close to 20% of the Chilean population the ISAPREs must become a more active partner in the effort to reduce obesity.

Chile should better assess the effectiveness of the policies and measure achievements in reducing obesity

Chile's obesity strategy is multifaceted and includes many different stakeholders, interventions, target populations and outcomes. To assess the effectiveness of the implemented policies and to measure achievements, Chile should put in place rigorous monitoring systems. Well-designed monitoring systems are also a fundamental tool to support the design of further innovative policies or to address potentially unwanted consequences of policies already in place.

In general, as stressed in Chapter 1, Chile needs to improve the availability of epidemiological surveillance data, including data on obesity and overweight. Chile has fairly robust data on child obesity rates, given the data collected under the JUNAEB programme with *El Mapa Nutricional*, and through regular child health checks especially in infancy. However, data availability for adult health risk factors, including obesity, depends on a periodic National Health Survey. There was no health survey undertaken between 2009 and 2017, which meant that for much of the period in which Chile has introduced its ambitious obesity strategy the impact on population health has been obscured. Regularly updated, robust data on obesity levels in the population will be critical for better tailoring the prevention approach in the years to come. The importance of improving the information availability for public health is further explored in Chapter 1, along with examples of different approaches taken by other OECD countries to collect more regular data.

At the same time as population-level monitoring with more regular data on obesity rates, Chile should take action to rigorously monitor the impact of individual obesity policies. The official evaluation of Chile's SSB policy is a good example of an academically rigorous approach to policy review. Other interventions should receive similar reviews to ensure their cost-effectiveness.

Monitoring of the implementation of policies will also be key. For instance, enforcement of the food labelling law, and sales of food in schools, is the responsibility of the SEREMIs, who monitor the labelling of food products through random inspections (sampling a higher number of food products aimed at children). However for products

that are on-sale nation-wide, a national approach for some products may be more efficient than having each region do their own inspection. There may also be a question around the accuracy of the labels, but while one study showed that a number of foods were inaccurately labelled (or unlabelled), it is unclear how representative these results are.

Cancer screening and prevention in Chile

In Chile, cancer incidence is low but cancer could become the first cause of mortality in the near future. In 2015, based on the mortality rates adjusted to the OECD population, cancer accounted for 202deaths per 100 000 population and was the second highest cause of mortality after diseases of circulatory system. But in recent decades, the burden of cancer has been increasing relative to other diseases, and in some regions in Chile cancer has already become the first cause of deathI thi.

Among men, prostate, stomach, colorectal, lung and kidney cancer have the highest incidence rate while among women, incidence is high for breast, colorectal, cervical, gallbladder and lung cancer. In terms of mortality, among men, cancer with highest rate is prostate, stomach, lung, colorectal and liver cancer. Among women, the leading cause of cancer mortality is breast, colorectal, lung, stomach and pancreas cancer. Following trends across OECD countries, cancer mortality rates in Chile are also higher among men than among women, and this can be explained at least partly by a higher prevalence of risk factors among men.

Although overall cancer mortality rates have been declining in Chile as seen in many OECD countries, progress has not been as fast as elsewhere for some cancers. Many cancers with high incidence and mortality rates in Chile such as prostate, breast, stomach, colorectal, and lung cancer share common risk factors including poor lifestyles such as obesity, physical inactivity, smoking, diet and/or alcohol consumption which are prevalent in Chile.

Chile has developed its cancer care system incrementally to tackle the increasing burden of cancer

In order to tackle the burden of cancer, Chile has strengthened cancer care governance and delivery. Chile has been strengthening the cancer care system incrementally over the past several decades. Since the late 1980s, Chile has implemented five nationwide programmes to reduce the burden of cancer and they focused on cervical cancer, cancer drugs for adults, cancer for children, and breast cancer; the programme also includes improved palliative care. Since the 2000s, Chile has been also tackling cancer as one of the major diseases as manifested in Health Priorities 2000-2010 and 2011-2020. In addition, in 2005, in view of achieving universal health care, Universal Access with Explicit Guarantees (AUGE) was introduced to improve access, quality, financial protection and timeliness of care for priority diseases including cancer. Initially, AUGE included 10 cancers but the types of cancer and cancer care interventions covered by AUGE have been increasing since then and 17 cancer-related interventions are now included.

Many other OECD countries also implemented specific cancer programmes, and most developed overarching and comprehensive cancer control policies through National Cancer Strategies or National Cancer Plans. These strategies or plans initially focused on prevention and screening but have since expanded policy focus on treatment, follow-up, care co-ordination, palliative care, patient-centred care delivery and monitoring. With a

view to further developing the cancer care system, Chile could learn from countries such as Australia, and Spain which systematically involved various local stakeholders when developing cancer strategies. For instance, the cancer care strategy in the Spanish National Health System was designed through co-ordination between the Minister of Health and the regional governments and close collaboration with all stakeholders including civil society. Such stakeholder involvement facilitated the implementation of cancer care strategy across health authorities in regions.

Chile has not introduced an overarching National Cancer Strategy or Plan, but important governance structures and policy tools for cancer control exist. The Ministry of Health is responsible for cancer care and as in other OECD countries with strong governance of cancer care systems, cancer-specific targets and timeframes for achieving them are specified in national health policy strategies called Health Priorities. Health Priorities 2000-2010 included targets such as decreasing age-standardised mortality rate by 40% for cervical cancer, by 25% for breast cancer and by 25% for gallbladder cancer. Although targets were not necessarily met during the decade, progress was made for these cancers particularly for cervical and gallbladder cancer. Subsequent Health Priorities 2011-2020 also sets a goal of decreasing cancer mortality by 5% by 2020 and between 2011 and 2015, Chile already decreased mortality rate by 4.1%. Additional resources were also made available in the cancer care system. For instance, the number of public cancer care centres was increased and the introduction of AUGE and its coverage expansion also increased public funding for covered procedures and treatment for cancer.

Chile has also sought efficiency gains and quality improvements in its cancer care system. In view of increasing efficiencies, cancer care delivery has been centralised by concentrating resources and expertise at specialised institutions as seen in other OECD countries. Cancer networks have been also established in order to facilitate co-ordination among professionals engaged in oncology care. With regards to the quality of cancer care, the Programa Adulto Nacional de Drogas Antineoplásicas – PANDA develops clinical guidelines to standardise and assure quality of cancer care. Reimbursement is linked with evidence-based care delivery according to the guidelines and only those treatments and procedures that are complied with the guidelines are reimbursed. The compliance level and quality of cancer care is considered to be improving as a result.

However, Chile still lags behind many OECD countries in terms of cancer control. Despite its very low cancer incidence (35% lower than the OECD average), cancer mortality in Chile is not substantially lower than the OECD average (only 3% lower). Room for improvement remains, including through further public health interventions.

The cervical cancer screening programme has contributed to substantial reduction in mortality rates but screening coverage could be increased

Chile has a well-established cervical cancer screening programme. Chile's cervical cancer screening programme was developed and rolled out nationwide relatively early, starting in 1987. Cervical cancer screening coverage has since increased. Free access to screening, stakeholder involvement for setting screening programme goals, provider incentives for higher coverage, quality assurance of screening tests and information systems to monitor the progress of the programme have contributed to improved cervical screening coverage, and the proportion of patients diagnosed with early stage of cervical cancer has increased. Together with policies aiming at improved health care access and quality of care, systematic approaches taken for cervical cancer screening have contributed to a mortality decline of 63% since the start of screening programme.

Following a trend in the OECD a school-based HPV vaccination is also in place in Chile as part of the National Immunisation Programme since 2014. To assure high coverage of HPV vaccination a comprehensive multi-stakeholder approach has been taken. This has enhanced the knowledge of HPV vaccination among the population and led to high vaccination coverage since its start, suggesting that the incidence of cervical cancer is likely to decrease in the country in the years to come.

Nonetheless, Chile needs to continue its efforts to increase cervical cancer screening coverage. The incidence of cervical cancer remains higher than the OECD average, and although the gap is generally narrowing over time, the mortality rate in Chile (8 deaths per 100 000 women) remains higher than that of the OECD average (4 per 100 000) in 2015. High cervical cancer screening coverage can reduce the disease burden but since its peak in 2008, the coverage has declined, reaching 56%, lower than the OECD average of 61% in 2015. Furthermore, despite the successful implementation of HPV vaccination, there are still non-participants of the immunisation programme and existing vaccines do not protect against all high-risk HPV types. In order to reduce the burden of cervical cancer, Chile will need to increase screening coverage.

Chile could adopt a more systematic and personalised approach in inviting target populations to screening programmes, as has been implemented in many OECD countries with high screening coverage. These countries identify each individual in the target group and send a personal invitation letter for screening, issued through a registry. The letter includes information on the benefits and risks of screening and asks for informed consent for screening, to increase public awareness and promote health literacy. More efforts are also made to invite people with positive screening results in the past for further assessment, and in some countries the appointment date is fixed in the letter to further facilitate access. As it can cost more to implement these strategies, cost-effectiveness would need to be assessed for the Chilean context.

Chile could also consider taking another route in parallel to increase coverage. Several OECD countries such as the Czech Republic, Denmark, Finland and Norway have undertaken trials and sent a self-sampling device for cervical cancer screening to target women who had previously declined screening participation. These trials were found effective in reaching out to non-participants, women's experiences were generally positive and sample devices were well received. If Chile were to follow this route, effective communication strategies for this alternative intervention would also need to be developed.

Chile needs to develop and implement more effective strategies for breast cancer screening programme

In terms of breast cancer, Chile began a National Screening Programme relatively late, in 1998. Screening coverage is only 37%, which is much lower than the OECD average of 60%, despite its free access and extended availability, for instance through mobile mammographs, a truck carrying mammographs. Screening coverage is particularly low among those with low socio-economic background including low educational attainment.

Through the screening programme the share of patients diagnosed at early stage among all patients with breast cancer has increased in Chile, but the burden of breast cancer is still relatively significant. While the incidence rate in Chile is about half of the OECD average, the mortality rate is only about 20% lower than the OECD average. Furthermore, since the introduction of breast screening programme in 1998, the mortality decline has been slower in Chile than in most OECD countries (9% in Chile compared to 22%

OECD-wide). This may be due to factors such as lifestyle changes and relative progress in the quality of breast cancer care compared to other OECD countries, but low screening coverage also poses a question of the screening programme's effectiveness in reducing the burden of breast cancer in the country.

In fact, many target women are not aware of the benefit of mammography screening in Chile. Among women aged between 50 and 75 who did not undergo mammography, more than half of them believed that they did not need it or it did not apply to them, or did not know that they needed to do it. About 30% of women forgot to do it, did not have time or reported that the test scared them or distressed them. Another study also found that secrecy, shame, fear and fatalism were associated with mammography, and some women had greater confidence in breast self-examination which was previously promoted as the appropriate screening method.

Chile should also look to develop more effective communication and implementation strategies for the breast cancer screening programme. First, as mentioned for cervical cancer screening, more systematic and personalised invitations could be developed for breast cancer screening. Second Chile needs to involve different key stakeholders when developing implementation strategies for breast cancer screening. For HPV, Chile has involved not only health professionals but also the education sector in developing implementation strategies, and it prepared manuals for teachers, and informed parents or guardians of target children about risks and benefits of HPV vaccination to their girls. Such efforts in involving different stakeholders could be extended for Chile's breast cancer screening programme. Barriers may be specific to regions, and different among people with different cultural and socio-economic background within the country. Voices of local stakeholders such as regional administrations, health care providers and representatives of the civil society need to be sought to identify specific barriers to accessing breast cancer screening, and to address specific needs particularly among the disadvantaged as early detection of cancer is often more challenging among them. Third, specific policy goals could be set in relation to mammography for local health systems. A stronger policy focus on mammography at the health system level is likely to promote public awareness not only among the public but also among health care professionals. Last, although the number of mammographs has been increasing in recent years, Chile could also seek ways to assure access to mammographs particularly in the isolated regions through a greater use of mobile mammography units.

For other cancers Chile should improve health literacy and promote access to screening and diagnostic tests

In order to reduce risks of developing some other cancers with a high disease burden, vaccinations and screening tests are provided for free at the primary health centres. Vaccination of Hepatitis B, one of the main risk factors for liver cancer in Chile, has been provided as part of the National Immunisation Programme since 2005 and the vaccination rate has been high, covering over 90% of children in 2017. Screening tests are also available for colorectal, stomach, prostate and liver cancer. In relation to lung cancer, as mentioned earlier, while Chile has a range of anti-smoking policies, the cost of smoking cessation treatment is not yet covered.

Access to these screening tests, however, is not well understood but is considered low. In general, public awareness of the importance of early detection for cancer appears low and there is a lack of provider incentives and long waiting time in primary care, leading to low access to cancer screening tests.

These challenges contribute to relatively poor outcomes of prostate, colorectal, stomach, lung and liver cancer. Between 2005 and 2015, the mortality rate for prostate cancer decreased slower in Chile (by almost 8%) compared to the OECD average (by 15%), and it remains much higher than the OECD average (44 deaths per 100 000 men compared to 33). With regards to colorectal cancer, although the mortality rate is still lower in Chile (20 deaths per 100 000 population) than the OECD average (24), it increased by almost 20% over the decade while the OECD average decreased by 15%. As for stomach cancer, mortality rates declined with a similar pace between Chile and the rest of the OECD, and the mortality rate remains high at 26 deaths per 100 000 population in Chile compared to 10 in the OECD. For lung cancer, mortality remained stagnant at 23 while the OECD average decreased by 10%, reaching 41 per 100 000. As for liver cancer, over the last decade, the increase in mortality rates was fast (by 13% compared to by 5% on average across OECD countries), reaching 10 deaths per 100 000 population and deviating from the OECD average (8).

Recommendations to increase screening coverage for cervical and breast cancer screening are relevant. Chile could develop a more systematic and personalised approach in inviting the target population to screening such as for colorectal and stomach cancer. Chile can also seek systematic involvement of key stakeholders in order to develop people-centred strategies for cancer prevention and screening.

There are also other approaches that Chile could consider – likely in tandem – to improving access to early diagnosis including screening. First, Chile would need to develop effective information-sharing strategies to improve health literacy of the population. Examples from other OECD countries could be useful. For instance, Denmark, England and Estonia have developed a platform such as a website or e-Health account to share evidence-based information related to care for different diseases throughout patient pathway with a view to promoting health literacy of the population and to support them to seek health care including cancer screening and diagnostic tests appropriately and in a timely manner. Second, Chile should ensure that necessary medical technologies are in place across all regions. In some settings this may mean that innovative technological solutions, mobile clinics or tele-radiology, can help overcome geographic challenges in access in a cost-effective way. Third, given geographic characteristics of Chile, financial support to cover travel cost may be needed particularly among low-income groups with high risks to assure access to different diagnostic tests if geographic access is still considered problematic even after expanding the use of technological solutions. Furthermore, for effective early detection of cancer, Chile needs to continue assuring the quality of diagnosis. Chile has taken steps to standardise and improve the quality of diagnosis through international collaboration and such efforts needs to be continued across providers for different type of cancer.

Last but not least, improving early detection of cancer also needs to be approached in the broader context of health system strengthening. Although slowly decreasing, the share of those with unmet health care needs is still high at around 8% in 2015, indicating overall challenges in assuring access to health care and achieving universal health coverage. Although the quality of primary care is important to effectively identify target population for cancer screening, people with risk factors for cancer and patients still at an early stage of cancer, resources are stretched in primary care, resulting in long waiting time, short consultation time and poor care coordination. .

Chile should develop more systematic monitoring for cancer control

Chile has developed a cancer monitoring system based on population surveys and regional cancer registries which include incidence and cancer types. Chile also participates in the international surveillance and monitoring of cancer care through its participation in international data collections, including with the OECD and the WHO including Pan American Health Organization and the CONCORD Programme. However cancer registries have only been developed in four regions. Conversely, many OECD countries have cancer registries covering all their populations, allowing regional and international comparisons of cancer incidence and survival.

In order to develop population-based screening programme further, Chile would need to develop its information system to bring together individual-level data around cancer screening and diagnosis in a more systematic manner across regions, providers and cancer types, and to facilitate identifying individuals with high risks more efficiently and effectively. This has already been done for cervical cancer and childhood cancer in the country to some extent; Chile has expanded the information system for cervical cancer and data are linked across providers including both in the private and public sector and registries; for childhood cancer, data from private and public sectors have been integrated in the national cancer registry since 2011. An information system based on registries is essential to send personalised invitations and reminders in view of increasing screening coverage, so information system developments should be extended across regions and to other cancers. Rich data generated from such systems could be explored periodically to assess the effectiveness of existing screening protocols such as target group, screening frequency and/or methods and across population groups.

A stronger monitoring and evaluation system for screening programmes could also improve provider performance and public awareness. An increasing number of OECD countries make key health information, including screening coverage, available in the public domain by region and provider in a user-friendly manner. Some of them including Israel, Italy, Portugal and the United Kingdom (England) monitor core services of primary health care providers including screening coverage within the performance assessment framework of primary care. In some of these countries, feedback is provided to individual providers and benchmarking is possible.

As cancer is one major disease affecting OECD populations, many countries have enhanced their efforts in monitoring not only cancer screening but also cancer outcomes including patient-reported outcomes such as patient-reported experiences (PREMs) and outcome measures (PROMs) in view of improving quality of cancer care and putting patients at the centre when delivering cancer care. Evidence shows that the use of PROMs in oncology care leads to improved detection of symptoms, better care process such as communication between clinicians and patients and higher patient satisfaction. This may be a route that Chile may wish to consider in view of making their cancer care system more people-centred.

Developing public health genomics to strengthen preventive care in Chile

A number of public health priorities in Chile have the potential to benefit from wider application of precision medicine. From a public health and preventive care point of view, precision medicine is most likely to offer benefit in those conditions which generate a sizeable burden of disease (whether measured in terms of mortality, morbidity or cost); which have a significant inherited component; and whose prevention, early diagnosis or

management could be influenced by knowing the genetic associations in a given individual or community. These criteria apply to cancer (where, for example, 10-20% of cases may have a hereditary component); and to congenital anomalies at birth, such as lysosomal storage disorders.

Other conditions to which precision medicine could be applied are less relevant to the public health and preventive care agenda. Some, such as obesity, have undoubted public health importance. But the genetic variants associated with the condition are so strongly eclipsed by environmental and behavioural factors that genetic information has little predictive value. Other conditions, such as some forms of lymphoma, have stronger genetic associations. But it is unclear how knowledge of the genetic antecedent would translate into a public health or preventive care strategy.

In choosing to engage, at this stage, with the role of genetics in health and disease, Chile is showing a clear understanding of the potential for genetic science to both benefit and transform the field of preventive medicine. Taking steps to consider the role of genetic medicine for public health care at this point, when the range of genetic tests is relatively limited, should leave Chile well-prepared for the expansion of available genetic tests that will undoubtedly develop in the years to come.

Chile is already giving serious thought to the future development of precision medicine at national level

Chile has a goal of becoming a regional leader in provision of and research in the field of precision medicine. Both the government and professionals are committed to this development; in 2016 *Sociedad de Genética de Chile,* a professional body, and the Ministry of Health jointly produced an analysis of Chile's needs in the field, which signals a high degree of ambition. Chile also already has an active research community in genetic science, supported by government research institutes. Both the Comisión Nacional de Ciencia y Tecnología (hosted by the Ministry of Education) and the Corporación de Fomento de la Producción (CORFO, hosted by the Ministry of Economy) offer funding for genetic research. These, and other funds, have allowed Chile to develop a substantial research base in clinical genetics and the basic science underlying it. The country, in fact, has more sequencers per head of population than any other Latin American country, supported by a network of high performance computers. One particularly promising development is *Chile Genomico*, a research platform that investigates inherited risk-factors for disease, including diabetes, hypertension and several types of cancer. Research collaboration with the private sector is also developing. In particular, CORFO has recently established a Centre for Excellence in Precision Medicine with Pfizer Chile. Chile also participates in the two regional Latin America clinical genetics networks.

As well as a growing research community, Chile benefits from a specialist clinical genetics workforce, even if it is small by international standards. There are currently 33 clinical geneticists working in Chile, equivalent to 1.9 per million inhabitants, the majority of whom are based in Santiago. There is currently one post-graduate residency programme available in Chile, with around 1 new specialist graduating per year. International comparisons suggest a shortfall in clinical genetics consultants; many OECD countries employ 3 or more clinical genetics consultants per million population (and some, such as Norway and Finland, have more than 5). However, efforts are made to offer clinical genetics consultations (typically for other medical specialists) via telemedicine. In addition to clinical geneticists, some oncologists (cancer specialists) also

offer genetic screening, for the common translocations that are associated with leukaemia, for example. A small number of paediatricians and/or obstetricians specialising in foetal medicine and pre-natal care may also offer relevant genetic tests to potential parents. Chile currently does not have any genetics counsellors – professionals who specialise in explaining inherited risk of disease to patients and helping them decide appropriate courses of action in response.

Regulation and health care coverage have not kept up with clinical advances in precision medicine in Chile

While Chile is clearly ambitious about expanding its engagement with the field of precision medicine the translation of ambitions into policy remains partial. For example, there are no policies currently in place to promote the integration of genomics (the study of an individual's entire genetic material) into routine clinical practice, even though this bottom-up activity must clearly be the fundamental plank of any national roadmap. Similarly, there has not yet been any systematic effort to improve knowledge and understanding of genetic and genomic tests amongst doctors, nurses and other health care professionals, nor the public. This limits the potential uptake and impact of genetic medicine.

Regulation in Chile has not kept up with clinical advances in the precision medicine field. Chile has established some key regulatory elements covering clinical genetic services, such as the requirement for Clinical Geneticists to be registered with the Ministry of Health. But important gaps are also apparent. Minimum standard and quality assurance requirements for clinical labs are generic, for example, with no specific requirements relating to genetic tests. In Chile as elsewhere, an increasing number of commercial labs are being established, some of which offer direct-to-consumer testing, but for which there is currently no quality control.

Chilean laws governing personal health data also do not adequately reflect the emerging landscape of genetic technologies. Current regulations allow sharing of individuals' health data only in very limited circumstances. This, however, may hinder growth of clinical genetics, because research and development in the speciality depends upon the analysis of patterns of genetic markers at population level, and their correlation with disease, which demands sharing patient data (obviously with stringent privacy safeguards in place). Chile is preparing a draft law on the use of samples and the sharing of data derived from biobanks, but the provisions apply only to research and not to clinical practice. This risks leaving clinical applications in a grey area, that either weakens the protection of personal health data, hampers better understanding of genetic profiles across the Chilean population, or both.

In addition, health care coverage has not kept up with clinical advances in genetic science. Very few genetics services are covered by the public insurance system in Chile, limiting effective access. At present the only genetics services covered by FONASA are cytogenetics, namely: i) karyotyping (for chromosomal abnormalities, such as trisomy 21, also known as Down's syndrome); and, ii) Fluorescent in-situ hybridization (used to detect specific DNA sequences that are associated with some congenital syndromes, such as Prader-Willi syndrome, and some leukaemias). New-born screening for phenylketonuria (always genetically determined) and congenital hypothyroidism (sometimes genetically determined), are also well-established. There are no molecular genetics or genomic analyses offered within the public insurance system. The Ricardo Soto Law established coverage for some rare inherited diseases, including some

lysosomal storage diseases (such as Fabry's or Gaucher's disease), other inherited disorders of metabolism (such as tyrosinemia), and HER2+ve breast cancer. Because private insurers take their cue from public coverage package, no molecular genetics or genomic analyses are generally offered by ISAPREs either. This means that only those who can afford to pay out-of-pocket for private consultations and testing in independent laboratories can benefit from newer technologies.

These barriers in the accessibility of testing have important impacts in some areas, in particular for children born with a major congenital abnormality. In addition, a number of clinical conditions are included within AUGE where genetic testing can be crucial in determining the most appropriate treatment approach, but is unavailable unless paid for privately (notably several cancers). For many thousand such patients, there is an inconsistency in the coverage under AUGE: treatments are offered, but genetic testing that could offer a quicker and more precise diagnosis is not.

A national strategy for precision medicine in Chile should be developed

Chile starts from a strong position in seeking to develop its clinical genetics to become a regional and global leader. There are nevertheless substantial further steps that need to be taken to realise this ambition. First and foremost, a coherent and comprehensive national strategy should be agreed to steer development of precision medicineover the coming years, encompassing both the use of genetics in clinical practice, in public health policy, and in research. The development of this strategy, which should be directly overseen by the Minister of Health, should include considerations of key dimensions including determining the expansion of genetic services to be included in GES; deepening collaboration between existing labs (public, private and academic) and rationalising the provision of key genetic tests across laboratories as appropriate; ensuring that regulations (particularly around laboratory quality assurance, data sharing and consent) are fit for purpose; and, developing a programme of public and professional education around the role of genetic medicine. Patient groups should be fully represented in the development of the strategy.

In focusing attention on the exciting and innovative area of precision medicine, new insights into the causes and prevention of disease offered by clinical genetics should not overshadow traditional public health approaches. The core challenge, in Chile as elsewhere, in developing the role of genetics in public health and preventive care is to combine deeper understanding of the population's genetic profile with "traditional" public health approaches. Similarly, in order to personalise preventive care, insights from an individual's genetic makeup need to be combined with knowledge of their behavioural and environmental risk factors to tailor a package of preventive interventions.

Critically, a health system such as Chile's (especially one with relatively few resources) should only invest in new services with a robust and detailed cost-effectiveness and budget-impact analysis, as well as business case. Chile's national strategic plan should ensure that this principle is adhered to in the area of genetic medicine. Equally, Chile should not invest inappropriately in next generation sequencing, where value for money is likely to be lower than older technologies, especially if the lack of therapeutic options means that any diagnostic information gained (at considerable cost) is effectively unactionable. Turning to public health specifically, the core activities of risk-factor surveillance, screening, regulation, persuasion, education and so on will never diminish in importance, despite the growing profile of genetic medicine and genetic public health. Chile should balance overall investment in genetic technologies with recommendations

for strengthening traditional public health made in the other chapters of this report therefore.

Appropriate regulation should underpin analysis and sharing of individuals' genetic data

Regulations specific to genetic data, which permit sharing whilst protecting confidentiality, are needed to advance the potential benefits of genetic data while protecting from potential harms. Genetic data is not the same as other types of personal health data. To approach a diagnosis, an individual's genetic (and phenotypic) data must be compared to the wider population, so that relevant variants linked to particular diseases can be found. Currently, Chile has strict regulations governing how personal health data can be shared. The current framework treats all personal health data equally, and is reported to be overly restrictive with regards to genetic data, risking progress in the field. Revised regulations that specifically relate to the sharing of genetic information would be welcome, therefore, to supplement the current regulatory framework. This would enable sharing of genetic data whilst protecting the privacy of identifiable personal data.

Crucially, very careful attention must be taken to ensure that individuals are not discriminated against (whether in terms of access to insurance, employment of other markets) because of their genetic profile. Patients should be involved in revising the regulatory framework that applies to genetic data.

Once sufficient data protection provisions are in place Chile should take steps to maximise the utility of available genetic data. This could include the building of a national register of genetic variants, linked to phenotypes, to better understand inherited causes of disease. *Chile Genómico* already provides a basis upon which to build this register.

Robust quality assurance should also guarantee minimum standards across all laboratories undertaking genetic analysis The precise approach should be agreed by all stakeholders in the Ministerial working party developing Chile's genomics strategy, and may involve peer-review or accreditation. Accreditation standards developed elsewhere are available to support this, such as those developed by the American College of Pathology. Rather than one-off assessment of minimum standards, however, it may be more effective to develop a programme of continuous quality improvement for labs and services, underpinned by regular audit cycles and other techniques, such as those developed by the Institute for Health Care Improvement.

The range of clinical genetic services covered by health insurers should be incrementally expanded

Agreement is needed on incrementally expanding the range of genetic services covered by insurers, given that AUGE has not kept up with novel diagnostic technologies offered in other health systems. Furthermore, several conditions with an important genetic component are included in AUGE, but genetic tests that could speed up, or clarify, their diagnosis are not included. Clearly, though, expansion of AUGE needs to be sustainable and incremental, guided by cost-effectiveness and budget-impact analyses.

An increasing body of research and international experience is available to support the approach to expanding AUGE coverage. It is recognised, for example, that whole genome sequencing (WGS) should be limited to rare or complex disorders whose diagnosis via

non-genetic pathways would otherwise be lengthy. In more common disorders, more focussed analysis of the selected regions of the genome is more efficient in determining genetic antecedents. Likewise, population-wide sequencing is also poorly cost-efficient, with targeting to specific groups first stratified by phenotype, again being more efficient. Although such techniques may capture the public imagination less that WGS, it is important that Chile should work to ensure equity, quality and sustainability of access to these "silver-level" technologies, and not invest inappropriately in "next generation sequencing".

In determining additional genetics tests to be included in AUGE, Chile again is starting from a good position. Professional and scientific associations have already drawn up a list of priority services to be added to AUGE. In terms of disease areas, the stated priorities with an important public health or preventive care component include breast, gastric, colorectal and prostate cancer. In terms of new techniques, priorities include Multiplex ligation-dependent probe amplification (which can distinguish differences of just one nucleotide in up to 50 different genomic DNA or RNA sequences at a time), Sanger sequencing (which can analyse contiguous DNA sequences beyond 500 nucleotides), and molecular karyotyping, which can identify copy number variations.

The capacity of the Chilean health system to take action on significant genetic findings should also be explicitly addressed. A key criterion in determining the expansion of AUGE's genetic component should be the existence of therapeutic options to respond to any abnormal results. A different – and more critical – aspect of actionability arises when a result becomes effectively unactionable because the health system in Chile does not make available interventions that are known to offer benefits. For example, if BRCA1 and BRCA2 testing were to be made widely available, AUGE's omission of prophylactic mastectomy for women who want it, means that even in the case of a positive result from BRCA there is no pathway of care available to the women concerned in AUGE. Hence, the capacity of the wider system to take action on results from genetic testing needs to be explicitly addressed when considering expansion of the genetic component of AUGE.

Ambitious goals to increase "genetic literacy" amongst both professionals and the public should be pursued

Increasing understanding of the costs and benefits of genetic testing, amongst health professionals and the public, will be key to both restricting use of genetic testing to the most appropriate indications, and spreading the benefits as far as possible.

In terms of health professionals, training in genomics as well as protocols and guidelines on use of genetic approaches to diagnosis, are needed. Clinicians can also be educated on the potential of genetic analysis, for instance in primary care. This need not be highly technical; one of the most useful genetic "investigations", for example, is a thorough and well-documented family history. This can be easily performed in primary care, for example, and may reveal increased likelihood of cardiovascular disease, cancer or other important conditions. The United Kingdom offers a model here: 700 person-hours professional training in clinical genetics will be funded as part of a national strategy to increase genetic literacy. Alongside training for front line health professionals, developing a cohort of specially trained genetics counsellors should be a priority for Chile.

Clinicians, including those working in primary care, should be offered training in when and how to refer patients for genetic analysis. The protocols and guidelines within AUGE should also be updated to include a stronger focus on when a genetic component is likely,

when and how to record a family history, and when and how to refer for further genetic analysis. From a preventive and public health angle, such updating of AUGE guidelines is particularly important for cancers or cardiovascular disease presenting at a young age. A particular priority, for example, is breast cancer where 10-20% of cases may have a hereditary component. AUGE guidelines should require, therefore, that a detailed family history should be taken in every new case, so that early diagnosis or preventive care can be offered to family members at high risk. Similar considerations apply to gastric, colorectal and ovarian cancer. Guidelines that support the identification of hereditary cases of these cancers have been developed in other countries (such as the National Comprehensive Cancer Network guidelines of the United States, or the National Institute for Health and Care Excellence guidelines in the United Kingdom), and provide models for Chile to consider.

Initiatives to increase public understanding of clinical genetics and the value of sharing individuals' genetic data, will be just as important as initiatives directed toward professionals. Efforts to increase public understanding should focus on explaining genetics' role in disease prevention and treatment, with a particular emphasis on the fact that pursuing a healthy lifestyle will always be necessary, irrespective of genetic risk. The value of data sharing, and assuaging public concerns about genetic discrimination, will also be important. The model of counselling and consent used at the point of genetic testing will be critical here, and will underpin efforts to educate the public and inspire confidence in genomics. Again, the United Kingdom offers one approach to consider. There, consent is essentially permissive (allowing individuals' data to be used for research and quality improvement), but consent forms and linked educational resources are very detailed. Patient groups should be fully involved in developing a programme of public education.

Chapter 1. The Public Health System in Chile

Overall Chile has a well-functioning, well-organised and effectively governed health system and public health architecture. Leadership from different levels of government is ambitious, and all government actors appear to have well-defined roles in delivering public health care. The key building blocks of the public health system are generally in place, and functioning well. However, more could be done to engage non-governmental actors in addressing Chile's public health concerns. Equally, while ambitious efforts to tackle obesity have been undertaken in Chile, other public health risks – notably smoking and alcohol consumption – merit further policy attention. There is also scope to strengthen public health information system in Chile, notably with more regular administration of the National Health Survey, which is a rich source of epidemiological data.

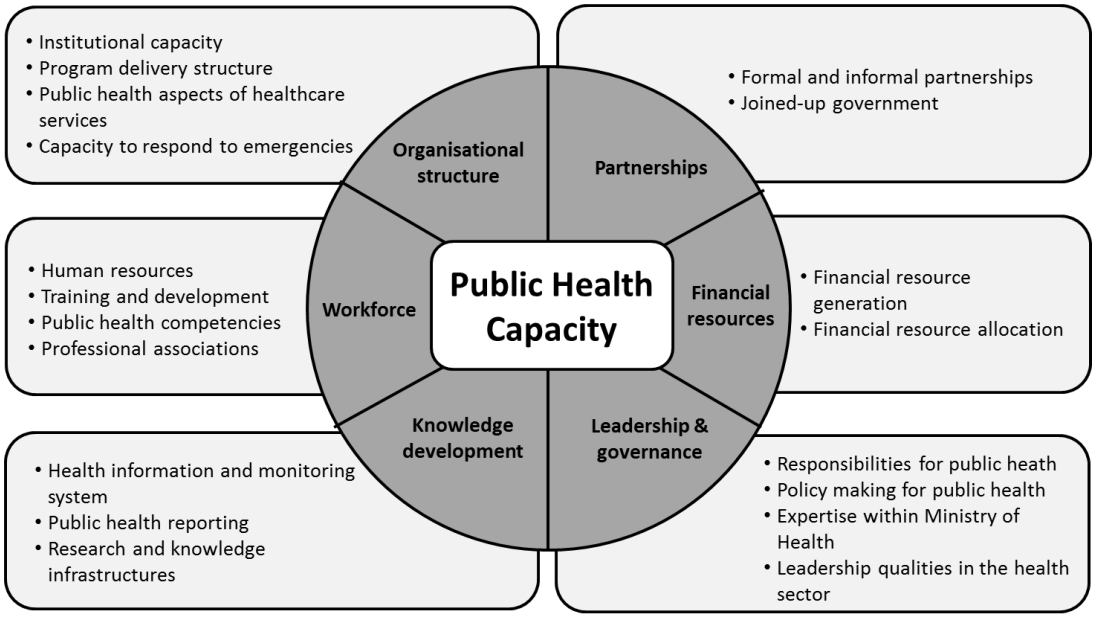
The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

1.1. Introduction

In the face of considerable public health issues, Chile has a robust and well-functioning public health system. Leadership from different levels of government, and in particular central government, is ambitious. The flow of public health leadership and planning from the central to the regional and local levels appears well thought-out, although more could be done to engage non-governmental actors in addressing Chile's public health concerns. Equally, while ambitious efforts to tackle obesity have been undertaken in Chile, other public health risks – notably smoking and alcohol consumption – merit further policy attention. There is also scope to strengthen public health information system in Chile, notably with more regular administration of the National Health Survey, which is a rich source of epidemiological data.

Public health issues have gained importance across OECD countries in recent years, as governments grapple with the best way to prevent disease and ill-health, and help their populations live longer, healthier lives. This chapter gives an overview of the epidemiological context and national public health needs in Chile, sets out a summary of the strengths and weaknesses of Chile's public health system, and where weaknesses are identified makes recommendations for policy strengthening. The description of public health policies in this chapter is structured according to a framework for analysing the public health system detailed in Figure 1.1 below.

Figure 1.1. Appraising Chile's public health capacity – analytical framework



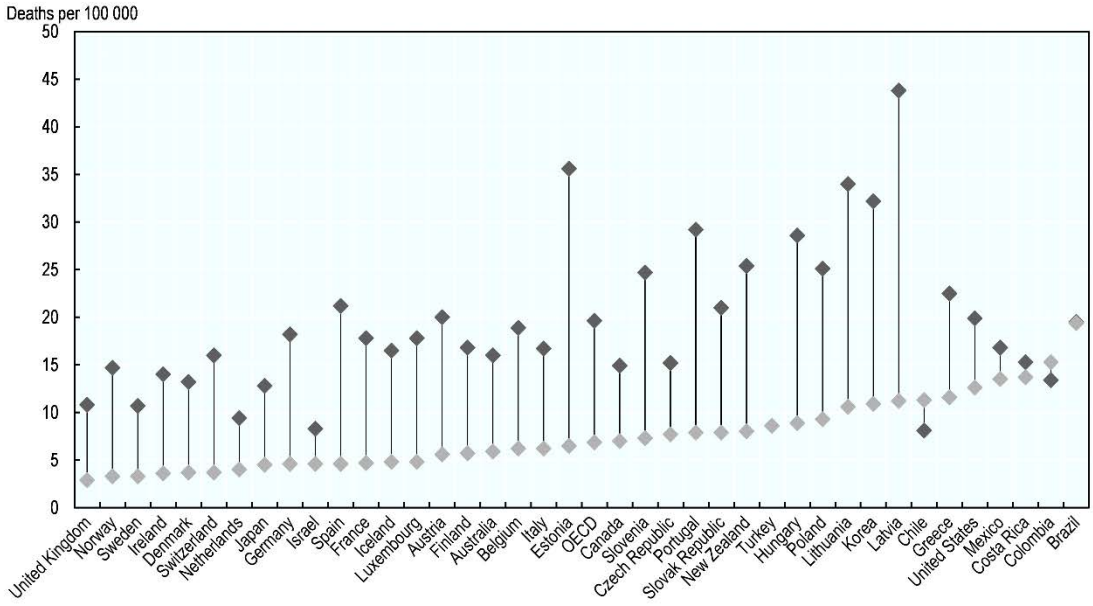
1.1.1. The health status of the Chilean population presents substantial cause for concern

While Chile has seen improvements comparable to the OECD average in recent decades, the health status of the population nonetheless falls fairly consistently below the OECD average. The average life expectancy in Chile has risen faster than the OECD average in the past forty years, and in 2015 was 81.3 years – 76.5 years for men and 81.7 years for

women –, compared to the OECD average of 80.7 years (77.9 for men and 83.2 for women).

Transport accident mortality in Chile should be a cause for concern. Since 1990 mortality due to transport accidents has fallen by more than 60% in the OECD; Chile is the only country where transport accidents have increased, having risen during the 1990s as the number of vehicles on the roads increased (see Figure 1.2).

Figure 1.2. Transport accident mortality 1990 to 2015, or nearest year



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

1.1.2. High rates of smoking and obesity in Chile represent significant risks to population health

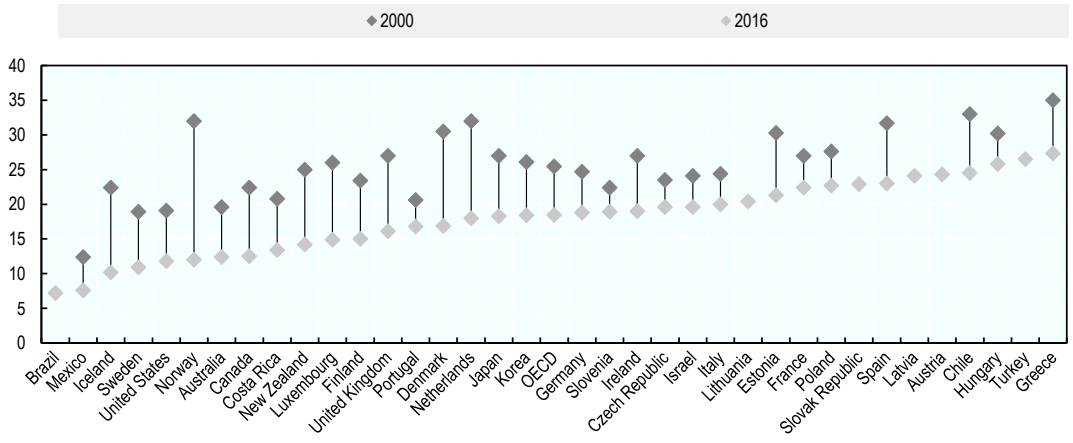
Health status across a number of key public health areas – tobacco consumption, alcohol consumption, obesity – is mixed in Chile, but worrying. Tobacco consumption, particularly amongst younger Chileans, and obesity, are high. Without an important change to these trends Chile could well expect to see an explosion in the burden of chronic disease in the years and decades to come.

High rates of smoking in general population are reported in Chile; among adolescents and young adults prevalence of daily smoking reached around 50% in the early 2000s, with prevalence for women aged 26 – 34 reached more than 40% daily smoking prevalence during the same period, even if declines were observed. More recent data, which covers a slightly different population, still show concerning high, albeit slightly lower, rates of tobacco use. Tobacco consumption rates in Chile have declined from 45.3% in 2003 to 39.8% in 2009-2010 to 33.3% in 2016-2017, while exposure in the home decreased from 31% to 15.2% in the same period (Encuesta Nacional de Salud, 2017[1]). The heaviest smokers were aged 20-49, with a smoking rate of more than 40%. As in other OECD countries, male smoking in Chile is higher than female smoking; 28.2 of Chilean males

were daily smokers in 2016, compared to 23.3% OECD-wide, and 20.9% of Chilean females were daily smokers, compared to 14.1% OECD-wide (OECD, 2018[2]).

OECD-standardised data showed a drop in adult smoking in Chile from 33% of the population as daily smokers in 2000, to 24.5% daily smokers in 2016, a decline of 26% (see Figure 1.3). The daily smoking rate in Chile remains above the OECD average, which is 18.4% of the population, and smoking rates have also declined more slowly. The OECD average rate of decline in smoking rates between 2000 and 2016 was 27%.

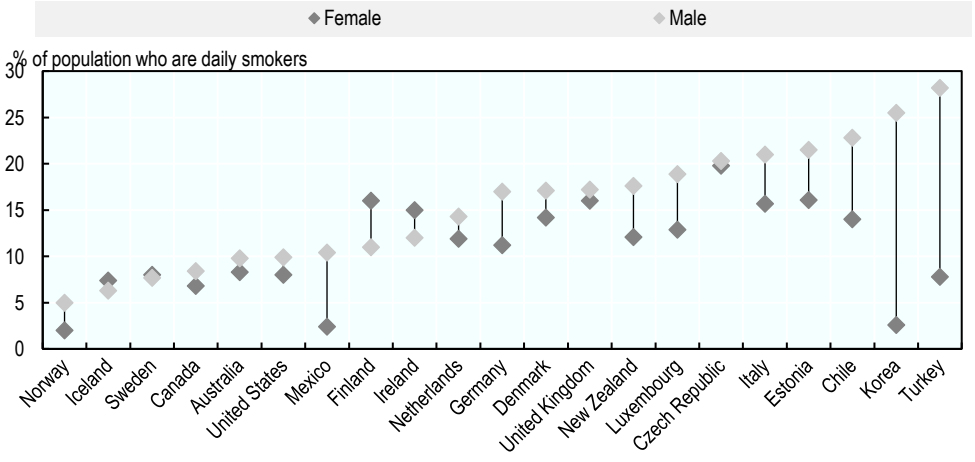
Figure 1.3. Daily smoking rate, total population, 2000 and 2016 (or nearest year)



Note: Percentage of the population aged 15 and over who are daily smokers.
Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

In 2013 24.5% of Chilean youth aged 13-15 reported using tobacco in the previous 30 days, with 27.8% girls reporting tobacco use compared to 19.8% of boys (WHO, 2015[3]; Centres for Disease Control and Prevention, 2013[4]). In 2016 young people (15-24) in Chile were more likely to be smokers than most other OECD countries who could report data by age; 14% of Chilean females and 22.8% of Chilean males aged 15-24 were daily smokers in 2016.

Figure 1.4. Percentage of the population aged 15-24 who are daily smokers, 2016 or nearest year

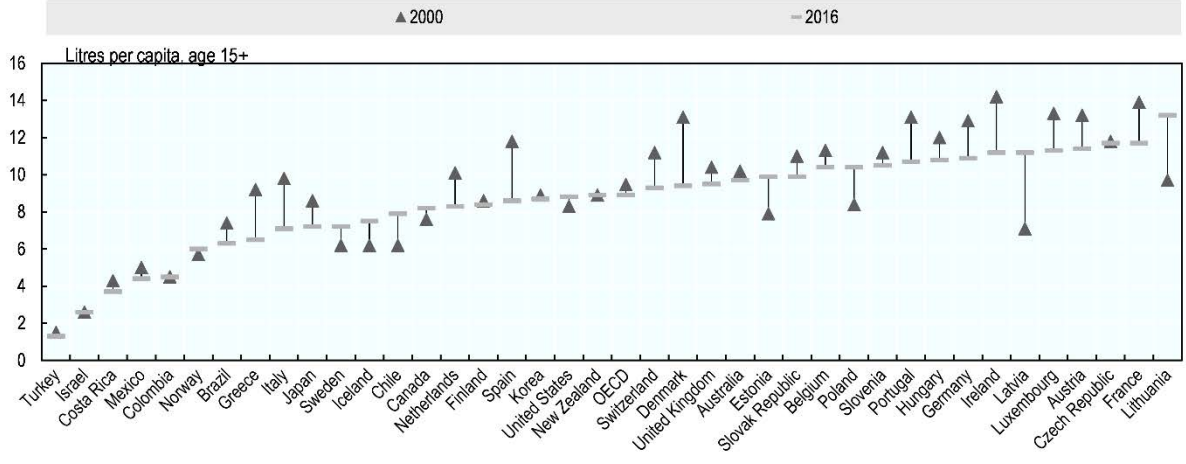


Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

Alcohol consumption amongst adults in Chile is lower than the OECD average. However, alcohol consumption increased slightly from 2000 to 2016, bucking the general trend towards lower consumption of alcohol on average across the OECD (Figure 1.5). In Chile alcohol consumption per capita was 6.2 litres in 2000 and rose to 7.9 litres in 2016, while OECD average consumption fell from 9.5 litres to 8.9 litres.

Prevalence of heavy episodic drinking in the population – wherein at least 60 grams or more of pure alcohol on at least one occasion in the past 30 days were consumed – was at 4.9% in 2010, but men were far more likely to be heavy episodic drinkers (9.8%) than women (0.1%) (World Health Organisation, 2014[5]). Chile's most recent national health survey, the *Encuesta Nacional de Salud 2016-17*, found that the risky consumption of alcohol fell from 12.7% in 2009-2010 to 11.7% in 2016-2017.

Figure 1.5. Alcohol consumption amongst adults, 2000 and 2016 (or nearest year)



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

It is noteworthy that Chile has relatively permissive national guidelines on alcohol consumption: in Chile a 'standard drink' contains 13-15.5g of alcohol as nationally defined; hazardous drinking (the limit above which people are at risk for their health) is defined as > 4 drinks per day (52-62 g/day) for men and > 3 drinks per day (29-46.5g/day) for women; and heavy episodic drinking is defined as more than 5 drinks in one occasion (>69g) (Sassi, 2015[6]). In comparison many other OECD countries set lower thresholds for the definition of a 'standard drink', of hazardous drinking, and of episodic drinking. For example in France 10g of alcohol is a 'standard drink', and hazardous drinking is set above 3 drinks per day (30g) for men and 2 drinks per day (20g) for women. Indeed in all OECD countries where national guidelines exist the hazardous drinking limit as measured in grams is lower than in Chile. Chile's guideline on heavy episodic drinking is also one of the highest in the OECD (Sassi, 2015[6]).

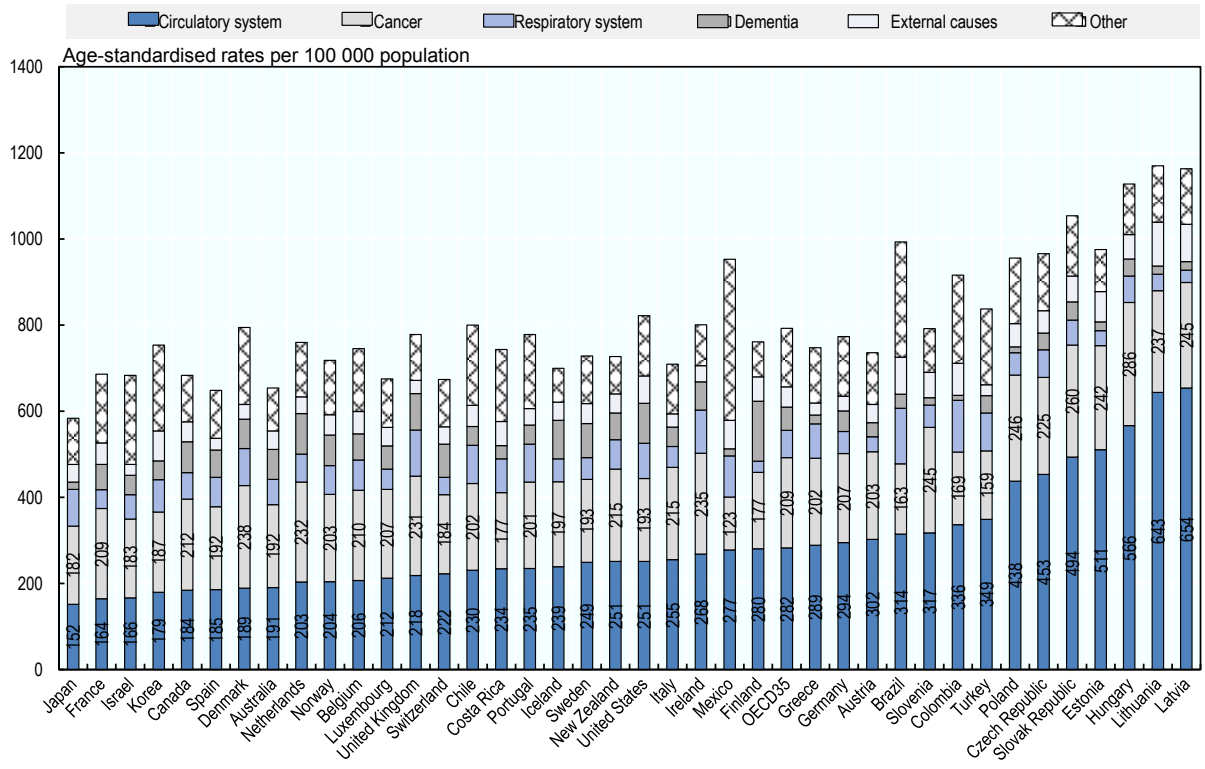
34.4% of Chilean adults were reported as being obese in 2016, well above the OECD average (OECD, 2018[2]); obesity and healthy diets are discussed in detail in Chapter 2.

1.1.3. Like Chile's OECD peers, the burden of disease is dominated by non-communicable diseases, though infectious diseases are more prevalent

Like Chile's OECD peers, the burden of disease in Chile is dominated by non-communicable diseases; diseases of the circulatory system, cancer, and diseases of the respiratory system are the leading causes of death (Figure 1.6). Ischemic heart disease, cerebrovascular disease, Alzheimer's, Lower respiratory infection, stomach cancer and COPD have been the leading causes of death in Chile for the last decade; lower back and neck pain, ischemic heart disease and cerebrovascular disease are the greatest causes of death and disability combined in Chile (IHME, 2016[7]).

However, infectious diseases, including tuberculosis and HIV/AIDs, do have a higher incidence and mortality rate in Chile than the OECD average. Mortality from infectious and parasitic diseases (ICD A00-B99) is higher in Chile than the OECD average – at 18.7 deaths per 100 000 population in 2015, compared to 14.7 OECD-wide – but lower than both Mexico (19.3 deaths per 100 000) and Brazil (40.1 deaths per 100 000). The incidence HIV/AIDS in Chile was 6.1 per 100 000 population in 2016, above the OECD average of 1.5 100 000 population, and incidence increased by 34% between 2010 and 2016 (UN AIDS, 2017[8]; OECD, 2018[2]). Chile has the fourth highest AIDS mortality rate, behind Latvia, Mexico and Estonia; incidence of AIDS was 6.1 per 100 000 population in Chile in 2016, compared to the OECD average of 1.5 per 100 000 population (OECD, 2018[2]) (see Box 1.1). Hepatitis B incidence is higher than the OECD average – an estimated 6.1 cases per 100 000 in Chile compared to the OECD 2016 average of 1.2 – and again, incidence has increased over the past decade (OECD, 2018[2]).

Figure 1.6. Main causes of mortality by country, 2015



Source: OECD Health Statistics 2017, https://doi.org/10.1787/health-data-en.

Box 1.1. Strategies to reduce incidence and mortality of HIV/AIDS

Chile, along with several other countries in Latin America as seen a recent increase in new HIV infections. However, Guatemala, Costa Rica, Honduras and Panama all saw increases in infection rate of around 10-20%, in Chile infections increased by 34% between 2010 and 2016 (UN AIDS, 2017[8]). Knowledge of status among all people living with HIV is relatively low (69%), only 53% of people living with HIV are on treatment (77% of those who know they have HIV), and 48% of people living with HIV are virally suppressed (UN AIDS, 2017[8]). Key populations affected by HIV in Chile are sex workers (with an HIV prevalence of 1.1%), gay men and other men who have sex with men (with a prevalence of 20.3%) and prisoners (0.4% prevalence) (UN AIDS, 2017[10]).

The Chilean Government has been taking action to reduce the incidence of HIV, and improve treatment coverage. Chile has a National Strategy for the Prevention and Control of HIV/AIDS and STIs (Estrategia Nacional de Prevención y Control del VIH / SIDA y las ITS), and in light of the significant increase in HIV infections launched a further campaign in 2017. The 2017 Government campaign focuses on a 'combined prevention' strategy, focusing on encouraging use of condoms and distribution of free condoms, HIV testing, access to care and antiretroviral treatments (ARVs), and STI prevention (Gobierno de Chile, 2017[11]). Treatment for HIV/AIDS, including diagnosis, follow-up,

monitoring and access to ARVs, is covered under AUGE, as is the prevention of mother-to-child transmission of HIV.

In Chile more comprehensive education around preventing HIV and other STIs is likely to be a key part of halting the rise in infections. Sex education has only been mandatory – and only in high schools – since 2010, and evidence suggests that knowledge around safe sexual practices amongst young people is poor (Pérez V et al., 2008[12]). Easy access to testing is also key, and the introduction of a self-administered HIV test available for purchase in pharmacies is under consideration in Chile.

Childhood vaccination programmes are in place, even if room for improvement remains, with vaccination rate against hepatitis B slightly above the OECD average, and vaccination against diphtheria, tetanus and pertussis (DTP) and measles just slightly below the OECD average. Vaccination schedules are aligned with global targets, with the exception of Hepatitis A (vaccination at 18 months is not in place nationally), and Chile has a Multi-Year Plan (MYP) for immunisation in place, and coverage for all WHO-recommended vaccinations is close to or above 90% population coverage (WHO, 2017[9]; WHO and Unicef, 2016[10]). A programme of Human Papillomavirus (HPV) vaccination for young girls began in 2014.

1.1.4. Earthquakes are a recurring public health hazard in Chile

Chile faces a number of natural hazards, including 50 active volcanos, significant earthquake activity, tsunamis, and in some parts of the country drought, wildfires, landslides and floods (Center for Excellence in Disaster Management, 2017[11]).

In particular, earthquakes and tsunamis are a recurring public health risk in Chile, which is one of the most earthquake-prone countries in the world, with an average 1-2 major earthquakes (above magnitude 7) hitting the country each year. The population impact of the earthquakes depends on the location of the epicentre. Chile's disaster preparedness efforts have helped reduce the number of earthquake casualties in recent years.

Tsunamis following earthquakes have also been destructive in recent years, in some cases triggering significant public health responses including mass evacuations, and leading to loss of life and injury. Both the Illapel earthquake in 2015 and the 2016 Chiloé earthquake triggered tsunamis and evacuation of coastal areas, while in April 2017 an earthquake of the coast near Valparaíso led to preventive evacuations in some coastal areas.

1.2. Organisational Structure

1.2.1. The Chilean Health System

Health care coverage in Chile is provided primarily either by the state-funded National Health Fund - *Fondo Nacional de Salud ,* most commonly known as FONASA, or by the private coverage schemes, *Las Instituciones de Salud Previsional* (ISAPRE). FONASA covers around 78% of the population, ISAPRES cover around 17-18% of the population, while a further 3-4% are covered under an Armed Forces insurance scheme.

Secondary care is delivered through a decentralised network of 29 autonomous health care services which make up the National System of Healthcare Services, coordinated in the Ministry by the Under-Secretariat of Healthcare Networks. Chile's challenging geography brings with it inherent problems in organising care, and promoting access,

especially in the remote northern and southern tips. In general, the government has sought to use the system of service networks to balancing efficiency – for instance centralising specialist centres, e.g. cancer centres – and access, often managed through satellite centres. Primary care provision is decentralised, and overseen by local governments (municipalities) – the *comunas*, of which there are 346 across Chile. Many *comunas* provide additional (supplementary) funding to the primary care sector. Consequently, primary health provision can vary significantly, although there is a defined primary care package which includes prevention, health checks and some chronic disease care.

Since 2005 the guaranteed benefit basket under the public health system in Chile has been secured under a system of enforceable guarantees. Citizens are guaranteed access to those treatments defined under the '*Acceso Universal con Garantías Explícitas*', or AUGE (see Box 1.2).

AUGE coverage is assessed every 3 years by the Ministry of Health, under advice from the Advisory Committee for the GES Plan, who defines the benefits that are covered. The AUGE Advisory Committee has nine members, of which six are named by the country's main academic institutions and a further three by the President of the Republic. Those named by the President mostly include representatives of scientific societies, universities and professional associations, and sometimes but not always patient groups. A catalogue of goods and services that are covered by public and private insurers (but not guaranteed by FONASA coverage) are assessed by the National Health Fund jointly with the Ministry of Health every year.

While AUGE functions as a way of making coverage guarantees more transparent, some patient groups have reported some confusion around the process by which conditions and treatments are covered, and limited engagement with patient groups by the Advisory committee.

This process may merit some re-examination by the Ministry and the Advisory committee, either to improve communication with patient groups or to increase involvement, or both. Involving patients and service users in decisions about coverage priorities can help promote the legitimacy, transparency, and accountability of the process, increase trust in the system, and decisions can benefit from patient knowledge and experience (Auraaen et al., 2016[12]; Barasa et al., 2015[13]). Indeed, at present AUGE coverage is not always clear to the public, and service users may not fully understand their entitlement, hindering access to health care. According to a national survey called CASEN, about one in four patients who are entitled to AUGE-covered care did not receive care under AUGE. Among those who did not receive AUGE services despite their entitlement, 11.8% did not know that their illness was covered by AUGE and 3.4% found the process involved in accessing AUGE-covered care difficult (Ministry of Social Development (MINSAL), 2015). Along with a move to more consistently involve patients and service users in discussions on AUGE coverage limits, further efforts to inform Chileans about their entitlements, and to improve health care literacy, are likely called for.

In contrast, while the range of conditions covered is more limited, coverage of the Law Ricarte Soto seems generally to be regarded as having a more transparent process by patient groups, and better consultation with patient groups around the listed drugs that the Law covers.

Box 1.2. The AUGE/GES and Ricardo Soto Law guarantees provide clear and comprehensive coverage for some – but not all – conditions

Under the 2005 AUGE (Acceso Universal con Garantías Explícitas) Plan Chilean government reformed the health system, introducing a system of explicit and enforceable guarantees which are legally binding. Applicable to all Chileans, whether covered by FONASA or Isapre, the guarantees cover provisions around access, quality, timeliness, and financial protection. Also known synonymously as GES (Garantías Explícitas en Salud), AUGE guarantees care for a positive list of conditions, often with a waiting time guarantee. Quality of care is assured through registration and accreditation of providers delivering AUGE-covered services, and medical protocols need to be followed for AUGE-covered interventions. Patients are guaranteed care within defined waiting time which is set for each condition and if the public sector is not able to provide care within waiting time guarantee, patients can seek care in the private system and the cost of private health services is covered by FONASA.

80 listed conditions are covered with a 20% co-payment (with a cap), while public health services – antenatal care, child health checks up to 6 years, immunization, TB diagnosis and treatment, and annual preventive exams – are fully covered. Cervical cancer screening is also part of AUGE, and Pap smears taken outside of the Preventive Examination are also provided free of charge. Care for diseases including diabetes (type I and II), a number of cancers, hypertension, depression, Ischemic stroke, COPD, and Hepatitis B and C is included under the current AUGE list.

While conditions listed under AUGE are guaranteed care, those not listed are not necessarily covered. In the case of some conditions which are not covered under AUGE public hospitals may cover treatment using their annual budget, for example lung cancer. However, since non-AUGE covered conditions do not have nationally structured programmes, treatment coverage varies across the countries and waiting times can be long. Those conditions with a waiting time guarantee are reported as being delivered in a more timely way than those without a guarantee.

Introduced in 2015 the Ricardo Soto Law provides coverage for certain high-cost illnesses; in 2017 coverage was further expanded to cover a total of 14 illnesses, for instance treatment-resistant Rheumatoid arthritis or multiple sclerosis, or HER2 positive breast cancer. In 2017, President Bachelet added three new pathologies, expanding coverage to 14 high-cost illnesses. In 2016, an estimated 3 500 people received treatment under the law.

1.2.2. Delivery of essential public health operations in Chile

In addition to those public health functions discussed throughout this chapter and this report, basic essential public health operations typically include population disease surveillance, vaccination programmes, and food and drug safety assurance.

In Chile infectious disease surveillance is undertaken by the Ministry of Health, in particular by the Department of Epidemiology in the Ministry of Health. The Chilean National Institute of Public Health (Instituto de Salud Publica, ISP) is the national reference laboratory. The Department of Epidemiology is also responsible for coordinating the investigation of disease outbreaks, which are run in the field by the epidemiology teams in the Departments of Public Health of each SERMI. Health care

institutions alert the *Secretaría regional ministerial* (SEREMIS), which in turn report to the Department of Epidemiology.

Food safety surveillance is coordinated by the Department of Food and Nutrition in the Ministry of Health, which works with the Department of Sanitary Action in each SEREMI. The ISP is also involved in quality assurance and registration, and laboratory analysis, for food safety purposes.

The ISP is also responsible for laboratory controls, quality control of medicines, control of food safety, surveillance of products subject to sanitary control, the authorisation and registration of medicines and other products, supervising the accrediting entities of the laboratories.

Childhood vaccination programmes are in place, with vaccination rate against hepatitis B, vaccination against diphtheria, tetanus and pertussis (DTP) and measles covering 93% of children in 2018, just below the OECD average rate of 95% in 2017 (OECD, 2018[2]). Vaccination schedules are aligned with global targets, including Hepatitis A vaccination at 18 months which was implemented from March 2018 as part of the National Immunization Programme. Chile has a Multi-Year Plan (MYP) for immunisation in place, and coverage for all WHO-recommended vaccinations is close to or above 90% population coverage (WHO, 2017[9]; WHO and Unicef, 2016[10]). A programme of Human Papillomavirus (HPV) vaccination for young girls began in 2014. 54% of over 65s were vaccinated against influenza in Chile in 2016, above the OECD average coverage rate of 43.6% (OECD, 2018[2]).

1.2.3. Primary, secondary and tertiary prevention

In Chile some key public health functions are delivered as part of core health services, while others are undertaken under dedicated programmes or plans. Ambitious efforts to tackle obesity have been undertaken in Chile, with a comprehensive multi-dimensional strategy in place. This approach, which is further discussed in Chapter 2, is timely, given the concerning high levels of obesity in Chile. However, greater attention may also need to be given to other public health issues. In terms of primary prevention, smoking rates are high while alcohol consumption is low but rising. In terms of secondary prevention a comprehensive set of health checks and screenings are covered, but in the main coverage targets are not being met.

Primary prevention efforts in Chile

As Chapter 2 sets out, efforts to address obesity in Chile – arguably the greatest public health threat in Chile at present – are impressive, even if room for expansion and improvement remains. Policies around preventing smoking could stand to be approached with similar ambition. Chile is a Party to the WHO Framework Convention on Tobacco Control on September 11, 2005, and does relatively well in terms of following the Convention's guidelines on implementing and managing tobacco control. Smoking is prohibited in the majority of public places, health warnings must cover 50% of all tobacco products, advertising bans are strict and tobacco products cannot be sold or advertised in a certain radius around schools although tobacco companies can still sponsor events and tobacco products can still be displayed at the point of sale. In 2014 taxes on tobacco products exceeded 75% of the retail price, and for the most-sold brand of cigarettes was estimated at 80.81% (World Health Organisation, 2015).

Reducing the prevalence of smokers in the general population from 40.6% to 35.6% was included as part of Chile's Health Objectives 2010-2020. Chile became a Party to the WHO Framework Convention on Tobacco Control on September 11, 2005, and does relatively well in terms of following the Convention's guidelines on implementing and managing tobacco control (see Box 1.3).

Box 1.3. Chile's performance against the WHO Framework Convention on Tobacco Control

In 2015 Chile's performance against the Convention can be summarised as follows (WHO, 2015[3]):

- Monitoring of smoking rates is in place, with recent and representative data available for both adults and children;
- Policies to ensure smoke-free environments are strong; Chile has a law prohibiting smoking in public places. The majority of public places – health care and educational facilities, indoor offices and workplaces, eating and drinking establishments, and public transports – smoke-free. However, Chile does not have dedicated funds for the enforcement of smoke-free environments;
- Cessation programmes are not cost-covered. While products such as nicotine replacement therapy are available in pharmacies, and other products for instance bupropion and varenicline are available with a prescription, their cost is not covered by insurances. Smoking cessation support is also not widely available, or cost-covered;
- Health warnings are displayed on tobacco packages, and must cover 50% of the packaging of all tobacco products. Limits are also placed on the wording that can be used on tobacco products, notably it is prohibited to label 'light' tobacco products;
- There are bans on advertising tobacco products on TV, radio, in magazines and newspapers, on billboards, and on the internet. Free distribution, promotional discounts, and product placement are also banned. However, as of 2014 tobacco companies could still sponsor events, and tobacco products could still be displayed at the point of sale;

In 2014 taxes on tobacco products exceeded 75% of the retail price, and for the most-sold brand of cigarettes was estimated at 80.81%.

While the range of anti-smoking policies in Chile is adequate, a more ambitious approach could still be envisaged. Further steps could be taken targeting the whole population, as well as populations with high smoking rates. In terms of population-wide policies, Chile should press ahead with the bill that has been before drafted for parliament since 2015 which would introduce plain packaging for tobacco products, as well as limit smoking at beaches and parks, a total ban of display on tobacco products that are on sale, and strengthening the capacity of the SEREMIS to enforce tobacco regulations.

Australia introduced plain packaging in 2012, and as of 2015 the introduction of plain packaging in combination with graphic health warnings on packets was estimated to have contributed to a 0.55% decline in smoking between 2012 and 2015 (Australian Government, 2016[14]). A ban on menthol cigarettes, proposed under the 2015 draft bill, would also be a powerful step in Chile. Menthol flavoured cigarettes are popular in Chile,

and while such a measure would apply population-wide it could be expected to have a more significant impact upon female smoking – which for young females is high in Chile – as females tend to a greater preference for flavoured cigarettes (Euromonitor, 2016[15]).

Targeted interventions for population groups with relatively high smoking rates could also be considered. The ban on the sale of tobacco products in a set perimeter around schools is already a good step towards trying to reduce smoking rates amongst children and young people. Chile could consider further mass media campaigns about the dangers of smoking – in general to reduce youth tobacco use, its use in the general population must be de-normalised (OECD, 2017[16]) – which could also be tailored to youth populations, either in their content or in where and when they are displayed.

Chile may also wish to re-consider whether to fund smoking cessation treatments. Smoking cessation services amongst the most cost-effective and clinically valuable preventive measures available in health care, and those with assistance in stopping smoking are associated with greater success rates (Auraaen et al., 2016[12]). Smoking cessation interventions can be provided in the form of pharmacotherapy, most commonly Varenicline and Bupropion, as well as nicotine replacement products such as nicotine patches or chewing gums, as well as through individual or group counselling provided by primary care physician or other authorised healthcare personnel. Often the interventions are combined; participation in support groups or therapy is a prerequisite for receiving smoking cessation coverage in Israel, the Netherlands and Sweden. A number of OECD countries have already introduced coverage for smoking cessation. In Belgium and France eligibility for accessing smoking cessation support (prescription drugs) is tailored to key population groups, notably COPD suffers as well as pregnant women and young people in France. Especially in light of the success of Chile's Vida Sana counselling and physical activity programme in primary care, expansion of primary-care based services to smoking cessation could be considered. Coverage for such interventions could begin in a stepwise manner, for instance following the example of France and Belgium and starting with vulnerable groups such as COPD sufferers.

The prevention of harmful alcohol use is another area where Chile has made important steps, but which could benefit from further expansion. Alcohol consumption has increased in the last 6 years, with the percentage of people drinking in the previous 30 days increasing from 40.5% to 46% (Observatorio Chileno De Drogas, 2017[17]). The number of days of consumption during those 30 days has also increased slightly, from 4.2 days to 4.4 days. In 2011, a new National Service for Drug and Alcohol Prevention and Rehabilitation (SENDA) was launched to implement the National Strategy on Drugs and Alcohol 2011-2014. The National Strategy promotes the prevention of alcohol use through interventions in schools, workplaces and the community (Ministerio del Interior y Seguridad Pública, 2011[18]). The SENDA's approach on alcohol consists of three areas of intervention: drink-driving controls, regional action plans, and community prevention plans on risky consumption (SENDA, 2018[19]).

The regional action plans are designed by the regional directorates of the SENDA, together with SEREMIs and local services. The plans aim to identify specific problems with alcohol in the region and tailor the approach to the local situation. Actions under the regional plans include addressing specific neighbourhoods with high alcohol use prevalence, reviewing regional patent fees, and working with local retailers to promote responsible sales (SENDA, 2018[19]). The community prevention plans follow a similar tailored approach, working together with the municipalities and local communities. These

plans are then approved by the municipal council, to lend them political support (SENDA, 2018[19]).

In addition to its national strategy, Chile has implemented a range of alcohol policies to reduce alcohol consumption, including excise taxes, minimum drinking age (18 years old), restrictions on sales hours and density, and a maximum legal blood-alcohol level for driving (0.03) (World Health Organization, 2014[20]) (Giesbrecht et al., 2013[21]). However, Chile does not have comprehensive legal restrictions on alcohol marketing, nor legally mandated warning labels on alcohol containers.

While Act No. 19.925 prohibits the advertisement of alcoholic products to children and generally within 100 metres from a school (DLA Piper, 2016[22]), there is no law restricting the marketing of alcohol to the general public. The 2011-2014 National Strategy does recognise the importance of restricting alcohol marketing as a public health intervention, but only discusses plans for a voluntary, self-regulation plan (Ministerio del Interior y Seguridad Pública, 2011[23]). Regulation of advertising during certain times or for specific media is a common approach in many OECD countries, and Chile could consider implementing this alongside voluntary approaches (Sassi, 2015[6]).

Alcohol products in Chile do not require a health warning label. Current regulation exists regarding the labelling of alcohol products, which includes an obligation to display the alcohol content, but there is no requirement to include a specific health warning on the label (International Alliance for Responsible Drinking, 2017[24]). A number of other countries do require alcohol product labels to warn consumers about health consequences of excessive alcohol consumption (Sassi, 2015[6]). For example, in France, alcoholic beverages are required to carry a written warning regarding the impact of alcohol during pregnancy, or to include an icon to this effect (Figure 1.7).

Figure 1.7. Alcohol warning label in France

Source: (Eurocare.org, 2011[25]).

Especially considering the fact that Chile is ahead of the curve with its marketing restrictions and warning labels for unhealthy food and drinks, it may wish to implement similar policies for alcohol products.

Preventive health checks – Examen de Medicina Preventiva

Under AUGE a series of preventive checks, the *Examen de Medicina Preventiva* or EMP are included as an entitlement for all beneficiaries of Fonasa and Isapres. The EMP are periodic voluntary health assessments which seek to support the detection of high-

prevalence diseases in Chile. EMS are targeted at particular populations, defined based on age and sex, for example pregnant women, newborns, or older adults (see Table 1.1). Other tests are undertaken in line with particular risk factors, for example women who have had breast cancer should have more regular mammography (Superintendencia de Salud - Departamento and Estudios y Desarrollo, 2015[26]). EMP tests are delivered through primary care, with funding coming from the municipalities which are responsible for primary care delivery in the Chilean system. Some of the pay-for-performance incentives included in primary care are also tied to the EMP.

Table 1.1. Examen de Medicina Preventiva in Chile – Preventive Health Checks

	EMP Test
During pregnancy	Diabetes during pregnancy HIV Infection Syphillis Urinary infection Overweight and obesity Arterial hypertension Drinking problem (alcoholism) Smoking
Newborns	Phenylketonuria Congenital hypothyroidism Hip dysplasia
Infants (at 3 months)	Hip dysplasia
Boys and Girls at 4 years	Overweight and obesity Amblyopia, strabismus and defects in visual acuity Detection of bad oral habits
Persons aged 15 and over	Drinking problem (alcoholism) Smoking Overweight and obesity Arterial hypertension Mellitus diabetes Syphilis Tuberculosis
Women from 25 to 64 years	Cervical cancer
People 40 and over	Dyslipidermia
Women 50 to 59 years old	Breast cancer
People aged 65 and over	Functional autonomy

Source: Adapted from (Fonasa, 2017[27]).

However, uptake of the EMP tests is low, with just eight tests meeting expected coverage targets in 2014-15 (see (Superintendencia de Salud - Departamento and Estudios y Desarrollo, 2015[26]).. For instance, only 0.4% of adults had their height and weight measured, compared to the target 100%, and only 1.1% of people were asked about their smoking habits, compared to a target 100% (Superintendencia de Salud - Departamento and Estudios y Desarrollo, 2015[26]).

The explanation for some of the low rates of EMP checks can be expected to be similar to the drivers of low cancer screening coverage explored in Chapter 3, notably low public awareness of availability and importance of the tests, problems with access and availability of services, poor uptake by providers, and weak monitoring of the rate that the tests are undertaken. The effective approaches for increasing the rate of checks should be focused on improving public health literacy, more targeted and personalised attempts to invite high risk

groups for screenings, and ensuring good geographical access. Given the large number of EMP checks for which the targets are missed, it may be that Chile should put particular focus on increasing the uptake of a few key checks, in line with public health priorities. The undertaking of these tests in particular could then be encouraged, both amongst health professionals in clinics and primary care settings and the population. A more focused approach could also mean undertaking some tests on a less regular basis but while aiming for greater population coverage, or targeting only high-risk groups with annual tests.

Tertiary programmes

The aim of the Preventive Health Checks is to provide timely treatment to control the disease. This tertiary prevention is guaranteed under two schemes: the Plan de Acceso Universal de Garantías Explícitas (Plan AUGE) system, which currently provides guarantees on access and timeliness for 80 prioritised problems; and Ley Ricarte Soto (LRS), the financial protection system for diagnosis and high-cost treatment, which provides financial coverage and establishes deadlines for the administration of treatments (Fonasa, 2017[28]).

However, these do not cover early treatment for all conditions included in the Preventive Health Checks – either because the treatment is not guaranteed within a certain time frame, or because the treatment is guaranteed only for specific target groups (Fonasa, 2017[28]). For example, there exists no guaranteed timely treatment for syphilis, UTIs, or tuberculosis. For hyperthyroidism only people over the age of 15 are guaranteed timely treatment, while the Checks include hyperthyroidism in new-borns. In May of 2017, the Ministry of Health established a specific Working Group to address this issue.

People identified as having cardiovascular issues, including diabetes and high blood pressure, are referred for tertiary prevention to the Cardiovascular Health Program (PSCV) (Ministerio de Salud, 2017[29]) (see Box 1.4. Programa de Salud Cardiovascular (Cardiovascular Health Program). Referred patients are counselled and treated pharmacologically by a multidisciplinary team to achieve target values in their blood pressure, HbA1c and LDL-cholesterol (see box for more information).

Box 1.4. Programa de Salud Cardiovascular (Cardiovascular Health Program)

The Programa de Salud Cardiovascular was created in 2002, by the merger of the programmes for diabetes and hypertension. Its aim is to reduce the morbidity and mortality from cardiovascular diseases. It is delivered in the primary care centres by a multidisciplinary team, and financed from the capitated payment paid to primary care providers, with supplements from the Ministry of Health and other funds.

People who are identified as having one or more of the following characteristics are entered into the programme:

- Arterial hypertension
- Diabetes mellitus type 2
- Dyslipidaemia
- A history of cardiovascular disease
- Active smoker and over 55 years old

In December 2017, over 2.3 million people were enrolled in the programme, of which 80% had high blood pressure, 48% dyslipidaemia, and 37% diabetes.

A patient is admitted to the PSCV programme during a medical consultation where a set of baseline examinations are reviewed. After this intake, patients enter into the first phase of the programme, where they are to achieve specific goals with regards to their blood pressure, HbA1c and LDL-cholesterol levels, according to their cardiovascular risk. To meet these targets, patients receive counselling on healthy eating, physical activity, smoking cessation, and alcohol consumption, in combination with pharmacological treatment.

Once these targets are achieved, patients move into the second, follow-up phase. Depending on their characteristics, the follow-up occurs between 3- to 12-months apart.

Over the last ten years the programme has become more effective, as the percentage of people reaching their target blood pressure increased from 48% in 2006 to 68% in 2017. The number of people with their HbA1c under control increased as well, from 33% to 45%. There are, however, marked differences between sexes, as 63-65% of women achieved their targets goal, compared to only 35-37% of men.

Sources: (Ministerio de Salud, 2017[29]).

1.2.4. Emergency response mechanisms

In Chile, the National Emergency Office of the Ministry of the Interior and Public Security (ONEMI) is in charge of planning, coordinating and executing activities aimed at prevention, mitigation, alert, response and rehabilitation in the face of threats and emergency situations.

Health Sector Response Teams were developed to improve the capacity of Chile to comply with the implementation of the International Health Regulations (WHO, 2003[30]). The first response teams were the rapid response teams (ERR) that were created from the Department of Epidemiology in the Ministry of Health following these recommendations, began their training in 2009. The Health Sector Response are composed of trained and specialised personnel available at all times to travel to disaster areas to perform various emergency response, disaster and epidemic response tasks with the preparation. In addition to the national teams the Regional Authorities (SEREMIS) and the Health Services can work together to establish Local Response Teams, in charge of collaborating in emergencies or disasters within their jurisdiction if the emergency does not exceed the capacity of local response. Local teams have their own training, selection, activation and certification mechanism.

During the year 2014, as a result of the preparation for the possible importation of Virus Ebola into the country, a joint effort was initiated between the Division of Healthy Public Policies and Promotion (DIPOL) and the Division of Health Planning (DIPLAS) to reinforce the Response of these ERRs. The success of the initiative, coupled with the constant emergencies that occurred in the country, led Chile to further expand the capabilities of the teams with the inclusion of health care network officials. In 2015, the Department of Management at Risk of Emergencies and Disasters (DEGREYD) was added to implement a training plan focused on delivering a more comprehensive response through multidisciplinary teams.

During 2016, the departments involved in the initiative, together with the Technical Committee on Emergencies and Disasters of the Ministry of Health, worked together to consolidate progress, generating technical guidelines for the formalisation of equipment, diversification and specialisation, and developing a consolidated strategy to strengthen local capacities to deal with emergencies, disasters and epidemics.

Chile's disaster response preparations for earthquakes and tsunamis are recognised as robust (Center for Excellence in Disaster Management, 2017[11]). Through a combination of strict building code enforcement to ensure that buildings do not collapse in an earthquake, and tsunami early warning systems, the loss of life from significant earthquakes – most recently a 8.2 magnitude earthquake in 2014 – has been reduced. Chile has also contributed to the development of the Sendai Framework for Disaster Risk Reduction, a global plan for reducing disaster losses.

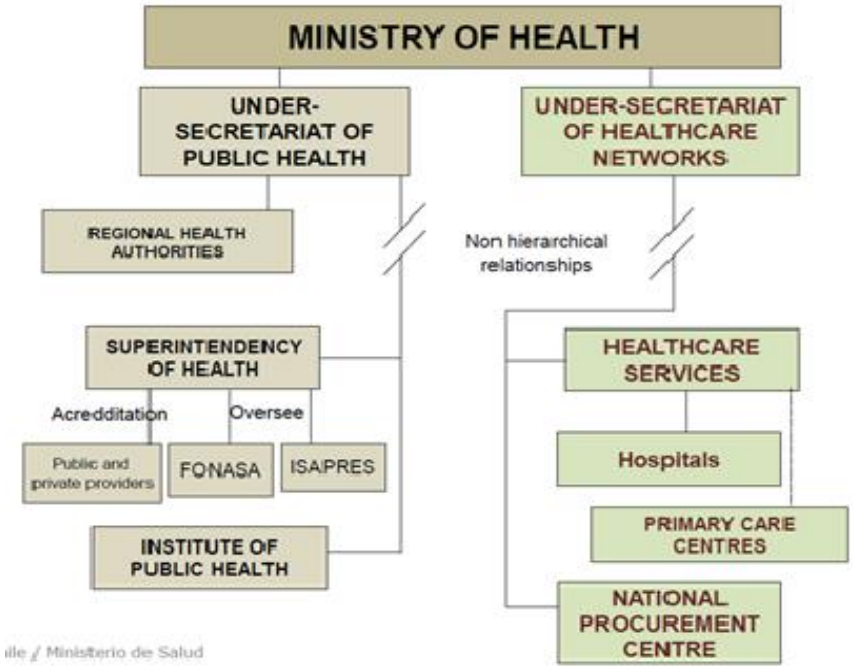
1.3. Leadership and governance

1.3.1. Key actors in the public health system

High-level public health leadership from within the Chilean Health System comes from the Technical Secretariat for Social Determinants and Health in All Policies (*Secretaría Técnica de Determinantes Sociales y Salud en Todas las Políticas*), which is responsible for installing the necessary processes within the Ministry of Health in order to ensure the inclusion of the principals of equity, social determinants of health and health in all policies in health actions. The Secretariat is composed of representatives of both undersecretaries of the Ministry of Health, FONASA, CENABAST, ISP and Superintendence of Health.

The organisation of the Ministry of Health into two sub-secretariats, one for Health Networks and the other for Public Health, in itself elevates the importance of public health issues for the government. The Under-Secretariat for Public Health, which is led by a Vice-Minister for Public Health, has oversight over the Regional Health Authorities – which themselves have an important role in public health – over for public and private providers, and has oversight over Fonasa and Isapres (see Figure 1.8).

Figure 1.8. Chilean Health System Governance



Source: Gobierno de Chile / Ministerio Salud.

Indeed, a number of government actors are involved in protecting population health and delivering policies to promote good public health (see also Figure 1.8). They include:

- **The Ministry of Health** is organised through two Subsecretariat: i**) the Subsecretariat of Public Health**; and ii) **The Subsecretariat of Assistance Networks**. The Subsecretariat of Public Health ensures all Chileans' right to health protection, exercising regulatory functions to ensure access and quality, and sustained improvement of population health. The Subsecretariat of Assistance Networks mission is to regulate and supervise the function of health networks which deliver health care services.
- The **Regional Ministerial Secretariats** (SEREMIS) ensures compliance with the national health norms, plans, programs and policies established by the authority, and adapt health strategic plans and programs to the reality of the respective region, within the framework set for this by the national authorities. This role includes, for instance, enforcement of Chile's Law 20.606 on food sales in supermarkets and schools. The Regional Ministerial Secretariats also ensure the protection of the populations from environmental risk, and also seek to ensure environmental protection measures and compliance with provisions of the sanitary code and environmental laws and regulations.
- **The Superintendence of Health** supervises legal guarantees including those under AUGE, the compliance of health providers with accreditation standards, and the legal and financial obligations of social security institutions;

- **Fonasa**, which is the ***Fondo Nacional de Salud*** **(National Health Fund),** is the national public insurance scheme, which guarantee universal quality, convenient health coverage to the national population with financial protection to the entire insured population, including public health care.
- Responsibilities of the **Institute of Public Health** include laboratory controls, quality control of medicines, medical food and other products subject to sanitary control, the authorisation and registration of medicines and other products, supervising the accrediting entities of the laboratories, and monitoring and reporting to the Ministry of Health around the surveillance of antimicrobial resistance.
- **CENABAST** is Chile's health procurement agency, which ensures the availability of medicines and medical supplies to health care providers, including the majority of Chile's public pharmacies. All public procurement is controlled by Chile COMPRA, in the Ministry of Finance. Contracts for the procurement of hospital equipment, for example MRI scanners, do not pass by CENABAST but are controlled by Chile COMPRA.

The leadership of the Ministry of Health on important public health reforms – most notably reforms and programmes to reduce obesity rates – are notable. An ambitious series of reforms to tackle obesity, detailed in Chapter 2, include the introduction of a sugar-sweetened beverage tax, food advertising restrictions, the introduction of food labelling as well as school-based interventions implemented by the Ministry of Education in close collaboration with the Ministry of Health. Indeed, the establishment of a new law on food labelling and advertising, Ley 20.606 Sobre la Composición de los Alimentos y su Publicidad, in June 2016 marks a significant achievement for the Ministry.

Additionally in 2013 a legal architecture was created for a government-wide approach to promoting healthy living and well-being, under Law 20.670 which created *"el Sistema Elige Vivir Sano"* (a System for Health Living) (Box 1.5). The Law established that programmes under the Elige Vivir Sano system should encompass objectives including promotion of healthy living, of sport, of outdoor activities, of self-care and of family development. The law institutionalised an intersectoral work platform for compliance with the National Health Strategy, and for achieving health priorities set for 2020.

Box 1.5. El Sistema Elige Vivir Sano

Government initiatives such as the Programa Vivir Sano, implemented in March 2011 to promote healthy eating and physical activity, are a key part of the government strategy to improve the health status of the population in Chile. In May 2013 Law No. 20,670 was issued creating El Sistema Elige Vivir Sano (The Healthy Living System), which aims to promote healthy habits and lifestyles to improve the quality of life and well-being of people. The Law established that all state institutions must incorporate policies to inform and educate the population about public health issues, and promote the prevention of risk factors linked to unhealthy behaviours.

The objectives of Elige Vivir Sano included the coordination of activities across the national, regional and local levels, delivering services to promote a healthy high-quality lifestyle; creating normative frameworks to improve health and quality of life (around tobacco, alcohol, physical activity, pollution, green areas, etc); and to monitor the evolution of 'healthy communities' so as to identify and address areas where challenges

arise. The programme has an Interministerial Committee that acts as an advisor and in which its Ministers participate from across the government, from the Ministries of Social Development, Finance, Health, Education, Labor and Social Security, Housing and Urbanism, and Ministry of Sport.

Individual Ministries also elaborated their own plans under the Programme, for instance the Ministry of Health identified the ways in which they would contribute to the objectives of El Sistema Elige Vivir Sano. The plan set out by the Ministry of health included the prioritisation of 'Health in All Polices', strengthening the public health competencies of national and local health leadership, and promoting engagement between authorities and Chilean citizens. 15 regional plans were developed by the SEREMIS, which identified ways to promote citizen participation through Citizen Dialogues, Regional Public Health Forums, and a competence development programme for public sector managers and civil society leaders.

While some regulations aimed at reducing obesity have been rigorously enforced by the government, others are more challenging or may not yet be matched by sufficient oversight and enforcement. Violation of the ban on advertising unhealthy foods to children, for example, have led to a number of fines by the National Consumer Service (see Chapter 3). Enforcement of Law 20.606 is undertaken regionally by the SEREMI, but may not be sufficient. For instance some examples where foods are not correctly labelled have been identified by consumer groups (see Chapter 2) (Corporación Nacional de Consumidores y Usuarios - CONADECUS, 2017[31]). It may be valuable to introduce a more systematic approach to checking of food labelling procedures and the enforcement of Law 20.606, including chemical testing of nutritional content against the labelling, for instance a periodic audit at the national level. Regional-level checks on food products that are on sale nation-wide may also not be the most efficient approach.

1.3.1. Engagement across government is effective

In addition to clear public health leadership from the Ministry of Health, in particular with regards to leadership of efforts to reduce obesity, collaboration with other government departments is also commendable. While there is always room for broader and deeper collaboration across government on public health issues, the cooperation between the Ministry of Health and, in particular the Ministry of Education but also the Ministries of Agriculture, Finance, Social Development, and Sport are impressive.

Commendably, the Ministries of Social Development, Health, Education, Labour and Social Welfare, Housing, Sport and Finance have a common national strategy for promoting healthy living, under *'Elige Vivir Sano en Comunidad'* (Choose Healthy Living in the Community) (Gobierno di Chile, 2014[32]). Launched in 2014, and encompassing a series of strategic objectives, programmes and its own budget, Elige Vivir Sano en Communidad aims to promote healthy living and healthy habits, for instance healthy eating and sport. Ministries committed to undertaking different activities to promote this overall goal, for instance the Ministry of Health would support the development of Community Health Promotion Plans (*Planes Comunales de Promocion de la Salud),* while the Ministry of Sport planned to promote physical activity in public spaces under the "*Deporte en Tu Calle*" (Sport in Your Street) programme, for instance closing streets to traffic.

Collaboration around diet in schools is a particularly successful example of cross-government working to promote better public health. JUNAEB, the department of the

Ministry of Education responsible for welfare in schools and universities established the Contrapeso ('Against Overweight') programme along with the Ministries of Health, Sport and Agriculture. Contrapeso includes 50 measures including restriction on the sales of unhealthy foods in schools, improving the quality of food provided to students, and teaching health cooking to families. These measures are further detailed in Chapter 2.

Other select examples of cross-governmental collaboration of public health in Chile, many of which fall under the Elige Vivir Sano en Communidad strategy, include:

- The Ministry of Health and the Ministry of Social Development collaborate on efforts to promote child development, including under the programmes 'Sistema de Protección Integral a la Infancia Chile Crece Contigo' for example, promoting breast feeding and early learning, as well as other programmes including one to develop school gardens to teach health living habits.
- The Ministry of Social Development, Ministry of Sport, Ministry of the Environment and the Ministry of Education are also part of regional and local working groups to which develop efforts to tackle obesity. For instance, the Ministry of Environment contributes advice on development of healthy physical environments.
- The Ministries of Health, Education and Sport have been working together to develop recommendations on physical activity for the Chilean population, and encourage health lifestyles. The Ministry of Health is part of the Interministerial Committee on Physical Activity and Sport which is a presidential advisory committee whose objective is to advise on the implementation of the National Policy on Physical Activity and Sport, aimed at expanding the participation of the population in sport, promoting healthy values and the benefits of sport and strengthening sports development. School curricula also include health topics, including about healthy living and wellbeing.
- The flow of public health leadership and planning from the central to the regional and local levels appears well thought-out: SEREMIS help to deliver the national *Elige Vivir Sano en Comunidad* approach, and also develop cross-sectoral programmes according to the 'Health in All Policies' (Salud en Todas las Políticas) approach, led by regional health for a (Foros Regionales de Salud Pública). Collaboration is also strong around the 'Chile Crece Contingo' (ChCC, Chile Grows with You) multisectoral programme for early childhood development. To deliver ChCC the Ministry of Social Development coordinates with the Ministries of Health and Education to support early years development for vulnerable children.

1.3.2. Regional and local public health leadership

Chile has a decentralised administration, and the responsibility for organising education, social services, primary health care, parks and recreation lies with municipalities rather than the central government.

At the regional level the Regional Health Authorities in Chile (SEREMIS) – of which there are 15 – have an important role in designing and delivering public health actions. The SEREMI are responsible for both key public health safety controls, and enforcement of national public health priorities. For example the SEREMI monitor food products and

nutritional labelling, and have the power to issue warnings, administer fines and recalls of food products if they identify anomalies.

The SEREMIS convene and coordinate a series of social participation initiatives, among which are the Consejos Asesores Regionales, (CAR, *Regional Advisory Councils*), which help to deliver the national 'Elige Vivir Sano en Comunidad' (Healthy Living in the Community) policy (see also Chapter 2). From 2014 the SEREMIS were also expected to develop local plans for the health promotion *(Planes Comunales de Promoción de Salud)* (Departamento de Promoción de Salud, 2013[33]).

SEREMIS also have an opportunity to develop cross-sectoral programmes according to the 'Health in All Policies' (Salud en Todas las Políticas) approach. The Health in all Policies approach in Chile has been systematically led by the Foros Regionales de Salud Pública (*Regional Public Health Forums*) since 2014. The Foros Regionales bring together regional authorities along with representatives of the community to develop strategic plans and actions. For example, Foros have been working to prevent Hepatitis B, improve PAP and mammography rates, reduce obesity or improve air quality (Minsal - Foros Regionales de Salud Publica, 2015[34])

Some local actors are also taking a leading role in public health policies, for example in Santiago where a multidimensional population health initiative is in place (see Box 1.6) and where the Mayor has made tackling childhood obesity a key priority (see Chapter 2).

Box 1.6. Promoting public health at the city level with Santiago Sano

The Santiago Sano programme, based in the Chilean capital Santiago, is a good example of the leadership that individual cities can take in introducing measures to improve the public health of the city. In Santiago the programme, 'Santiago Sano, brings together stakeholders from every municipal government into 40 dedicated committees. The programme covers five key intervention areas:

- Public spaces: Santiago Sano has created a network of healthy kiosks throughout the city, selling fruit, vegetables, nuts and juice. It has also set up a playground to provide young children with a safe place to be active.
- Alcohol: To reduce alcohol use, Santiago has implemented a 20% surcharge on the marketing of alcohol, and a 50% surcharge on permits to sell alcohol at events in public places. In addition, community models are being developed to reduce the sale of alcohol to minors and those already inebriated.
- Schools: The Nine Steps agenda was developed to improve diets and physical activity in schools, and is being implemented by the Department of Education. The interventions include healthier food options, school gardens, sport facilities and transport to and from school.
- Sexual health education: The Santiago Sano programme has created dedicated 'Friendly Spaces for Adolescents', where they can go for sexual health counselling, contraceptives and psychological support, delivered by midwifes and psychologists.
- The elderly: Santiago Sano organises geriatric evaluations for elderly people with reduced mobility, and runs three-month workshops focusing on maintaining an independent and healthy lifestyle.

Santiago and the Santiago Mayor have also made reducing childhood obesity a policy priority, as detailed in Chapter 2. In 2016 Santiago was one of Bloomberg Philanthropies 'Mayor's Challenge's five Latin American prize winners.

Sources: (Peña, 2016[35]; Bloomberg Philanthropies, 2016[36]; Municipalidad de Santiago, 2016[37]).

1.3.3. Leadership from Chilean civil society

Coalición Mover (Movement Coalition) is founded Chile's medical societies promotes physical activity amongst the public, and encourages doctors to prescribe exercise to patients. Civil society groups have also been engaged in monitoring food labelling, as well as local cycle schemes. The government has also supported the implementation of voluntary actions to promote healthy living in workplaces; around 200-250 workplaces have implemented interventions such as physical activity courses and bicycle parking spaces.

The civil society group Conadecus has also played a surveillance role since the introduction of Chile's new food labelling laws in 2016. As Chile's national consumer organisation, Conadecus, announced the launch of the Observatory for Food and Advertising. This observatory will regularly review food labels, ingredients and nutritional composition of food products, and advertising practices, to assess whether or not they comply with national regulations. Their aim is to improve transparency for the customers, and increase compliance by providing recommendations to the Ministry of Health (see Chapter 2 for further details).

In addition, the group *Educación Popular en Salud* (EPES, Public education in health) is a civil society organisation engaged with improving the health and wellbeing of vulnerable people and communities, principally through education, activism and social mobilisation (Educación Popular en Salud (EPES), 2017[38]). Founded in Santiago in the 1982 the group is now active across Chile. EPES is engaged with a wide range of public health issues, including tobacco use, HIV/AIDs and nutrition and food, and undertakes a mix of educational activities, lobbying work, training and workshops, and efforts to promote access to services. For example, EPES has promoted breast self-examination, consulted with the Ministry around tobacco legislation, and promoted citizen monitoring of adherence to food labelling legislations.

Medicos Sin Marca is another noteworthy civil society group, which brings together Chilean doctors to promote responsible evidence-based clinical practice, insulate doctors from conflicts of interest, and resist propaganda and incentives from the medical industry (for instance the pharmaceutical industry) (Médicos Sin Marca, 2017[39]). The group has suggested, for example, that efforts be made to separate the role of industry from funding of Continuing Medical Education (CME) in Chile, and that hat scientific societies, medical publications and educational activities should not receive funding from the pharmaceutical, medical devices and food industries. The group has also been supportive of the recent policies introduced to combat obesity in Chile, for instance the introduction of some limits on food marketing, and labelling and marketing restrictions which have pushed restaurant chains to reduce the sugar content in meals marketed at children.

However, in general engagement of civil society (and the private sector) does not appear to be a main pillar of Chile's efforts to improve public health. In general the voice of civil society organisations also remains relatively weak; civil society in Chile tends to be arranged in small organisations, which limits their ability to influence and support public

health objectives. However, there have been some recent steps in the right direct with regards to engaging civil society in a leadership role for public health. First, in 2015 the Institute of Public Health (Instituto de Salud Pública) opened registration for a Civil Society Council made up of not-for-profit civil society organisations. The working group is composed of 11 counsellors who will engage with the Institute of Public Health on topics including medicines and medical devices and consumer facing products (Instituto de Salud Pública de Chile, 2015[40]). Second, in 2016 the Ministry of Health established the 'Consultative Council of the Ministry of Health' (*Consejo Consultivo de la Sociedad Civil*). This initiative, which will include more than 100 representatives of health-related citizen organisations. The Consultative Council is intended to give a greater citizen voice to setting public health priorities in Chile, and incorporate citizen participation as a guiding axis of the work of the Ministry (Ministerio de Salud, 2016[41]). The Council will work in an advisory capacity for the Ministry, and is also expected to reach out to the Chilean population to gather views and prompt dialogue.

1.4. Partnerships and collaborations

1.4.1. Engagement with patient groups

The role of patients in Chile and in guiding the Chilean health system appears to be growing, and is recognised as being centrally important; in 2012 the Ley de Derechos y Deberes (Law on the Rights and Duties of Patients) was introduced, safeguarding the rights of the patient in both public and private sectors, legally establishing that the main orientation of the health system must be towards health system users, and informing the "Charter of Rights and Duties of Patients", which specifies each of the aspects indicated in the new law (Ministerio de Salud, 2012[42]). Chile has a small number of patient groups, which have grown both in size and influence over the past decade. Around 60% of these groups are also brought together under the *Alianza Chilena de Agrupaciones de Pacientes* (Chilean Alliance of Patient Groups). The Alliance aims to bring together smaller patient groups to work together with a single stronger voice, with a primary focus on expanding and improving health care coverage (Alianza Chilena de Agrupaciones de Pacientes, 2017[43]).

The introduction of GES in 2005 is reported as having increased interest by patients in engaging with the health system, and in particular advocating for the inclusion of particular conditions under AUGE. However, it appears that the mechanisms by which patients and/or patient groups are consulted over revisions to AUGE are weak, or at least that the process is not particularly transparent. Both the introduction and the operation of the Law Ricardo Soto, which provides coverage for high cost drugs, have a more central role for patient participation. Named after a prominent Chilean journalist and lung cancer patient, the law was established in part in response to popular protest around access to certain drugs including cancer drugs.

Importantly, the law also makes consultation with patients a systematic part of any changes and new inclusions of drugs. The law defines clear mechanisms by which any person or organisation can present technologies for evaluation under the law. Two Commissions, a Commission for Surveilance and Control of the Ricarte Soto Law (*Comision Ciudadana de Vigilancia y Control de la Ley Ricarte Soto)* and a Commission for Prioritised Recommendation (*Comision Recomendacion Priorizada Ley Ricarte Soto)* were also established, both of which have patient representatives who are elected to the commissions by their own patient organisation. These different channels should establish

diverse formal representation and feedback with patients during and on the decision making process.

There is still likely space for further engagement with patients and patient representatives in the Chilean health system, including around public health issues. Active inclusion of patients and service users' views in the both setting strategic policy goals for the health system and day-to-day decisions, for example hospital management or deciding on individual's care strategies, is important from a patient rights perspective and can also improve quality of care (OECD, 2017[44]).

1.4.2. Partnerships with the private sector could be strengthened

While the Chilean government, both Ministries at the central government level and local and regional governments, appear strongly engaged in public health issues, the private sector is far less present. There is more that the government could do to engage with non-governmental actors, in particular with the private sector. In addition, the ISAPREs which hold an important place in the architecture of the Chilean health system are very passive in the field of prevention.

In general, the engagement of the private sector in public health issues is somewhat limited. There are some notable examples of non-governmental involvement with public health. The involvement of MoAgri in providing a platform for the reformulation of food is notable; the National Federation of Independent Street Markets (*Confederación Gremial Nacional de Organizaciones de Ferias Libres, persas y afines*) has been involved promoting healthy diets both independently and in partnership with Ministries. This group represents 60% of the nearly 86,000 traders of street markets throughout Chile. This Federation's mission is to consolidate strategies and create conditions for street markets to be strengthened and developed as the food main supply channel for households in each of the regions of Chile. Their commitment is to continue supplying the community, especially those with fewer resources of healthy products, with high nutritional value, with high quality and well-priced food. The Federation also Works closely with the Ministry of Health, the Ministry of Social Development and the Ministry of Education on educational campaigns and dissemination of healthy food information.

However, engagement of the private sector) does not appear to be a main pillar of Chile's efforts to improve public health. A number of OECD countries have pursued a collaborative approach with civil society, and with industry in a number of public health areas. For instance in Canada and Denmark healthy eating campaigns have been implemented as a joint venture with the industry, and Ireland's obesity policy includes a voluntary code of practice on food advertising and marketing. In other countries public-private collaboration have led to agreements between government and business stakeholders work to improving health, including for instance through reducing salt intake. In Denmark the government collaborated with several retail chains to promote a food labelling scheme which marked out healthful products, with an evaluation showing that the informational campaign impacted shopping behaviour (Mørk et al., 2017[45]).

1.4.3. Chile's private insurance sector is disengaged from public health issues

The ISAPREs are key actors in the Chilean health system, covering 17-18% of the population. However, the engagement of the ISAPREs in public health and prevention is weak. According to the Association of ISAPREs the high rate of turnover in the insured population reduces the incentive for ISAPREs invest in prevention and public health initiatives. ISAPREs should be playing a greater role in promoting healthy living and

prevention strategies. As stressed in Chapter 2 and 3, ISAPREs should recognise the attractiveness of a prevention and promotion package to attract enrolees. This said, more important savings in the medium-to-long term could be felt if all ISAPREs worked together to improve the health of their enrolees.

Insurance providers in other countries have introduced schemes to incentivise participation of enrolees in schemes to improve their health. In Japan and the State of Alabama (United States) health insurance discounts have been offered to those who participate in wellness programmes (OECD, 2010[46]). In the United States the "Affordable Care Act" required new health insurance plans cover alcohol screening and brief interventions without a co-payment (Sassi, 2015[6]). Well-designed secondary and tertiary prevention programmes have also been found to be effective in preventing the development of complications, and can produce savings for insurance companies (Green, Brancati, Albright, & Primary Prevention of Diabetes Working Group, 2012). For example, mobile technology can be used to improve the prevention and management of diabetes by providing information, medication reminders, and by increasing patient-provider communication (World Health Organization, 2016).

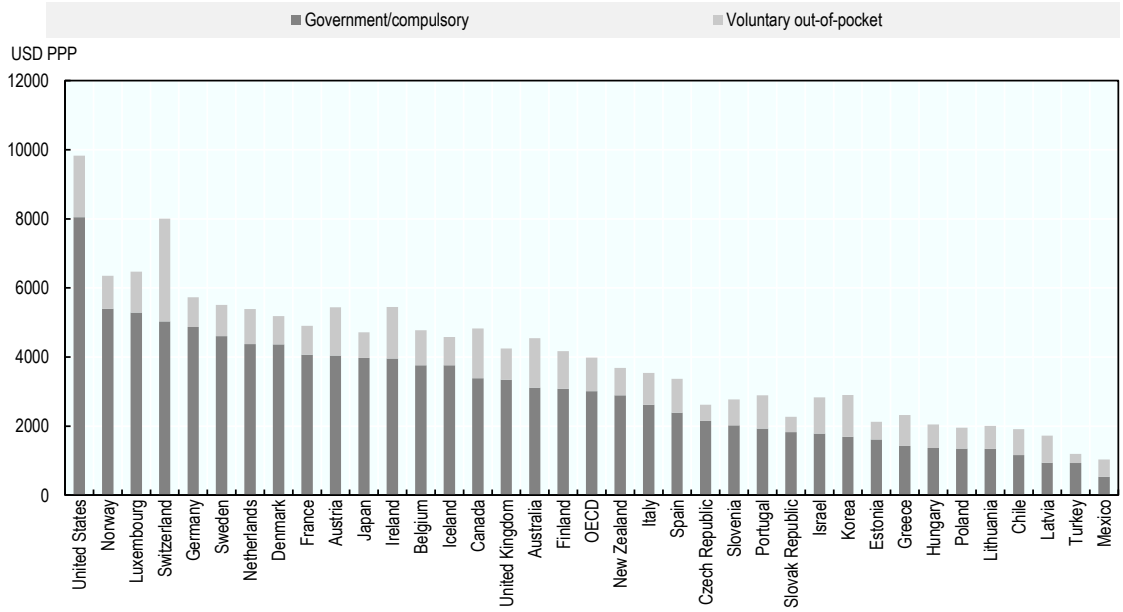
Above all, though there should be an expectation that ISAPREs provide care that is at least equal to provision by FONASA, for example covering counselling and diet programmes in primary care. While ISAPREs should see the potential benefits of investing in public health programmes for their enrolees, it may be that more prescriptive requirements by the Ministry are needed, for example through setting minimum prevention requirements across the industry through regulation.

1.5. Financial resources

1.5.1. Spending on health is low compared to the OECD average, but has been increasing

In 2016 health expenditure in Chile was USD 1 977 per capita, and 8.5% of GDP (OECD, 2017[47]), which is below the OECD average of USD 4 003 per capita. A significant proportion of this is voluntary/out-of-pocket spending – in Chile out-of-pocket payments represent 33% of health spending, the 5th highest share among OECD countries. Health expenditure is increasing in Chile – faster than other OECD countries – and is expected to remain fairly stable. Indeed, health expenditure in Chile increased faster than any other OECD country between 2009 and 2016, growing by 5.9% compared to the OECD average of 1.4% (OECD, 2017[47]).

Figure 1.9. Health expenditure per capita, 2017 (or nearest year)



Note: Data for 2017 was estimated by the Secretariat for those countries that were not able to provide this information. PPP stands for Purchasing Power Parities and adjusts health expenditure for differences in price levels between countries.
Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

1.5.2. When it comes to expenditure on public health, it is hard to identify, and difficult to ring fence

In terms of information gathering and knowledge development, one area of weakness that stands out in Chile is the availability of financial data pertaining to health. Generally, information on health spending in Chile remains at an aggregate level such that any detailed expenditure data specifically on prevention and public health is severely lacking; currently no overall estimates of preventive spending or any of its subcomponents are available. To be able to more effectively identify and monitor public health and prevention spending, significant development in a standardised set of health accounts is required. Chile should continue the efforts that have already begun; working with the OECD and WHO PAHO to improve their reporting on health spending by fully implementing the System of Health Accounts (SHA). While a breakdown of health spending from the financing perspective exists, an allocation of total health spending by the various health care activities (which includes prevention and public health and some important subcomponents) and health care providers is not yet reported as part of the international data collections. In the same vein, Chile should also consider producing health spending data by disease when implementing SHA.

In addition, greater monitoring of some of the public health and prevention programmes that Chile has introduced is needed. In many respects a richer and more regularly updated set of epidemiological surveillance data will help with this monitoring. However, specific efforts to monitor and, particularly to evaluate some of the programmes are needed, for instance cancer screening and early diagnosis as stressed in Chapter 3, and the comprehensive package of obesity prevention measures as set out in Chapter 2.

1.5.3. Some payment mechanisms exist to incentivise public health functions amongst key providers

In Chile, as in many countries, the decentralisation of primary care system governance under the control of municipal governments brings opportunities – notably primary care can better engage and adapt to local needs – but also risks setting this crucial sector outside the broader health system priorities. Primary care practices are key actors in prevention activities in Chile, for instance undertaking health checks and screenings. Other OECD countries have focused on developing primary care as key providers of public health interventions, for example diet and nutrition counselling or smoking cessation programmes (at present Chile's Vida Sana counselling and physical activity programme is run from primary care, but is an independent programme carried out by dedicated counsellors).

In Chile a system of payment-dependent targets for key primary health indicators are a lever by which the Ministry can set priorities at the primary care level, and could also be used to encourage primary care providers to engage with key public health objectives. A 'pay-for-performance' scheme attached to primary care 'Health Goals' was first introduced in 2002, wherein a set of 8 goals comprised of 10 indicators are set at when met they deliver a salary bonus for health care workers (Ahumada, Herrera and Tadiri, 2017[48]). Each year an index of priorities is set by the Ministry, and the targets attached to them are then negotiated between the health service and the municipality, for instance the percentage of the covered population who should receive a certain service, or a required improvement in outcome, for instance improving coverage of Pap smears (see Chapter 3). The bonus attached to these targets is significant for the primary care workforce – and represents around 8% of workers' salaries. In addition, some vertical goals set delivered by health services are tied to funding.

From 2005 a second component of pay-for-performance in primary care was introduced in Chile, through the 'Primary Health Care (PHC) Activity Indicators' which introduced a performance criteria to a share of the capitated payments that municipalities receive. If annually set goals across 16 indicators are not met, monthly capitation rates are lowered (Ahumada, Herrera and Tadiri, 2017[48]).As well as being a source of valuable primary care-level data in Chile, these pay-for-performance schemes are levers through which the central government can encourage municipal governments to align themselves with national health care goals, including around public health.

1.6. Knowledge development

1.6.1. Strengthening key data sources

Epidemiological data in Chile is primarily based on the National Health Survey, which was carried out in 2017, and prior to this in 2009 and 2003. The National Health Survey offers a rich source of data on the health status of the Chilean population. For example the National Health Survey in Chile actually includes both measured and self-reported height and weight, which is very useful, and not many surveys include both dimensions. Other sources of data in Chile include the WHO Global Information System on Alcohol and Health (GISAH) includes data for Chile on alcohol consumption (for 2014) and patterns of consumption (for 2010), and JUNAEB's *El Mapa Nutricional* which tracks obesity rates in children and adolescents. The 'National Survey of Quality of Life and Health 2015-16' (Encuesta de Calidad de Vida y Salud) includes information on smoking rates, as well as on self-perceived health and wellbeing and sexual health.

The *Encuesta de Caracterización Socioeconómica Nacional, Casen* (National Socioeconomic Characterisation Survey) which is carried out by the Ministry of Social Development biannually or triannually (and was last undertaken in 2015) collects information about poverty and social development, including some health dimensions. For example the survey includes population who have had an accident or illness, who have received health care, or who had an illness that was not covered by their health care provider, and percentage of woman who have had a PAP smear, broken down by region and often by age and sex also.

However, given that the National Health Survey is a very important source of key population health data, it needs to be undertaken on a more regular basis. Undertaking the survey every eight years – which is the time elapsed between the most recent two Health Surveys – is not sufficient to effectively monitor changes in non-medical determinants of health, or to assess the impact of public health policies. Many other countries OECD countries, for instance Italy, France, Canada and England, have surveys much more regularly, even annually. Mexico also has a health survey (ENSANUT), which takes place every 4 years (last one was in 2016), and includes measuring of height and weight. The survey should not be seen as an ad-hoc undertaking, but rather should be a regular part of public health policy. It may be that an established timetable for undertaking the survey needs to be set – for example every 2 to 4 years – and/or that that responsibility for the survey is shifted out of the Ministry to an a-political institution, for instance the Public Health Institute, which might include the survey as part of their core business. The survey should be designed to provide data in line with Chile's guidelines and thresholds for public health issues. For example, the recommended frequency for consumption of certain foods (daily, weekly, etc) does not always match the survey questions, and the survey does not cover all food types, such as pulses, potatoes, meat, and eggs, which are included in the guidelines.

The Ministry of Health also has a number of administrative data sources and registries, linked to individual national ID numbers, including hospital admissions, an immunization registry, an HIV information system, and a mandatory notification system for select communicable diseases. Some exchange of information agreements have also been the Ministry of Health and other institutions, such as the Ministry of Social Development, the police, and others.

In many respects information on the uptake of public health activities is good. For example uptake of the Vida Sana counselling and physical activity programme in primary care appears well-monitored (see Chapter 2), uptake of the Examen de Medicina Preventiva is recorded (see 1.3.2) and rates of cancer screening are systematically recorded (see Chapter 3). However, space still remains to collect and exploit data more effectively. Notably, a greater capacity to use data to identify individuals with high risk more efficiently and effectively is recommended as part of strengthening cancer screening, but a similar approach could be applied to other disease risks, for example as part of a more tailored approach to applying the Examen de Medicina Preventiva. A more data-driven approach system-wide also demands efforts to integrate data from the private sector; at present data on the activities and patients under Isapres is not systematically included in national data sources. Some data from Isapres is collected by the Superintendency of Health, but availailability and connectedness with other data sources is limited.

1.6.2. Promoting health literacy around public health

When it comes to public health Chile appears to be fully engaged with public education, and improving public health literacy, at least in some key domains. While engagement with patient groups could still stand to be strengthened (see 1.5.1) public education is clearly a priority in Chile. Public health literacy begins at the school level, where JUNAEB runs a comprehensive campaign around healthy eating and obesity. The introduction of clearly understandable labels indicating the nutritional value of packaged food is also a clear step towards improving public understanding of health eating (see Chapter 2).

Earthquake and tsunami drills, education and alerts are also a part of Chilean life, and education around earthquakes begins at school age. Chile's 'Plan Francisca Cooper', also known as 'Operación Deyse' sets out that each school must have an earthquake response plan, students must understand how to respond to an earthquake, and drills must be undertaken regularly. In schools in tsunami risk zones the response plan must also include evacuation to an area 30 metres above sea level. Indeed, panels indicating tsunami risk are in place in coastal areas.

Recent campaigns have included campaigns to prevent HIV/AIDS. For example the HIV/AIDS strategy focuses on comprehensive HIV prevention, including promoting condom use, HIV testing, ARV treatment and adherence, and prevention of STIs (Ministerio de Salud, 2017[49]). The campaign includes segments for television and radio, as well as roadside posters, and internet and social network targeting. The campaign, run by the Ministry of Health, was designed in collaboration with civil society groups including the National Council of HIV/AIDS and Human Rights (*Mesa Nacional de VIH/SIDA y Derechos Humanos*), the National Council of Indigenous Peoples on HIV/AIDS and Human Rights (*Mesa Nacional de Pueblos Indígenas en VIH/SIDA y Derechos Humanos*) and the National Council of Trans Persons on HIV, Human Rights and Health (*Mesa Nacional de Personas Trans, en VIH, Derechos Humanos y Salud*).

While campaigns to promote public awareness of key public health issues appear to be generally well-used in Chile, weaknesses in health literacy more generally might need further attention. For example, Chapter 3 sets out that low public awareness and understanding of cancer screening protocols may be discouraging some women (with regards to breast and cervical cancer) from participating. Chile may look for more ways to increase patient participation in both health promoting and disease-detection activities, and encourage patients to better understand their own health, for instance through accessing their own patient data. OECD has identified informed-patient choice, promoting patient education and investing in decision aids for patients as key dimensions of building health literacy (OECD, 2017[44]). In some countries patient-friendly data portals have been a key part of this strategy, for example in England where the MyNHS website gives key performance data on health care providers, or in Portugal where patients can easily access their own care data in a user-friendly format

1.7. Workforce

1.7.1. Human resource shortages are affecting public health care, but the Ministry is addressing the problem head-on

Chile has a shortage of medical staff, which is understood to put strain on the health system. Compared to other OECD countries Chile has low numbers of both doctors and nurses: in 2016 Chile had 2.3 licensed physicians per 1 000 population, compared to the OECD average of 4.9 (number of practicing physicians was not available); in 2015 Chile

had 2.4 licensed nurses per 1 000 population, compared to the OECD average of 14.5 (OECD, 2018[2]). Particular pressure points affecting the delivery of public health care are reported. In the primary care sector turnover is high – about half of Chile's doctors are Generalists – with reports of high levels of job strain, high patient numbers, and high levels of fragmentation. Uneven geographical distribution of the health workforce is another reported challenge, especially for specialists.

The Ministry of Health does appear to be engaging with the challenge health workforce shortages. In 2015, the Government announced a Plan for Recruiting, Training and Retaining Specialist Doctors. This plan should add 1 100 new primary care doctors and 4 000 specialists and dentists over 4 years (Gobierno de Chile, 2015[50]), and contribute to an increase the overall workforce numbers in the years to come. The challenge of geographical distribution of medical staff is being addressed in part through the organisation of specialist regional hubs – for example cancer hubs in the North and the South – as well as through the use of telemedicine for specialist consultations.

1.7.2. To ensure that the public health workforce is able to deliver public health services, Chile could advance its public health and prevention training

At present Chile does not have a registry of public health specialists, and there is no specific guidance when it comes to public health specialist training. Each university which offers public health specialist training defines their own curricula. Likewise, each medical school defines its own curricula, leading to wide variety in the extent and manner in which public health is included. The only common standard which all medical schools follow is the contents profile for which every medical doctor is tested in the National Single Exam of Medical Knowledge at the end of their training.

When it comes to strengthening Chile's health workforce in the area of public health and prevention, Chile may wish to focus attention on building capacity in primary care. Building capacity to manage health risks in primary care has been a successful approach taken in other OECD countries (OECD, 2017[44]). Primary care can deliver public health services such as targeted education programmes, counselling, cost-effective screening programmes and effective management of chronic diseases.

In Chile the primary care sector is already functioning as a key pillar to efforts to tackle obesity, through the Vida Sana programme. Primary care practitioners are also expected to undertake the EMP screenings and tests, which are incentivised through the pay-for-performance indicators in primary care. Nevertheless, there may still be scope to expand the contribution of the primary care sector.

To enable primary care to act as the provider of public health, nurses and other ancillary functions can be trained to deliver public health services. Throughout the OECD, there exist a number of examples of countries where nurses, community health visitors and other support personnel are trained and empowered to provide counselling, screening and preventive care (see Box 1.7) and Chile may find that following this example is an effective way to expand the public health workforce (Maier, Aiken and Busse, 2017[51]).

Chile already uses nurses for some public health interventions. For example, 92% of PAP smears are done by midwives or nurses in primary health clinics (Suarez and Prieto, 2005[52]). However, the Vida Sana programme is delivered by physicians, dieticians, psychologists and physical therapists. There might be space to involve nurses and other support staff in this programme, especially considering its current low coverage of the eligible population (DIPRES, 2016[53]).

Box 1.7. Building public health capacity in primary care through nurses and other ancillary workforce

Throughout the OECD, there exist a number of examples of countries where nurses, community health visitors and other support personnel are trained and empowered to provide counselling, screening and preventive care. In Canada, Hungary and Brazil nurses are delivering key public health services, and taking on tasks that were previously performed solely by physicians.

Hungary

Before 2010, cervical cancer screening in Hungary was performed solely by gynaecologists. Due to limited access to these specialists, screening participation rates remained low at only 10%, and were particularly low in rural areas. To address this issue, the scope of practice for "health visitors" was expanded in 2010. Health visitors – also called public health nurses – are qualified to provide health promotion advice, health check-ups, immunisation, screenings and preventive care to women, newborns, school children and adolescents. Since 2010, health visitors are also authorised to perform cervical smears after having successfully completed additional training and being licensed to perform this activity. The number of health visitors trained has rapidly increased in recent years, from 250 in 2014 to 1 400 in early 2016 (Maier, Aiken and Busse, 2017[51]).

Canada

In Canada, Nurse Practitioners (NP) are become increasingly common in primary care. In British Columbia, a study showed that NPs provided 20-30 minute consultations per patient instead of 10 minutes by GPs (Roots and MacDonald, 2014[54]). NPs used the extra time for public health activities, including health promotion advice, disease prevention, assessments of complex situations and case management. In addition, NPs often introduced a new, community- and population-based focus to their practices. Activities provided by NPs included outreach activities outside the office to marginalised populations, which was not previously done by GPs GPs (Maier, Aiken and Busse, 2017[51]).

Brazil

In Brazil, primary health care is delivered through a community approach. Family Health teams, consisting of a physician, nurse, nurse assistant and up to 6 full-time community health agents, cover a defined population of up to 1 000 households. The community health agents, who are lay people from the community, provide an essential part of public health services by visiting families, identifying issues or risk factors, and supporting their access to preventive care or treatment (Macinko and Harris, 2015[55]).

1.8. Conclusion

Chile has a well-functioning, well-organised and effectively governed health system and public health architecture, which both appear to be in good shape to tackle some of the significant public health challenges that Chile faces. Perhaps the biggest among these challenges is the significant burden of obesity amongst the Chilean population, both adults and children. This burden of obesity, and the concurrent health problems, would be a strain on any health system, but Chile is showing itself to be capable of thorough and

determined policy making across different sectors of government, as discussed in Chapter 2. Other public health challenges are intertwined with the organisation of the health system; some advances in cancer screening and treatment appear held back by insufficient health infrastructure and human resources, and gaps in health care coverage (Chapter 3). Meanwhile, health system funding remains tight, and there is some question of a need for a significant health system reform, in part to address a serious budget deficit.

Having shown a clear capacity for decisive policy making, effective health system leadership and reform, a key challenge for Chile now will be to find the right balance between ambitious and innovative policy packages – for instance the range of policies to tackle obesity and overweight, or to effectively engage with personalised medicine – and getting some of the basic building blocks of the public health system right. In some key areas – notably health data and information, some areas of health system infrastructure and resources, and some technical advisory domains – there are weaknesses that risk rendering existing policies approaches less effective, and becoming increasingly important obstacles to implementing good policies in the years to come.

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Chapter 2. Tackling obesity, unhealthy diet and physical inactivity

Obesity is one the main causes of morbidity and mortality in Chile, and the growing prevalence is creating a major threat to the health of the country. Chile has put in place a comprehensive portfolio of interventions, from population-level fiscal policies, to school- and workplace-focused programmes, to individual interventions in primary care. There are a number of ways in which Chile could further strengthen its portfolio of interventions, including through expanding some polices so that they cover a greater share of the population, and a greater number of food products. In addition Chile's private health insurers – the ISAPRES – have a bigger role to play, and could do more to positively influence the health of their insurees.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

2.1. Introduction

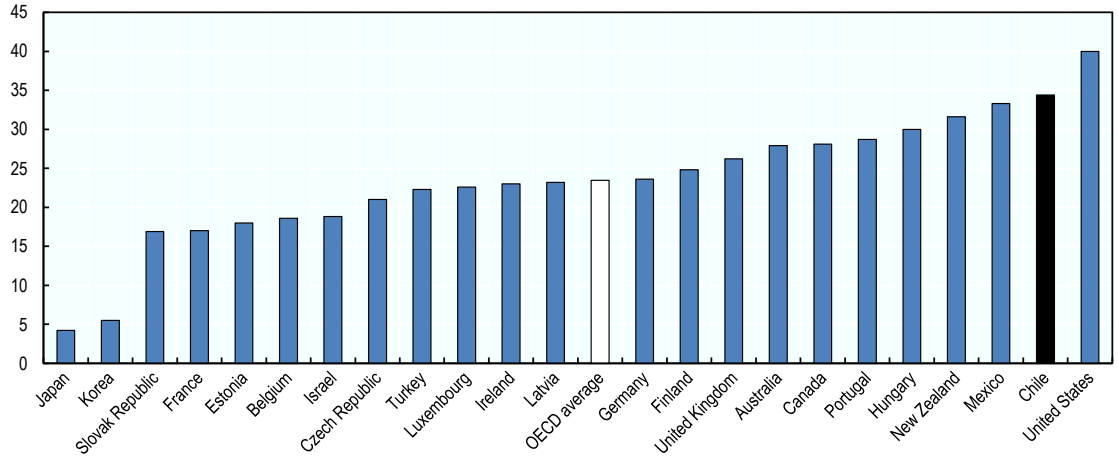
Obesity is one the main causes of morbidity and mortality in Chile, and the growing prevalence is creating a major threat to the health of the country. In this chapter, we explore the causes and impacts of this risk factor, as well as Chile's policy response. Chile has put in place a comprehensive portfolio of interventions, from population-level fiscal policies, to school- and workplace-focused programmes, to individual interventions in primary care. This chapter examines these interventions, and makes a number of recommendations for ways to further improve the effectiveness – and cost-effectiveness – of Chile's ambitious obesity strategy.

2.2. Obesity and associated unhealthy behaviours are a top public health priority in Chile

2.2.1. Nearly two-thirds of the Chilean population, and a third of children, is overweight or obese

In 2016, 39.8% of the Chilean population was overweight, and another 34.4% was obese (Ministerio de Salud, 2017[1]). This is one of the highest rates observed among OECD countries, though many others also have a high prevalence of overweight and obesity (see Figure 2.1). While data is too scarce to analyse the trend of obesity in Chile, data from the National Health Survey shows that the obesity rate has increased considerably in recent years, despite improved awareness and action. While between 2003 and 2009 obesity rates went from 24.5% to 25.1%, in 2016 this number rose to 34.4% (Ministerio de Salud, 2017[1]).

Figure 2.1. Measured obesity prevalence in 2016 (or nearest year)



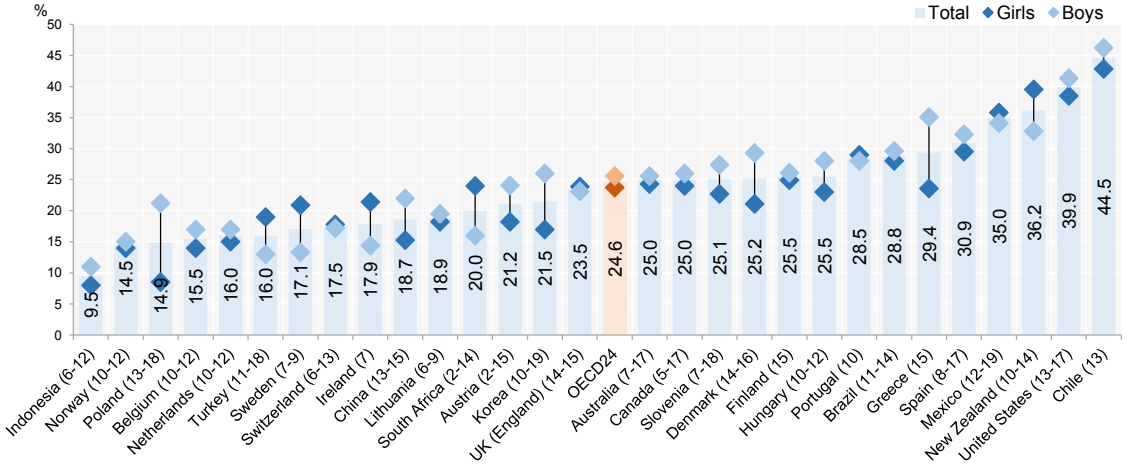
Source: OECD Health Statistics, https://doi.org/10.1787/health-data-en.

As in other countries, Chile has seen an increase in the number of children who are overweight or obese (see Figure 2.2). The rate of overweight and obesity for children aged 13 years old in Chile was nearly 45%, which is the highest rate in any OECD country for which data is available. A recent survey of Chilean students paints a similar picture, with just over 50% of pre-school children already overweight (see Figure 2.3).

Children who are overweight are more likely to be overweight as adults, and are at greater risk of poor health in the future (OECD, 2015[2]; OECD, 2010[3]) . As such, Chile's high prevalence of childhood overweight and obesity can be considered a 'health time-bomb' (OECD, 2010[3]).

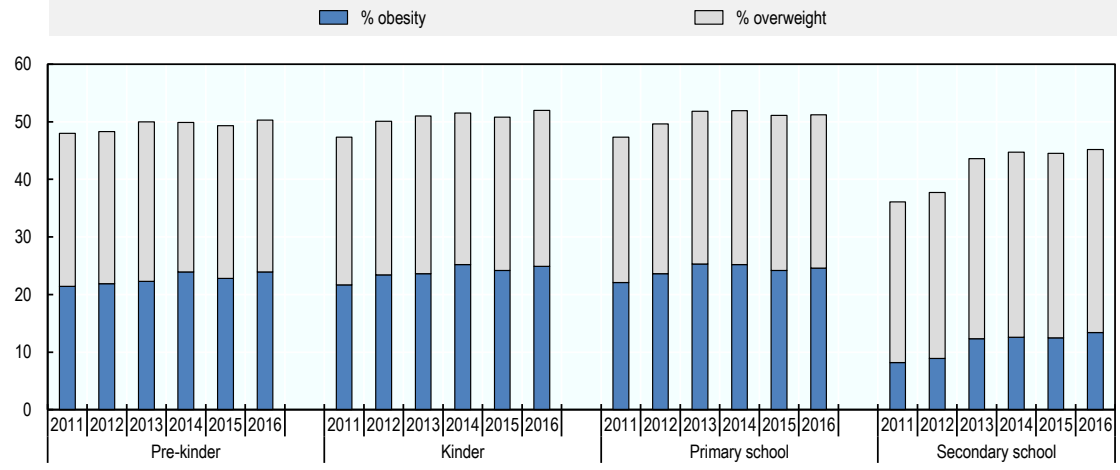
Figure 2.2. Childhood overweight prevalence in 2010 (or nearest year)

Measured overweight (including obesity) among children at various ages



Note: The numbers in parentheses refer to the age of the children surveyed in each country.
Source: OECD Health at a Glance 2017 (OECD, 2017[4]).

Figure 2.3. Measured overweight and obesity among Chilean children, 2011 to 2016



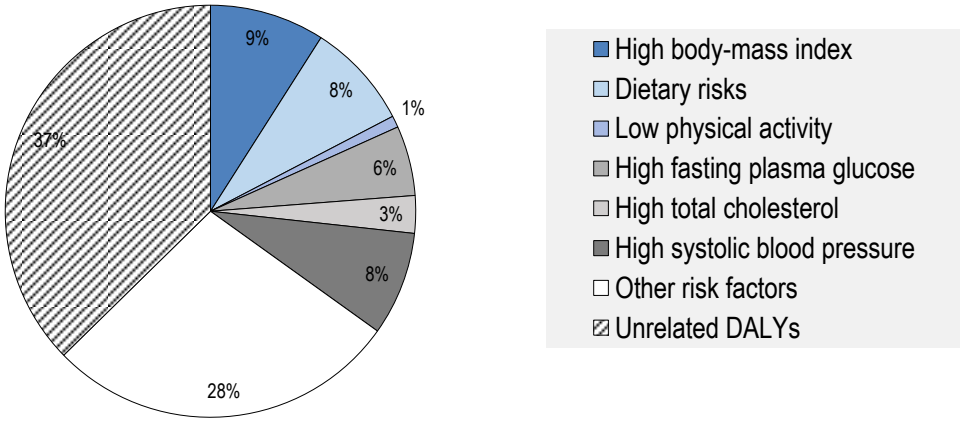
Source: JUNAEB Mapa Nutricional 2016 (JUNAEB, 2016[5]).

2.2.2. Obesity and associated factors contribute significantly to the overall burden of disease in Chile

Burden of disease is the impact of a health problem as measured by mortality, morbidity, or other indicators. It can be quantified in terms of Disability-Adjusted Life Years (DALYs), which is equivalent to one year of healthy life lost. In 2016, high body mass

index (BMI) was the cause of 9.1% of total DALYs in Chile, while closely associated risk factors – dietary risks and low physical activity – contributed another 9.2% (see Figure 2.4). The potential consequences of obesity – high levels of blood glucose, cholesterol and blood pressure – together account for an additional 16.6% of total DALYs. Overall, obesity and its causes and consequences contribute significantly to the burden of disease in Chile.

Figure 2.4. Chile's burden of disease (DALYs) by risk factor, 2016



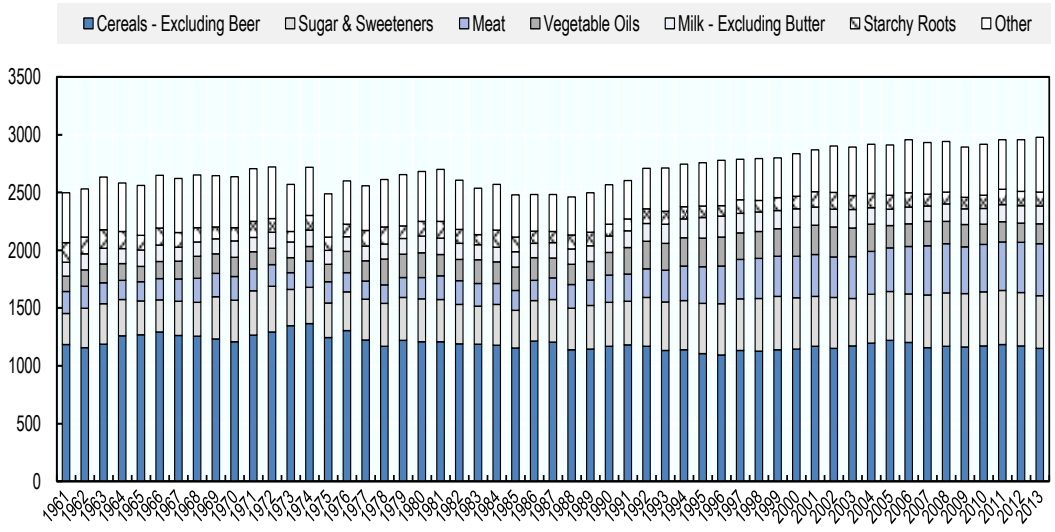
Source: Global Burden of Disease (IHME, 2018[6]).

2.2.3. A number of factors are driving the high rate of obesity

The rise of obesity in Chile in the past decades is associated with a decrease in levels of physical activity and an increase in consumption of calorie-dense food. These processes can be linked to several factors, such as changes in lifestyle and in the economy.

Since 1961, total food availability has increased by nearly 20%, from just under 2 500 kcal/capita/day to nearly 3 000 kcal/capita/day in 2013 (see Figure 2.5). This increase is almost entirely attributable to an increase in calories from animal products (733 kcal/capita/day in 2013 versus 402 in 1961) and sugar and sweeteners (458 kcal/capita/day in 2013 versus 269 in 1961). A higher food energy supply leads to an increase in average population body weight (Vandevijvere et al., 2015[7]).

Figure 2.5. Food supply in Chile (kcal/capita/day)



Source: FAOSTAT (FAO, 2017[8]).

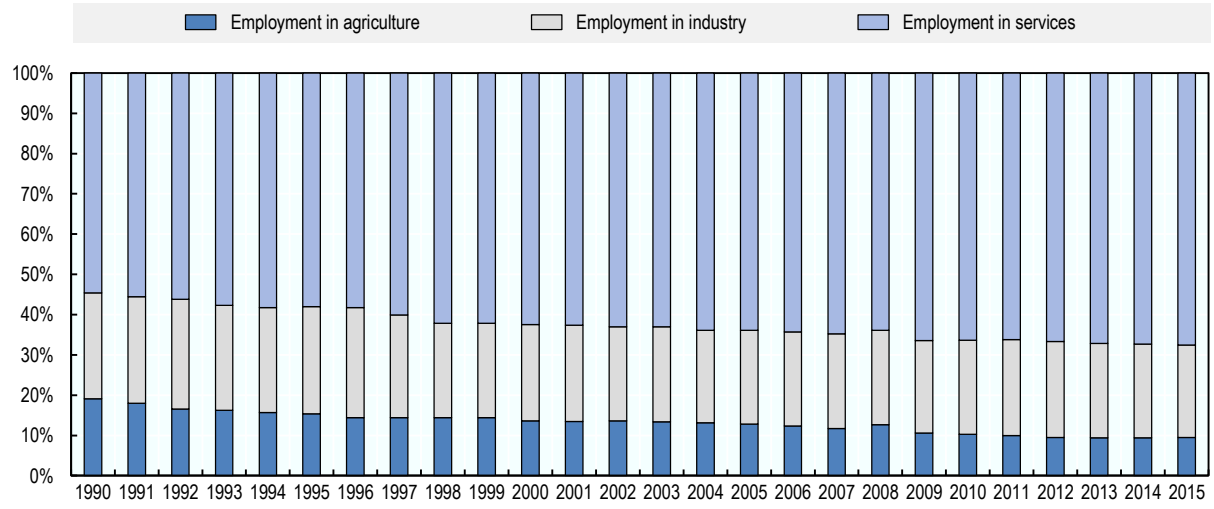
Other factors have also contributed to this phenomenon. For example, the increased female labour force participation has often been accompanied by an increase in overweight and obesity, as family eating habits change (Philipson, 2001[9]; OECD, 2010[3]). In Chile, the participation of women in the labour force has increased by almost 60% in recent decades. In 1990, 32% of women were active in the labour force, while in 2015, the rate had risen to 51% (ILO, 2015[10]).

While the diet in Chile has been evolving, Chileans have also been shifting towards a more sedentary lifestyle. Total physical activity is usually divided into four main domains: work, transport, domestic and discretionary-time physical activity (Bull et al., 2004[11]). Available evidence suggests that Chileans have been performing less physical activity in at least two of these four domains.

During the last few decades, the Chilean economy has further developed into a service economy. This evolution translates into fewer physically demanding jobs and an increasing amount of sedentary work, such as office jobs (Gendler, 2014[12]; OECD, 2010[3]). Since 1990, the share of jobs in the tertiary sector (e.g. provision of services and utilities) has increased from 55% to 68% (Figure 2.6). The share of jobs in the primary (e.g. agriculture, mining) and secondary (e.g. industry such as processing and manufacturing) sectors, which tend to require a higher level of physical activity, has dropped from 19% to 9% and 26% to 23%, respectively.

Modes of transportation have evolved as well. The number of circulating passenger cars per 1 000 inhabitants in Chile has risen from 71 in 1998 to 171 in 2016 (INE, 2001[13]; 2005[14]; 2007[15]; 2011[16]; 2016[17]; World Bank, 2017[18]). Car ownership is associated with lower levels of walking and cycling transport (Mackett and Brown, 2011[19]), and spending more time in cars has been shown to increase the probability of obesity (Frank, Andresen and Schmid, 2004[20]).

Figure 2.6. Employment by sector



Source: World Bank Jobs Data (World Bank, 2018[21])

In addition to these macro-economic factors, there also are individual determinants that influence lifestyle and obesity, including housing, education, gender, the environment, income and age. The prevalence of obesity in Chile increases with age. While 24.6% of 20 to 29 year olds is obese, this rises to 41.7% in 50 to 64 years old (Ministerio de Salud, 2017[1]). Women are more likely to be obese than men: in 2016, 38.4% of women in Chile was obese, compared to 30.2% of men (OECD, 2018[22]).

In children on the other hand, a higher prevalence of obesity was found for boys compared to girls (Herrera, Lira and Kain, 2017[23]). Interestingly, the same study found that children from a more vulnerable socio-economic background were less likely to be obese, but this same group also saw the largest increase in obesity between 2009 and 2013.

A study of diet and physical activity identified males under the age of 20, or over the age of 65, who had either a low education or a high socio-economic status, as having the least healthy behaviours in Chile when both diet quality and level of physical activity were considered at the same time (Graf and Cecchini, 2018[24]). When looking at diet specifically, people aged 20 to 64 with a low or medium socio-economic status and medium or high education had the lowest quality diet.

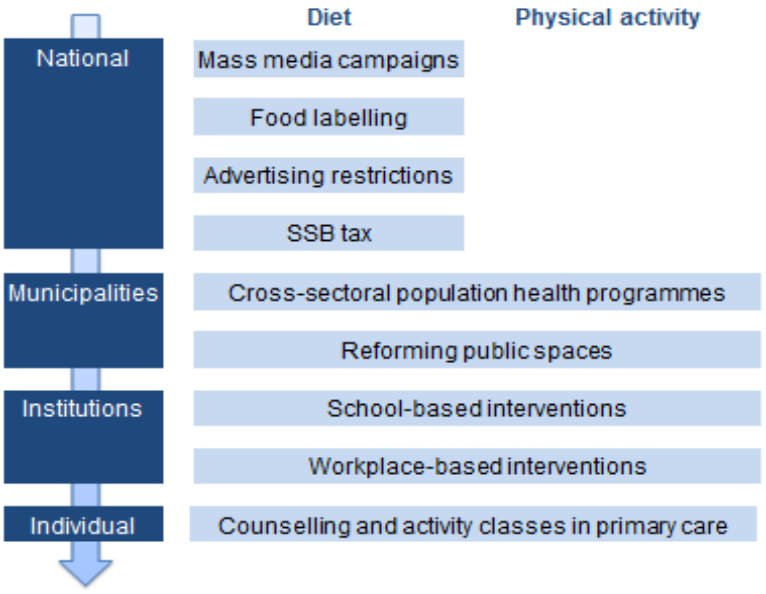
2.3. Chile has put in place a comprehensive policy package to tackle obesity

There is a wide range of policies and interventions that governments can use to tackle obesity, from population-level fiscal policies to individual-level counselling interventions. Combining different approaches in a multi-intervention strategy, targeting different population groups and settings, significantly enhances the impact on health (OECD, 2010[3]).

Chile has sought to address high obesity levels by implementing a wide-ranging portfolio of actions to address the main causes of obesity: physical inactivity and in particular unhealthy diets, taking a social determinant approach (see Figure 2.7). At the national level, mass media campaigns are being used to educate the public on healthy choices.

National laws on marketing, labelling and sugar taxes have been implemented in an effort to improve diets. At the regional level, city-wide programmes are bringing together different stakeholders to deliver multifaceted interventions, and to transform local spaces. Schools and work places are also involved to create healthy environments for their students and employees. Finally, primary care plays a key role in delivering individual interventions to high risk people.

Figure 2.7. Chile's policy package to tackle obesity



Source: Author's elaboration

2.3.1. Mass media campaigns have played a part in Chile's prevention strategy

Mass media campaigns are an important part of a public health strategy. To improve diets, many countries have run campaigns focused on increasing the consumption of fruit and vegetables. Rather than telling the public what they should not do, these campaigns present a positive message.

In 2004, Chile launched a major campaign to promote the consumption of 5 portions of fruit and vegetables a day (Hawkes, 2013[25]). The campaign is run by the 5-a-Day Corporation, a not-for-profit organisation set up by the Institute of Nutrition and Food Technology, other academic institutions, and private sector organisations such as the Association of Supermarkets.

The campaign includes a website, twitter messages and advertisements on radio and television. The 5-a-Day Corporation also creates a range of educational materials, including posters and leaflets, and coordinates education at supermarkets, workplaces and in schools (Zacarías et al., 2006[26]). The campaign has produced several popular recipe books, in cooperation with the Ministry of Agriculture.

Another mass media campaign was launched to promote the newly introduced warning labels on food. This campaign lasted for one month, and saw spots aired 3 to 4 times a

day on television and 10 to 12 times a day on the radio. The high cost of this campaign (ca. 500m pesos or 650k Euros) has led the Ministry to review other options for future campaigns, including online video website YouTube.

2.3.2. Chile's threshold values for food warning labels are among the strictest in the world

Many countries have introduced front-of-package food labelling schemes, to help the public make healthier choices when buying food. The majority of these programmes are voluntary schemes, where producers are incentivised to produce healthy products which are rewarded with a 'healthy choice' or 'low in …' label. A few countries have introduced mandatory warning labels, such as Finland the 'high in salt' label, and Chile's new labelling scheme.

In 2016, a mandatory food labelling system took effect in Chile that uses four black labels to indicate whether a certain foodstuff is high in calories, salt, sugar or fat (see Figure 2.8) (Ramirez, Sternsdorff and Pastor, 2016[27]). The labels only apply to packaged food, and are not required for bulk goods or unpackaged food, including bread and fast food.

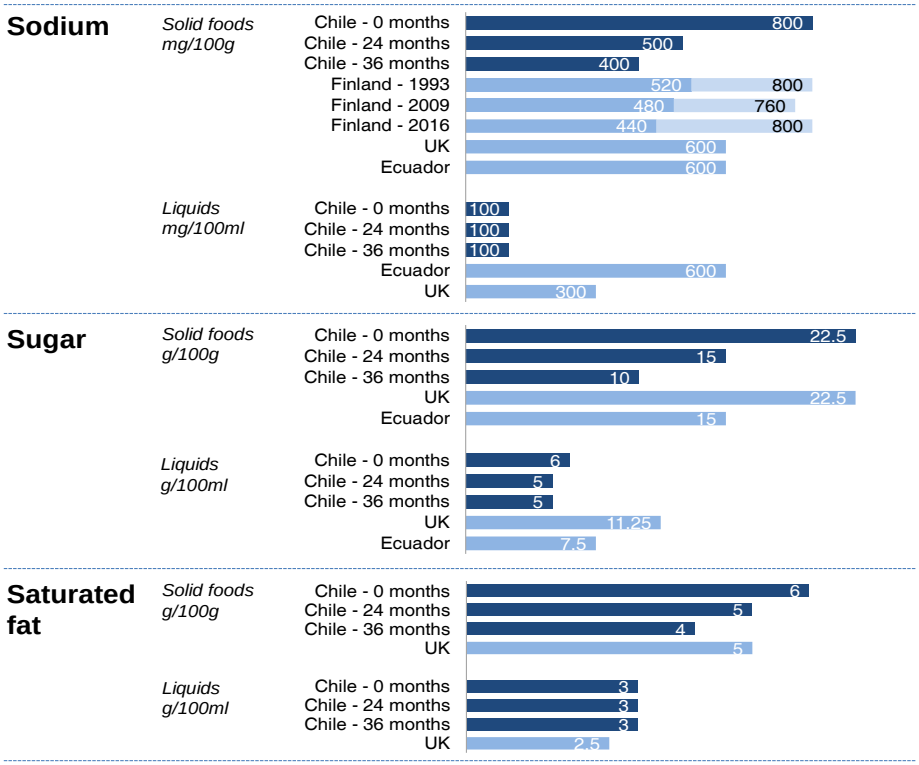
Figure 2.8. Chile's food labels

Labels warning of products high in sugar, saturated fat, salt and calories, respectively

Source: Chile Ministry of Health.

The thresholds for the labels are being introduced in a phased design, with increasingly strict targets set at 24 and 36 months after implementation. The final thresholds, which will come into force in 2019, are ambitious compared to other international labelling standards (see Figure 2.9). Finland also introduced mandatory warning labels for products high in salt in 1993, tightening the threshold for various products in 2009 (Sarlio-Lahteenkorva, 2015[28]). In 2016 the limits were re-evaluated in light of new EU regulation on food labelling. However, both Finland's historic and current limits are higher than the thresholds that Chile will use after 36 months.

Figure 2.9. Comparison of food warning label thresholds



Note: Values for UK and Ecuador are for the 'red' or 'high' label; Finland has set different sodium thresholds for different products, ranging from 440mg/100g for bread to 800 mg/100g for crisp bread, cheese and breakfast cereals.
Source: (Ramirez, Sternsdorff and Pastor, 2016[27]; Department of Health, 2016[29]; La Ministra de Salud Publica, 2013[30]; World Cancer Research Fund International, 2017[31]) (Sarlio-Lahteenkorva, 2015[28]) (Sydan.fi, 2017[32]) (Pietinen, 2009[33])

The labels do not only function to encourage consumers to make healthier choices, but also determine where and how a product can be marketed and sold. Products that carry a warning label cannot be sold or advertised in schools, nor can they be advertised to children under 14. They cannot be given away for free, or accompanied by presents such as toys or games (Ramirez, Sternsdorff and Pastor, 2016[27]).

Enforcement of the policy is done regionally. The Regional Ministerial Secretariats (SEREMI) of Health are tasked with monitoring food products through random testing, sampling a higher number of food products aimed at children. In the first year, 3000 inspections took place, 28% of which identified issues with either the 'high in' label, or its advertisement to children or sale within schools (Ministerio de Salud, 2017[34]). The majority of the resulting 524 judgements were warnings and admonitions (91%), but they also included fines (7%) and sales prohibitions (0.6%). 1.5% was dismissed.

Testing is not limited to a review of the nutritional label but includes chemical analysis of the food. The Ministry of Health conducts annual reviews of nutrient labels for a selection of food products that are widely consumed, or that have previously been shown to misrepresent their nutritional composition. The 2017 report shows that, of the 41 products tested, 78% had an accurate label (Ministerio de Salud, 2017[35]). In 23.3% of the samples

analysed for sugar the actual content was higher than the reported content by 20% or more. The same was found for 20% of samples analysed for salt content, and 33% of energy content samples. It is important to note though that the products sampled had a higher risk of misreporting, and the overall prevalence may therefore be lower. In addition to these checks, citizens can also report complaints or misuse of the labels (Box 2.1).

Box 2.1. The role of civil society in monitoring food labels

In response to the new food labelling laws introduced in 2016, Chile's national consumer organisation, Conadecus, announced the launch of the Observatory for Food and Advertising. This observatory will regularly review food labels, ingredients and nutritional composition of food products, and advertising practices, to assess whether or not they comply with national regulations. Their aim is to improve transparency for the customers, and increase compliance by providing recommendations to the Ministry of Health.

The involvement of public interest watchdogs in enforcing labelling standards has been instrumental in other countries. In Denmark, independent consumer rights organisation Taenk has taken on a similar role. After discussions with producers did not result in any changes, Taenk brought complaints on 26 products and their labels to the Danish Veterinary and Food Administration. Foodwatch in the Netherlands, an organisation independent of the government and food companies, organises an annual competition where 24 000 consumers vote for the most misleading health claim on a food product. Presented in an entertaining and amusing way, the aim of this campaign is to make consumers more critical of health claims and food labels.

In addition to consumers, other civil society groups can also be involved. For example, a greater involvement could be envisaged for patients associations, medical societies and other relevant groups of stakeholders depending on the matter under discussion. However, civil society in Chile tends to be arranged in small organisations, which limits their ability to influence and support public health objectives.

Source: (Foodwatch, 2016[36]; Conadecus, 2017[37]; Taenk, 2017[38]).

The policy has already had an impact. An evaluation by the Ministry of Health found that 44% of consumers used the labels to compare products, and 92% of them were encouraged to buy less or to buy different products (Ministerio de Salud, 2017[34]). In addition, the industry has responded to the policy by reformulating products and introducing alternatives that are below the label threshold. Nestle, for example, has changed the recipe of popular breakfast cereal Chocapic to include artificial sweetener Stevia, in addition to reducing the sugar content by 25% over the last five years (Nestle, 2017[39]).

However, there are some limitations of the policy. For bottles and other non-square packaging the label can be printed towards the side of the front label, potentially obscuring it if the product is slight rotated when displayed in store (Castro Villarroel and Medel Valdivia, 2017[40]). Including the label on the front and the back of the product could help address this issue. The law is also currently limited to pre-packaged, non-alcoholic food and beverages. Expanding it to include more products such as bread, fast

food and alcoholic beverages would level the playing field between products and could inform the public about the nutrient profile and calorie impact of these products.

2.3.3. Chile has implemented comprehensive regulations to restrict the marketing of unhealthy foods to children

Advertisement of unhealthy products can have a strong influence on diets, and the WHO has developed guidelines on the marketing of food and drinks to children (World Health Organization, 2010[41]). Countries are encouraged to reduce the exposure of children to marketing of foods high in saturated fats, trans-fatty acids, free sugars, or salt.

Chile has implemented regulation to curb the advertisement of unhealthy foods. Marketing regulations currently fall under two laws. The first forbids all marketing of unhealthy food with "high in" labels directed at children under 14, in all places (including the internet), through all means, and at all times. The second law, which complements the first one, prohibits marketing to all audiences of food with labels between 6am and 10pm on TV and in cinemas. The definition of marketing directed at children includes advertisement with children, with the voices of children, with music for children, or depicting a place for children (e.g. schools); or when a television audience consists of more than 20% children.

To ensure compliance, the Ministry of Health works with the National Television Council, the National Consumer Service and the Ministry of Education (Ministerio de Salud, 2017[34]). In November of 2016, the National Consumer Service sued three multinational food companies for their breakfast cereal mascots which they claimed breached the ban on advertising foods with labels to children, requesting fines of USD 90 million for each (Servicio Nacional del Consumidor, 2016[42]). In March 2017, fines of more than USD 10 million were requested for another four companies (Servicio Nacional del Consumidor, 2017[43]). However, the Court of Appeals and, later, the Supreme court have dismissed the cases and ruled that the enforcement of the labelling law is up to the SEREMI and not the courts (La Tercera, 2017[44]) (La Tercera, 2018[45]).

The ban is difficult to monitor and enforce for the Ministries. The central government checks audience composition of television, radio, press, magazines, and internet content by working with tracking systems such as Megatime and Admetricks. However, the use of internet among children is less easy to monitor. This is a major issue as studies in other countries have shown that children's websites are a prime target for food advertisements (Ustjanauskas, Harris and Schwartz, 2014[46]).

In addition to regulating screen and print marketing, Chile has also restricted outdoor advertising and the law includes a ban on advertising unhealthy foods inside schools. Legislation banning outdoor marketing of unhealthy products one block around schools has been adopted by 10 municipalities, and is being considered by another 200 of the 350 municipalities in Chile.

2.3.4. The implementation of a sugar-sweetened beverage tax shifted consumption towards low-sugar products

In October 2014, Chile also introduced a SSB tax as part of the tax reform (Reforma Tributaria), which came into force in September 2016. Prior to the reform, all SSBs were taxed at 13%. After the reform, the tax became dependent on the amount of sugar in the beverage: SSBs with more than 6.25gr of sugar/100ml (or 15gr/240ml as stated in the law) are taxed at 18%, while SSBs below this threshold are taxed at 10%.

An official evaluation of the policy was conducted by the University of Chile, the Catholic University of Chile, the University of Santiago and the University of York. They found that the change in tax resulted in a 3.4% decrease in household purchases of high-sugar SSBs, while the volume of low-sugar SSBs purchased increased by 10.7% (Caro et al., 2018[47]).The Treasury has said that the current level of taxation of SSBs has had no negative impact on employment, which is consistent with evidence from Mexico (Guerrero-López, Molina and Colchero, 2017[48]).

This evaluation did not however look at the behaviour of the producers of SSBs. The introduction of a tax can incentivise the reformulation of SSB products to decrease sugar content. In the United Kingdom for example, the expected revenue from the Soft Drink Industry Levy was reduced by more than half as manufacturers reformulated their drinks to avoid a higher tax rate (Government of the United Kingdom, 2018[49]).

2.3.5. Municipalities play an important role in delivering cross-sectoral population health programmes

Non-communicable diseases, including obesity, are the result of a large number of determinants. Some of these can be addressed through healthcare, but many lie beyond the remit of the Ministry of Health. Housing, income, education and the environment all influence diet and exercise, but are governed by policies from the ministries dealing with education, agriculture, finance, housing, urban development and social services. Greater collaboration across ministries holds the potential for better incorporation of health objectives in policy making across government departments.

Chile has a decentralised administration, and the responsibility for delivering education, social services, primary health care, parks and recreation all lie with the municipalities. As a result, the municipalities are uniquely positioned to develop cross-sectoral programmes. They achieve this by developing Community Health Promotion Plans which focus on the wider determinants of health (Ministerio de Salud, 2014[50]).

An example of a population health initiative at the regional level is the Santiago Sano programme, in Chile's capital city Santiago (see Chapter 1). This programme delivers interventions on alcohol, sexual health, physical activity for the elderly, and childhood obesity (Box 2.2), by bringing together stakeholders from every municipal department into 40 dedicated committees. Through cross-sectoral collaboration, the programme was able to create community gardens, launch healthy food stalls, run workshops, and change physical education in schools, amongst other things.

Non-health initiatives at the local level can have an important impact on population health. The Ministry of Housing and Urban Development-led "I Love my Neighbourhood" programme was introduced in 2006 to counter the deterioration of neighbourhoods, recover social spaces and strengthen the social fabric (Ministerio de Vivienda y Urbanismo, 2016[51]). Their work reviving neighbourhoods also created new outdoor space and communal gardens, which contribute to physical activity and healthier diets.

Box 2.2. Tackling childhood obesity in Santiago

In Chile's capital city of Santiago the city Mayor and her administration have made reducing childhood obesity a policy priority. In 2016 the Mayor's office developed a plan to galvanise school communities to play a bigger role in reducing childhood obesity. This plan was developed in the context of Bloomberg Philanthropies' 'Mayor's Challenge' and Santiago was one of five Latin American prize winners.

Out of this approach grew the 'Juntos Santiago' (Together Santiago) which is part of the Santiago Sano programme. Juntos Santiago aims to reduce obesity rates in Santiago schools and neighbourhoods through gamification, involving children, parents, teachers and communities who compete to win prizes for completing healthy challenges.

Participating schools and neighbourhoods compete in three types of challenges: choosing healthier food options, a step challenge, and a healthy activity challenge where children compete in local sporting and exercise events. By completing the health challenges schools or neighbourhoods win points, which can be used for prizes such as family activities or cooking courses.

A second wave of implementation aims to broaden the programme scope, for example rewarding expanded sport and health transport options or the creation of school gardens. An online platform was also developed to allow groups to track their progress and communicate with other participants, and where schools can communicate with parents.

Source: (Municipalidad de Santiago, 2016[52]; Bloomberg Philanthropies, 2016[53]).

2.3.6. Chile is taking steps to transform public spaces to encourage physical activity and healthy diets

Another example of a cross-sectoral programme is the Elige Vivir Sano en Comunidad (Choose Healthy Living in the Community) initiative. This programme is run by the Ministry of Social Development, but supported by the Ministries of Health, Education, Labour and Social Welfare, Housing, Sport and Finance (Ministerio de Desarrollo Social, 2017[54]). Under this programme, a number of initiatives have been implemented that aim to create a healthier environment, which promotes and enables an active lifestyle.

The Health Squares initiative aims to provide the public with places to exercise. The programme runs an interactive map of outdoor exercise locations. These Health Squares have a range of exercise equipment and can be used free of charge by the public. For the Open Streets initiative, designated roads and streets are temporarily closed for motor traffic, and opened up to the public for jogging, cycling and walking. Games and workshops are also organised in the streets to get people active.

The CicloRecreoVia programme is developing routes which are exclusive to cyclists, to stimulate the active transport in the population (CicloRecreoVia, 2017[55]). While currently there are a number of separate cycling routes, the goal is to create a single Metropolitan Cycle Road, to connect all the neighbourhoods of Santiago and allow people to cross the entire city. The cycling routes are available on Sundays, and every weekend 40 000 people make use of them (CicloRecreoVia, 2017[55]).

To encourage healthier diets, food markets have been established to promote the consumption fresh local products. Where previously there were so-called 'food deserts' – places where no healthy foods could be purchased – this initiative creates an environment that support a healthy lifestyle. This programme is run in close collaboration with the Ministry of Agriculture (Box 2.3).

Box 2.3. The role of the Ministry of Agriculture – Ensuring access to healthy food

The Ministry of Agriculture in Chile reports three main objectives: 1. To ensure food production; 2. To ensure the quality of food produced; 3. To ensure access to food. They provide technical and financial support to producers, in particular small- and medium-sized producers, with the objective of increasing the production and increase export. The Ministry is also involved in a number of programmes with strong links to public health:

- The Ministry supports 'rural markets', to facilitate the sale of fresh local products produced by small producers. In particular, they try to reduce the food chain from producers to consumers; to work with municipalities to identify places for the markets; and to support producers with the preparation of documents. Fruits and vegetables sold at these markets are cheaper than in supermarkets, and they are located to decrease food deserts.
- About 10 years ago, the Ministry launched a programme bringing together public institutions and private industry, working together to promote reformulation toward healthier products, focusing on sausages, jam, and cheese.
- The Ministry of Agriculture works together with the Ministry of Health and of Education to improve diets in schools. For the Contrapeso programme, the Ministry of Agriculture supports schools in finding local providers of healthy produce.

2.3.7. A comprehensive portfolio of school-based interventions has been developed to improve diet and exercise in students

As shown in Figure 2.2, Chile has the highest rates of childhood obesity among OECD countries, and this rate is growing (OECD, 2017[56]). The impact of childhood obesity on later health is significant, and interventions to curb this rising tide are therefore crucial. Schools play an important role in fighting childhood obesity, by providing children with a healthy environment and by educating them on healthy lifestyles.

Chile has implemented a comprehensive school-based intervention on obesity. The Contrapeso programme aims to promote healthy eating and physical activity among school children (JUNAEB, 2016[57]). It is managed by the governmental organisation JUNAEB (the National Board of School Aid and Scholarships), which is responsible for the welfare of students from primary school to university. JUNAEB is part of the Ministry of Education, but the Ministries of Health, of Sport and of Agriculture also contribute to the design and running of the programme.

The Contrapeso programme consists of 50 measures, including:

- **A restriction on the sale of unhealthy products in schools.** School cafeterias and vending machines are prohibited from selling products that carry the "high in" black label (see section on food labelling). In addition, the school food programme managed by JUNAEB was reformulated to contain less sugar, sweeteners and salt, and more fruit, vegetables and whole grains.
- **Increasing the healthy food choices available for the BAES card.** Approximately 500 thousand students attending high school are entitled to a special card which they can use to buy food. The Contrapeso programme is working to restrict the use of this BAES card to healthy options only, and to increase the number of outlets where the card can be used.
- **Bracelets to monitor physical activity.** Students receive a bracelet which counts steps and analyses sleeping time, to encourage them to reach physical activity targets. The programme also promotes gamification, by providing resources for teachers to develop games and competitions using the bracelets (Box 2.4).
- **Involving the family**. Rather than focusing only on the school environment, the Contrapeso programme engages parents to improve students' lifestyle outside of school and to develop role models. Families can participate together in educational workshops, and school menus and nutritional information are available online for parents.

JUNAEB has a budget of about USD 1 billion, 70% of which is spent on providing food in schools or to top-up BAES cards. JUNAEB also provides computers for students, and the physical activity bracelets. According to JUNAEB, the implementation of the Contrapeso programme, including changes in the food canteens and the provision of the physical activity bracelets, did not produce any substantial change in the annual budget as all the improvements have been implemented following contract negotiations with manufacturers and suppliers.

The Contrapeso programme was launched in 2016, and is currently being implemented in phases. Participation is compulsory for public schools and for publicly subsidized schools. By the end of 2019, 11 000 schools and 1.8M students in Chile will be covered by the programme. However, in its current form private schools are not included in the programme, which account for about 20% of students.

Box 2.4. Increasing physical activity through gamification

What is gamification?

Gamification in its broadest sense refers to the use of game design elements in non-game contexts. In healthcare specifically, it has become a popular method to promote behaviour change. By creating a game around healthy behaviour, these interventions aim to increase motivation and sustain habits. Generally, gamification refers to interventions that involve some form of technology.

What types of gamification exist?

Different technology platforms are being used for gamification in healthcare, including traditional **gaming consoles** (e.g. motion-controlled 'exergames', where players have to exercise, jump and dance to control their avatar onscreen), **smartphones** (e.g. apps which can be used to track a run and compare the distance and route to other users) or dedicated **physical activity monitors** (e.g. activity bracelets, which awards badges when the individual reaches a goal number of steps for the day).

Games encourage healthy behaviours in various ways. They can provide the **capacity** to monitor and improve lifestyle, for example by counting steps or by educating. They can also increase **motivation**, by creating goals, giving out incentives such as badges, or by providing social support. Finally, games can provide the **opportunity or trigger** needed to make changes in lifestyle, through competition and peer pressure, or reminders and alerts.

Does gamification work?

Gamification in healthcare is a relatively new concept and there is no definite answer yet on its effectiveness in changing behaviours. Nevertheless, a number studies have reported encouraging results that show gamification interventions can increase physical activity, improve diets, contribute to weight loss and increase adherence to online programmes. For example, one study, looking at the gamification of dietary decision-making in school cafeterias through a competition, showed an increase in fruit and vegetable consumption of 66% and 44% respectively. Another intervention delivered through a social network app increased weekly moderate-to-vigorous physical activity in adults by 135 minutes versus a control group. However, the long-term impact of these interventions requires further research.

Sources: (Deterding et al., 2011[58]; Johnson et al., 2016[59]; Lister et al., 2014[60]; Looyestyn et al., 2017[61]; Schoeppe et al., 2016[62]) (Jones et al., 2014[63]) (Maher et al., 2015[64]).

2.3.8. Voluntary workplace interventions are incentivised through accreditation

Obesity influences the performance of employees, and can lead to absenteeism and presenteeism (OECD, 2010[3]). It is therefore in the employers' best interest to invest in the health of their workforce. Considering the large amount of time spent in the office, workplace-based interventions can have a considerable impact on overweight and obesity. Employers can create incentives for healthy behaviours; design a healthy workplace with healthy food options and opportunities for exercise; or generally encourage a culture of health (Heinen and Darling, 2009[65]).

While Chile does not have a centrally mandated workplace-based programme, the Chilean government has supported the implementation of voluntary actions in workplaces. So far, about 200 to 250 workplaces have implemented interventions including dedicated walking breaks, physical activity courses, and bicycle parking spaces.

There is no economic incentive associated with the interventions, but organisations can apply for an official certification (SEREMI de Salud O'Higgins, 2013[66]). Companies that conduct an internal review to identify improvement opportunities and develop an improvement plan can become an accredited Workplace Health Promotor (Lugares de Trabajo Promotores de Salud). This certification, and the positive publicity associated with it, functions as an additional incentive for companies to invest in the health of their employees.

The government could develop policies to encourage the implementation of workplace-based health and lifestyle interventions. In the USA, the Affordable Care Act permits employers to provide discounts of up to 30% on healthcare coverage charges to employees who participate in wellness programmes (US Department of Labor, 2014[67]). In addition, the government could provide subsidies, support research and improve dissemination into effective wellness schemes (Goetzel, 2016[68]).

2.3.9. Primary care plays a key role in delivering counselling and physical activity classes

In many OECD countries, the primary care physician functions as a first point of contact in case of illness, and a trusted source of information (OECD, 2010[3]). They are in a unique position to advise patients on healthy diet and exercise. Structured counselling programmes, delivered by primary care physicians and dieticians, have been proven to significantly reduce fat intake and BMI. Chile has a strong primary care system, which plays a key part in the obesity strategy through the Vida Sana programme.

The Vida Sana counselling and physical activity programme was started 10 years ago as a pilot, and has been part of the national prevention package in Chile since 2014. To date, there are about 300 teams delivering this intervention throughout Chile. This one-year programme aims to improve physical activity and diet in patients with obesity, or overweight patients with other risk factors. Participants receive individual and group counselling sessions with nutritionists and psychologists. To contain the delivery cost, medical doctors are only involved if the patient specifically requires medical attention (e.g. in case of diseases). In addition, patients complete 144 hours of physical activity in classes guided by a physical education teacher, physical activity therapist, or kinesiologist (Ministerio de Salud, 2015[69]).

While the sessions take place in primary care centres, the programme is completely independent and run by dedicated councillors. The costs of the intervention, around USD 119 per participant per year, are covered by the national health fund (FONASA). In 2015, 54 529 people participated in the programme, accounting for 6% of the potential target population of 870k people (DIPRES, 2016[70]). To these participants the programme delivered nearly 500k activities, including 164k consultations with dieticians, and 127k physical activity classes.

Despite the high cost associated with the programme, there is reason to believe that it is cost-effective. Intensive counselling interventions combining primary care physicians and dietician are known to be high-cost, but they also have the largest impact in terms of DALYs saved (OECD, 2010[3]). As such, they may also be of interest to the private health insurers (Box 2.5).

Box 2.5. The role of private health insurance schemes

Private insurers (ISAPREs) currently play only a marginal role in prevention, despite covering about 15%-18% of the population. According to the Association of ISAPREs, 10% of individuals change their insurance scheme each year – reducing the incentive as well as the opportunity for individual providers to invest in prevention and public health initiatives. In addition, as the ISAPREs can unilaterally charge a risk-rated premium, the large majority of elderly patients are covered by the public FONASA. This further reduces the incentive for the ISAPREs to invest in prevention and healthy aging.

Some ISAPREs have nevertheless experimented with interventions in this area. One organisation tested a diabetes programme that provides individuals at risk with a funded savings account, which tops up as patients comply with certain pre-determined activities. This funding could be used later in life to cover medical treatment. Conversely, ISAPREs report that all the previous attempts to implement tertiary prevention programmes, empowering patients to limit further disease development, did not bring the expected results and were discontinued. The Association of ISAPREs has, however, indicated that it would support reforms and governmental action that would increase their involvement in public health.

In other countries, private insurers have invested in prevention to reduce cost. For example, in Germany, private insurers or sickness funds are required by law to develop and offer Disease Management Programmes (DMP), which aim to improve coordination and enhance quality of care for the chronically ill. Sickness funds receive incentives for establishing DMPs and enrolling patients. While insurers are free to design their own DMPs, they need to be validated by the Federal Insurance Agency. In 2012, it was estimated that 70% of all diabetic patients were enrolled in a DMP. Diabetic patients enrolled in a DMP were shown to have a lower hospitalisation and mortality rates, and to have lower cost: €122 per patient, including DMP administration and service costs, versus €169 for controls.

Private health insurers in Chile would benefit from primary prevention interventions to tackle unhealthy behaviours and to promote an active lifestyle. Available evidence suggests that private health insurers can expect reduced hospital and drug expenditure. Part of these savings could then be used to kick-start DMPs, which would sustain further reductions in expenditure.

Sources: (Cecchini and Sassi, 2015[71]; OECD/WHO, 2014[72]).

2.4. Further policies can be implemented or expanded to enhance Chile's current obesity strategy

Chile has put in place a large range of interventions and programmes to curb the rise of obesity. Taxation of sugar-sweetened beverages has been implemented to reduce the consumption of these drinks, strict labelling regulation has driven the reformulation of unhealthy food products, and the primary care service in Chile is playing a vital role in delivering prevention programmes.

The Ministry of Health is already working with other Ministries and stakeholders on several initiatives, but there remains scope to do more. The Ministry has indicated an aspiration to further strengthen the collaboration with the Ministry of Education to

increase physical activity levels in schools. It is also important to engage the private health insurers, who are a key stakeholder in both delivery of and benefiting from prevention.

However, a number of further steps could still be taken to improve, complement or expand the current strategy on obesity.

2.4.1. Nutritional labelling policies could be strengthened and expanded to include other products and settings

Chile is ahead of the trend with its strict labelling laws. The use of simple front-of-package warning labels, as has been implemented in Chile, prompts a higher response rate from consumers than a list of nutrients (OECD, 2017[56]). In addition, the scheme has already proven effective in incentivising the reformulation of unhealthy products.

The current labelling programme can be strengthened in a number of ways to increase its impact. The warning labels could be included on both the front and back of packages, to ensure they are clearly displayed at all times. The labelling law can also be extended to cover alcohol products, to create a level playing field for all food and drink products and increase public awareness about the caloric content of alcoholic beverages and. For example, one study found that 16% of consumers said they would reduce their alcohol consumption if calorie information was provided (TNS European Behaviour Studies Consortium, 2014[73]).

In a number of OECD countries, including Canada, Mexico and the United States, it is mandatory to provide nutritional information in certain cases, for example for alcoholic beverages with additives such as sweeteners, for non-standard or prepared beverages, or for beverages which carry a nutritional claim (International Alliance for Responsible Drinking, 2017[74]).

Chile could consider implementing additional labelling regulation that applies to other settings. For example, the labelling laws could be expanded to include menus in chain restaurants, as has been done in states and cities in the USA, Canada and Australia, or to prepared, take-away food (OECD, 2017[56]).

2.4.2. The ISAPREs could play a more active role in the prevention and management of obesity

While private insurers play an important role in Chile's healthcare system, they are less involved in obesity prevention. Private insurers should play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases. An example of a prevention programme managed by a private health insurer is the Vitality programme, which is run by South Africa's largest private health insurer, Discovery Health (Lambert and Kolbe-Alexander, 2013[75]). This incentive-based programme is based on four pillars: assessment and screening, healthy choices, health knowledge, and physical activity. Beneficiaries are encouraged to participate in different activities such as health checks and visits to dieticians through a points system. In addition, gym memberships are subsidised, and fruit and vegetable purchases are eligible for a 25% cash rebate. The cash rebate has been effective in increasing expenditure on healthy foods by 9.3%, and decreasing spend on less healthy food by 7.2% (Sturm et al., 2013[76]). The Vitality programme has resulted in a reduction in medical claims for Discovery Health, thus providing a direct incentive for private insurers to invest in prevention.

The ISAPREs should be encouraged to play a more active role in promoting healthy behaviours and preventing the complications of chronic diseases. For the ISAPREs, offering an attractive prevention and promotion package to enrolees – for instance following the Vitality programme model – could give a competitive advantage. If this is insufficient, the Ministry might look for ways to incentivise greater engagement by the ISAPREs.

In addition, the Ministry could consider including basic prevention services with proven effectiveness and a high return on investment in the minimum package of services that ISAPREs are required to deliver. For example, marketplace healthcare plans offered under the US Affordable Care Act are required to offer cholesterol and diabetes screening, as well as diet and obesity counselling (U.S. Centers for Medicare & Medicaid Services, 2017[77]). As coverage providers for close to 20% of the Chilean population, the ISAPREs should expect to become a more active partner in the effort to reduce obesity.

2.4.3. The successful school-based programme could be expanded to include more measures, cover more schools, and extend to other sectors

Addressing the growing rate of childhood obesity is vital for Chile. The Contrapeso programme in Chilean schools delivers a wide range of interventions to improve diets, physical activity and health education in students. This successful programme could be further expanded to increase its impact across society.

In addition to banning the marketing and sale of unhealthy foods in school, these activities also might be restricted around schools. Some municipalities have already banned outdoor advertising around schools, and these initiatives should be evaluated to determine the effectiveness. If they are proven to have an impact, the Ministry could work with the other municipalities to extend this programme to all regions.

The existing programme should also be extended to private schools, either through a voluntary agreement or as part of their accreditation. Currently about 80% of students (i.e. all students attending a public school or a school receiving funding from the government) is covered. Extending the programme to private schools would result in virtually universal coverage of children.

The healthy food programme implemented at schools could be further extended to other places, such as the army and all the canteens in public institutions. In a second stage, the programme could be also cover food vouchers provided by employers. Lunch or meal vouchers are given to employees to buy food at lunchtime in restaurants and other outlets near work. While these were originally a means to fight malnutrition, they can also be used to fight overweight (Wanjek, 2005[78]). Restricting the use of these vouchers to healthy food options, similar to the credit cards given to students, would improve the diets of employees.

2.4.4. Physical activity interventions could be expanded and better coordinated to complement the policies on diet

The current obesity strategy in Chile encompasses a wide range of interventions to improve the diet of Chileans. However, the policies on physical activity show some room for improvement. While there exist physical activity initiatives at the local level, there seems to be a weaker central coordination and strategy. Especially since physical activity promotion is dependent on a large number of sectors (including housing, urban planning,

education and transport), developing a cross-governmental strategy is crucial to ensure effectiveness and sustainability (OECD/WHO, 2015[79]).

To provide a coordinated approach to physical activity, the government of Slovenia has developed the National Programme for Nutrition and HEPA (Health-enhancing physical activity) 2015—2025 (WHO, 2015[80]). Led by the Ministry of Health, the programme also involves around 16 other Ministries and administrative agencies and institutes, as well as NGOs and professional associations. The programme invests in green open spaces for recreation and organised sports activities; promotes walking, cycling, and hiking in nature; promotes active transport; and ensures the availability of high-quality sports and HEPA programmes.

The use of active transport is an area where Chile could also increase its efforts. The central government could incentivise and support the local implementation of schemes that provide bicycles, improve road safety or encourage active transport. For example, the Smarter Choices, Smarter Places programme was set up by the Scottish government, and provides funding for local initiatives that aim to increase the uptake of walking, cycling and the use of public transport (Norwood et al., 2014[81]). The programme funds the implementation of infrastructure and transport facilities, but also campaigns and training events.

2.4.5. Monitoring and evaluation are key to ensure Chile's strategy is effective

Chile's obesity strategy is multifaceted and includes many different stakeholders, interventions, target populations and outcomes. To assess the effectiveness of the implemented policies and to measure achievements, Chile should put in place rigorous monitoring systems. Well-designed monitoring systems are also a fundamental tool to support the design of further innovative policies or to address potentially unwanted consequences of policies already in place.

As discussed in Chapter 1, Chile needs to improve the availability of key health data, including data on obesity and overweight. Chile has fairly robust data on child obesity rates, collected by JUNAEB as the Mapa Nutricional, and through regular child health checks especially in infancy. The Ministry of Social Affairs also collects self-reported obesity rates for children in the CASEN survey every 2 to 3 years. In addition, the data from the activity bracelets could provide novel insights into physical activity patterns among school children.

However, data availability for adult health risk factors, including obesity, depends primarily on a periodic National Health Survey. There was no health survey undertaken between 2009 and 2016, which meant that for much of the period in which Chile has introduced its ambitious obesity strategy the impact on population health has been obscured. Regularly updated, robust data on obesity levels in the population will be critical for better tailoring the prevention approach in the years to come. The importance of improving the information availability for public health is further explored in Chapter 1, along with examples of different approaches taken by other OECD countries to collect more regular data.

In addition to information on obesity prevalence, Chile may benefit from having more data and insight into the food environment (e.g. what people buy, where they shop, and what they eat). This data would also allow the government to analyse if people change their habits as a result of the policies that have been implemented.

Chile should take action to rigorously monitor the impact of individual obesity policies. The official evaluation of Chile's SSB policy by the University of Chile, the Catholic

University of Chile, the University of Santiago and the University of York is a good example of an academically rigorous approach to policy review. Other interventions should receive similar reviews to ensure their cost-effectiveness.

Monitoring of the implementation of policies is also vital. The enforcement of the food labelling law, and sales of food in schools, is the responsibility of the SEREMI, who monitor food products according to the guidelines provided by the central government. At a national level the Ministry of Health conducts chemical analysis to verify food labels.

The collection and use of any type of individual-level data needs to be carefully governed to ensure privacy is protected. Putting in place a clear framework for data protection, legislation, an accreditation process, and best practices in data security can help create a high-value, privacy-protective health information system (OECD, 2015[82]).

2.5. Conclusion

Obesity is one of the main risk factors threatening the Chilean population and economy. The rates of adult and childhood obesity are higher than the OECD average and would continue to rise without intervention. Chile has put in place an ambitious set of policy measures to combat the rise of obesity. At the national level, mass media campaigns are used to promote healthy lifestyles. National laws on marketing and labelling provide a strong legislative basis to promote healthier choices. A sugar-sweetened beverage tax has been introduced. In many respects, Chile is at the forefront of international public health policy. As a result, international evidence is not always available on the effectiveness of these policies, making it all the more important that initiatives are properly monitored and evaluated.

Local governments are contributing to the fight against obesity with city-wide and community programmes, which aim to provide more healthy food options and stimulate physical activity. Contrapeso, a programme of school-based interventions, encompasses a wide range of interventions aimed at school-aged children, including education on healthy eating, restrictions on the sale of unhealthy products in schools and increasing the healthy food choices available for school meals. Similarly, workplace-based programmes have also been implemented to promote physical activity at work. Finally, at the individual level the primary care system is playing an important role in providing one-on-one counselling and treatment through the Vida Sana programme.

There are a number of ways in which Chile could further strengthen its portfolio of interventions. Chile could expand some of the national policies to include more products and people. For example, the warning logos could be used on menus and alcoholic beverages. Chile should carefully assess the impact of its SSB tax. The success of the Contrapeso programme could be rolled out in other public settings, such as the army or government organisations. There is also a larger role to play for the private insurers, the ISAPREs. Since 17-18% of the Chilean population is covered by the ISAPREs, they have the potential to make a significant impact on population health. To achieve this, it is important to put in place a mechanism by which the ISAPREs can influence their population's lifestyle, as well as benefit from the savings.

Underpinning all these efforts should be a rigorous monitoring system. There currently is a lack of understanding of the effectiveness of the different policies, and the overall impact they are having on obesity, related disease and the economy in Chile. Cost-effectiveness studies are needed for the different interventions, as well as more regular data on obesity prevalence in the population and the food environment.

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Chapter 3. Cancer screening and prevention in Chile

In Chile, cancer is the second leading cause of death and could become the first cause in the near future. In order to reduce the disease burden, Chile could do more to prevent many deaths due to cancer through cancer screening and prevention. This chapter describes the epidemiological burden of cancer in Chile, assesses the governance of Chilean cancer care system and public health policies in terms of prevention and early detection of cancer based on cross-national comparisons, and concludes with a number of policy recommendations which could help Chile strengthen cancer screening and prevention. Together with policies to promote healthy lifestyles, public health policies specific to cancer are key to reducing the burden of cancer in Chile.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

3.1. Introduction

In Chile, as in other OECD countries, cancer is a leading cause of death, for which effective screening and prevention strategies are a high policy priority. Chile has already built mechanisms to screen for some cancers, but weaknesses remain, including in areas of system capacity, stakeholder involvement, population awareness, and data systems to monitor and implement public health policies to fight against cancer.

This chapter begins by setting out the current cancer burden in Chile, as well as recent trends in cancer incidence and mortality. Secondly, the strengths and weaknesses of Chile's cancer care system are explored, followed by a close examination of the Chile's public health policies in the area of cancer, including vaccination and screening and diagnosis for different cancers such as cervical, breast, prostate, colorectal, stomach and liver cancer. Finally, the chapter makes a series of recommendations on the policy priorities for Chile when it comes to increasing cancer screening coverage and promoting early detection of cancer.

3.2. Burden of cancer is high in Chile

Across OECD countries, cancer is the second highest cause of death, but the burden of cancer is increasing faster relative to the first cause of death, diseases of circulatory system. The mortality rate of cardiovascular diseases has declined substantially over recent decades, while cancer mortality has also decreased but at a slower pace. This section summarises cancer incidence and mortality rates and their changes over time in Chile compared to OECD averages to illustrate the relative importance of cancer for public health policies in Chile.

3.2.1. In Chile, cancer incidence is low but cancer could become the first cause of mortality in the near future

Cancer incidence in Chile is significantly lower than that in most OECD countries. There were 196 new cases of cancer per 100 000 population in 2018 which is 35% lower than the OECD average at 301. Across OECD countries, cancer incidence has generally been increasing in recent years, and Chile follows this trend (OECD, 2018[1]; IARC GLOBOCAN, 2018[2]). Since the prevalence of risk factors such as smoking and obesity is high and sometimes increasing in Chile (see Chapters 1 and 2), cancer incidence is likely to continue increasing.

Despite a low rate of cancer incidence in Chile, the burden of cancer is high in Chile. In 2015, based on the mortality rates adjusted to the OECD population structure, cancer accounted for 202 deaths per 100 000 population, only slightly lower than the OECD average of 208. Potential years of life years lost, a summary measure of premature mortality and an indicator of disease burden among people aged between 0 and 69 years old, shows that 20% of all potential years of life years lost is due to cancer. This is a significant share, albeit lower than the OECD average of 27% (OECD, 2018[1]).

In terms of leading causes of death, in Chile, cancer surpassed diseases of the respiratory system in 1970, and since then as observed in many other OECD countries, it is the second highest cause of death after diseases of circulatory system (with the mortality rate of 226 deaths per 100 000 population in Chile and 290 deaths per 100 000 population on average across OECD countries in 2015). Across OECD countries including Chile, the mortality rate for diseases of circulatory system has decreased rapidly over the past

decades while cancer mortality has also decreased but at a slower pace, so the relative burden of cancer mortality is increasing in the OECD.

Following this trend, in Chile it is expected that the burden of cancer will continue to be significant and cancer could become the first cause of deaths in the near future. Already in some regions such as Arica and Parinacota, Tarapaca and Antofagasta in the north of Chile, and Araucania, the poorest region in terms of GDP per capita, and Los Rios in the south, cancer has become the first cause of deaths (Ministry of Health, 2014[3]).

3.2.2. Many people in Chile develop and die from preventable cancers

In Chile, prostate cancer has the highest incidence at 51 new cases per 100 000 men in 2018, followed by breast cancer with 41 new cases per 100 000 women. Colorectal cancer has the third highest incidence with 21 new cases per 100 000 population for both genders and it is higher among men (24 new cases per 100 000 men compared to 18 new cases per 100 000 women). Stomach cancer follows (18 new cases per 100 000 population) and it is much higher among men (27 new cases per 100 000 men compared to 10 new cases per 100 000 women). Lung cancer has the fifth highest incidence at 13 new cases per 100 000 population for both genders and more new cases are found among men (17 per 100 000 men compared to 12 per 100 000 women). To summarise by gender, among men, prostate, stomach, colorectal, lung and kidney cancer have the highest incidence rate while among women, incidence is high for breast, colorectal, cervical, gallbladder and lung cancer in Chile (IARC GLOBOCAN, 2018[2]).

Many of these cancers share common risk factors including poor lifestyles such as obesity, lack of physical activity, smoking, diet and alcohol consumption (Box 3.1). For instance, one study found that 20% of cancer in Chile may be related to obesity (Garmendia, Ruiz and Uauy, 2013[4]), so recommendations to tackle risk factors such as smoking, obesity, alcohol consumption, and physical inactivity that are laid out in previous chapters are very relevant for cancer and important in reducing risks of developing different cancers.

Box 3.1. Risk factors for cancers with highest mortality rates in Chile

Different risk factors are known to contribute to developing cancer. Although not exhaustive, this box lists major risk factors for cancers with highest mortality in Chile in an alphabetical order.

Bladder cancer: smoking, exposure to chemicals such as arsenic, aniline dyes, 2-Naphthylamine, 4-Aminobiphenyl, xenylamine, benzidine, and o-toluidine, age, gender, personal history of bladder or other urothelial cancer, genetic predisposition such as a mutation of retinoblastoma (RB1) and family history.

Breast cancer: age, family history of breast cancer or ovarian cancer, genetic predisposition such as BRCA1 and BRCA2 gene mutation, previous diagnosis of breast cancer, breast density, lifestyles including obesity, physical inactivity, unhealthy and unbalanced diet, alcohol consumption, hormone replacement therapy and contraceptive pill.

Cervical cancer: human papilloma virus (HPV) infection, smoking, weakened immune system, diet low in fruits and vegetables, overweight, and long-term use of oral contraceptive pill.

Colorectal cancer: age, family history of colorectal cancer or polyps, Crohn's disease, ulcerative colitis, genetic predisposition including familial adenomatous polyposis (FAP) and Lynch syndrome (hereditary non-polyposis colorectal cancer (HNPCC)), and lifestyle factors such as a diet high in fat and low in fibre, lack of physical activity, obesity, tobacco and alcohol consumption.

Gallbladder cancer: age, obesity, smoking, unhealthy diet, gallstones, cholecystitis, diabetes, and family history of gallstones, cholecystitis or gallbladder cancer.

Kidney cancer: obesity, smoking, high blood pressure (hypertension), family history of kidney cancer, genetic conditions such as Von Hippel-Lindau syndrome, and long-term dialysis.

Liver cancer: cirrhosis, cirrhosis caused by excessive alcohol consumption, long-term hepatitis B or C viral infection, haemochromatosis, and lifestyles such as obesity, unhealthy diet and inactivity.

*Lung canc*er: smoking and passive smoking, exposure to radon and/or certain chemicals and substances such as arsenic, asbestos, beryllium, cadmium, coal and coke fumes, silica and nickel, air pollution, and family history of lung cancer.

*Pancreas canc*er: age, smoking, diabetes, chronic pancreatitis, stomach ulcer, Helicobacter pylori infection, family history and genetic predisposition such as hereditary breast and ovarian cancer syndrome, caused by BRCA1 or BRCA2 gene mutations and familial atypical multiple mole melanoma (FAMMM) syndrome caused by p16/CDKN2A gene mutations.

Prostate cancer: age, family history, obesity, lack of exercise, smoking, diet and genetic predisposition including BRCA1 or BRCA2 gene mutations, Lynch syndrome.

Stomach cancer: age, gender, smoking, H. pylori infection, diet, a family history, genetic predisposition including HNPCC, FAP and BRCA1 and BRCA2, having another type of cancer, pernicious anaemia, peptic stomach ulcer, and stomach surgery.

Source: (American Cancer Society, 2017[5]; NHS Choices, 2017[6])

As of 2018, the incidence of cancers which are common in Chile is generally lower than those in most OECD countries with some exceptions. On average across OECD countries, the incidence rate is 71 per 100 000 men for prostate cancer, 78 per 100 000 women for breast cancer, 31 per 100 000 population for colorectal cancer and 29 for lung cancer and they are all higher than the rates in Chile in 2018. For some cancers such as cervical, stomach and gallbladder cancer, however, the rate in Chile is higher than the OECD average. For instance, for cervical cancer, incidence rate in Chile is almost 30% higher than the OECD average of 9 new cases per 100 000 women (IARC GLOBOCAN, 2018[2]).

Turning to mortality, the most recent data available show that in Chile cancer accounts for 252 deaths per 100 000 men, which is lower than the average rate in the OECD (274) but not significantly lower despite much lower cancer incidence (222 new cases per 100 000 men in Chile compared to 342 on average in the OECD). Among men, in 2015 cancer with highest mortality in Chile is prostate cancer (44 per 100 000 men), stomach cancer (40), lung cancer (32), colorectal cancer (22) and liver cancer (12). The mortality

rate in Chile is lower than the OECD average for lung and colorectal cancer, about the same for liver cancer, and higher than the average for prostate and stomach cancer (OECD, 2018[1]; IARC GLOBOCAN, 2018[2]).

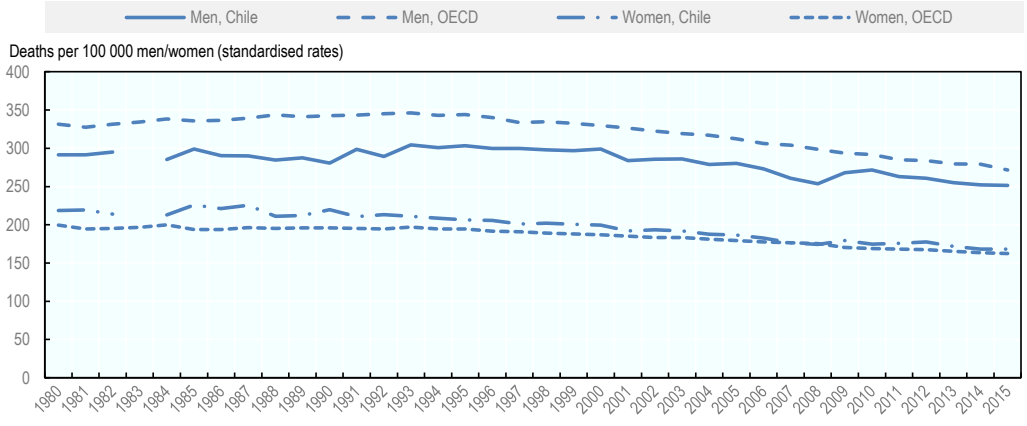
According to the latest data, cancer mortality amongst women in Chile is 168 deaths per 100 000 women, slightly higher than the OECD average (163 per 100 000) while the incidence rate is much lower than the average (178 new cases per 100 000 women in Chile compared to 271 on average in the OECD). Among women, the leading cause of cancer mortality in Chile is breast cancer (19 per 100 000 women), colorectal cancer (18) and lung cancer (17), stomach cancer (15) and pancreas cancer (10) in 2015. The mortality rate is also high for cervical cancer (8) and liver cancer (8). Compared to most OECD countries, the rate is low for breast, lung and pancreas cancer and about the same for colorectal cancer but high for stomach, cervical and liver cancer (OECD, 2018[1]; IARC GLOBOCAN, 2018[2]).

Following the trends across OECD countries, mortality rates due to all cancers are higher among men than among women in Chile. The gender difference in cancer mortality can be explained at least partly by higher prevalence of some risk factors among men (see Chapter 1 and Chapter 2).

3.2.3. Lung, prostate and colorectal cancer mortality rates in Chile have not declined as they have in many OECD countries

Although overall cancer mortality rates have been declining in Chile, as in most OECD countries, the pace was different by gender and Chile made slower progress among men than among women. Among men, the decline was slightly slower in Chile than in most OECD countries. Since the peak of cancer mortality rate in the OECD and in Chile in 1993, mortality has declined by 17% in Chile while the OECD average decline was 22. Amongst women cancer mortality was highest in 1984 in many OECD countries, and highest in Chile in 1985. Since the 1984 peak, the female OECD cancer mortality average dropped by 19% while the rate for Chile fell by 21% (Figure 3.1). For both men and women, overall cancer mortality decline in Chile was mainly due to the reduction for stomach cancer (Figure 3.2 and Figure 3.4).

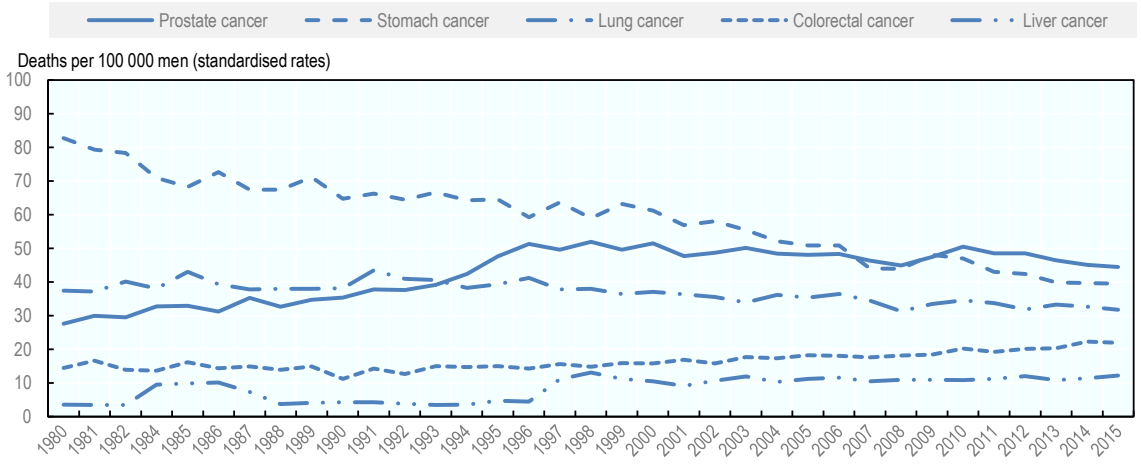
Figure 3.1. Cancer mortality rates among men and women, Chile and OECD, 1980-2015



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

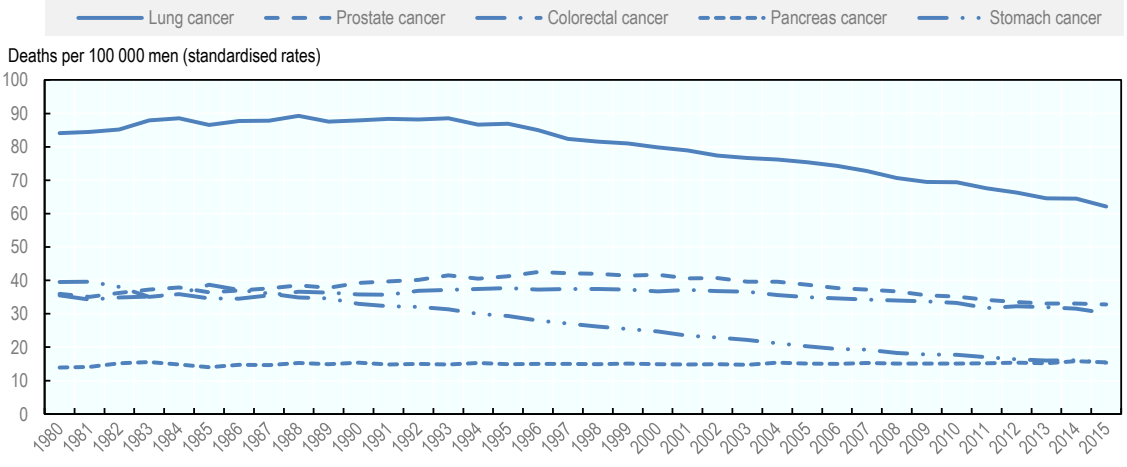
For some cancer such as lung, prostate and colorectal cancer, the trend in mortality rates among men in Chile deviated from the OECD averages. For lung cancer, in the 1980s most OECD countries had a much higher mortality rate than Chile, but since 1980 the OECD average lung cancer mortality rate has declined faster (by 26% compared to by 15% in Chile), probably reflecting at least partly the smoking rate which continues to be high in Chile compared to many OECD countries (see Chapter 1). On the other hand, for prostate and colorectal cancer, mortality rate in Chile increased while most OECD countries managed to have a decreasing trend over recent decades (Figure 3.2 and Figure 3.3).

Figure 3.2. Mortality rates of major cancers among men in Chile, 1980-2015



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

Figure 3.3. Average mortality rates of major cancers among men in the OECD, 1980-2015

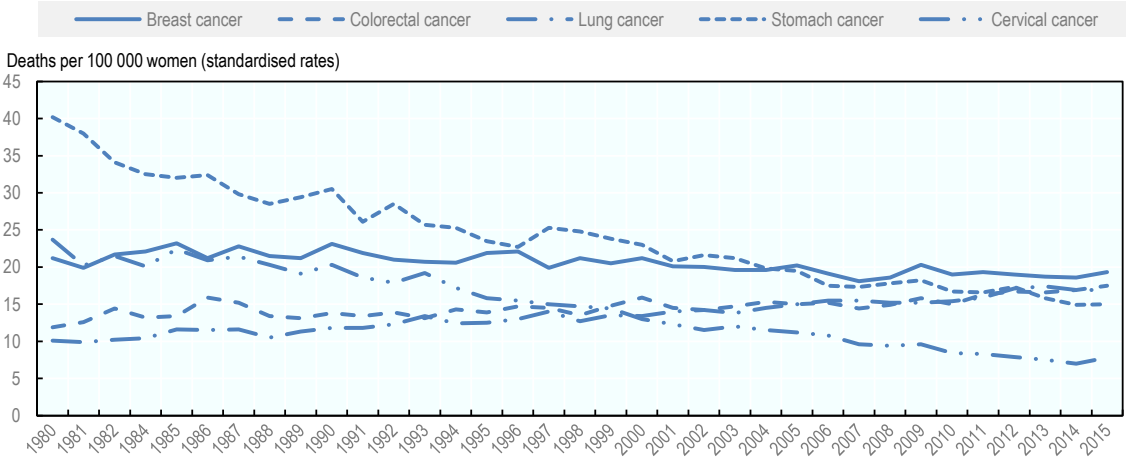


Source: OECD Health Statistics 2018 https://doi.org/10.1787/health-data-en.

Similarly, among women, for breast and colorectal cancer, the mortality trend in Chile was different from the trend in most OECD countries. With regards to breast cancer, the

mortality rate in Chile was 35% lower than OECD averages in 1980, but it did not decline as fast as in many other OECD countries (since 1980 a decline of 9% in Chile compared to 25% on average in the OECD). As for colorectal cancer, similar to the trend observed for men, the mortality rate has declined steadily in most OECD countries since 1980 but Chile experienced an increase, narrowing the gap with the OECD average (Figure 3.4 and Figure 3.5).

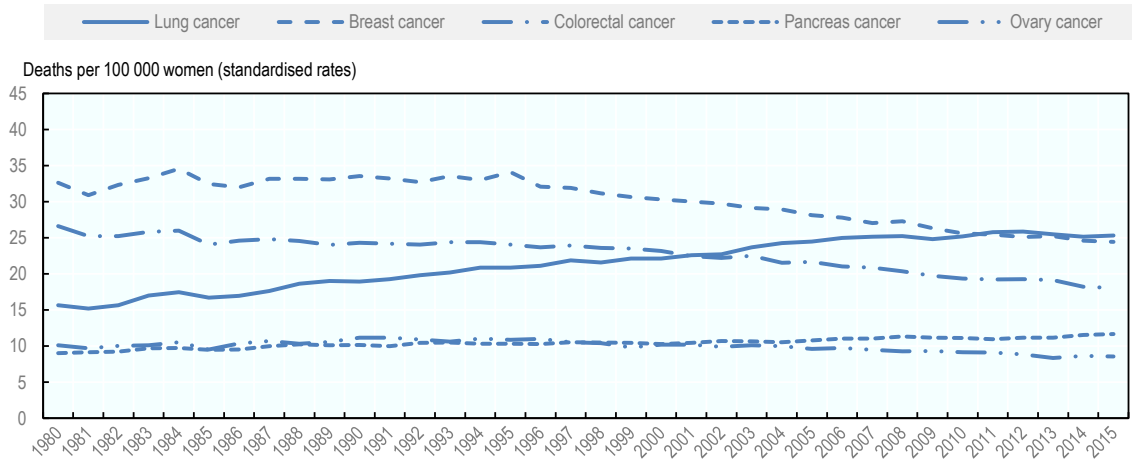
Figure 3.4. Mortality rates of major cancers among women in Chile, 1980-2015



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

With regards to lung cancer, contrary to the overall trend among men, the mortality rate for women has increased across OECD countries including Chile over the past decades, and the rate grew slightly faster in Chile (by 67% between 1980 and 2015) than the OECD average (by 62%). Smoking is considered to increase the risk of developing lung cancer later in life and an increasing mortality trend is likely to reflect an increase in smoking rates among women decades ago (OECD, 2015[7]).

Figure 3.5. Average mortality rates of major cancers among women in the OECD, 1980-2015



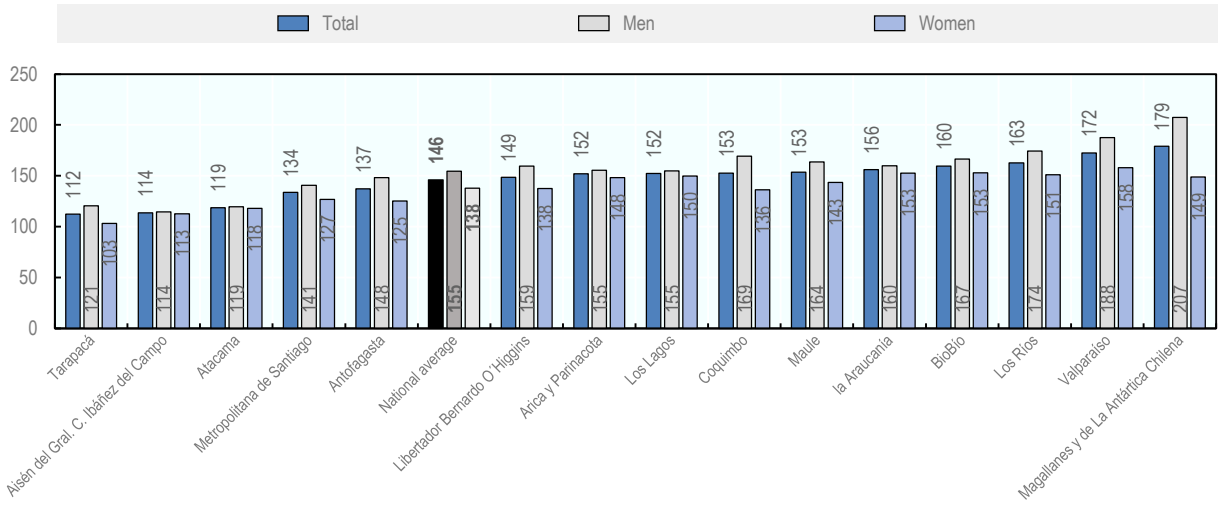
Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

3.2.4. In Chile, the burden of cancer varies by regions, ethnicity and socio-economic group

Cancer incidence in Chile varies by region, socio-economic and ethnic background. The incidence of stomach cancer is relatively high among indigenous populations, and gallbladder cancer incidence is higher among people with certain ethnic origins, lower educational attainment, women and urban residents (Jimenez de la Jara et al., 2015[8]). These within-country variations in incidence may be partly related to differences in modifiable lifestyle factors for which public health measures can play some role, while they are also likely to be related to differences in genetic predisposition to some extent.

The cancer mortality rate also varies across Chile's regions. The overall cancer mortality is high in some regions including Los Rios, Valparaiso and Arica y Parinacota, while it is low in Tarapaca region (Figure 3.6). The mortality rate of specific cancers is also different across regions. For example, the mortality of rectal cancer is high in southern regions (The Government of Chile, 2010[9]). The mortality rate of colon cancer is particularly high in Magallanes and Arica at over 10 per 100 000 population and it grew rapidly over the past decade, particularly in Arica. In Valparaiso, Maule and Magallanes the mortality rate of stomach cancer is higher than the national average while in Valparaiso, Maule and Los Ríos the mortality rate of prostate cancer is higher than the national average. As to lung cancer the regions of Arica and Parinacota, Antofagasta, Atacama, Valparaiso, Metropolitan Santiago and Aisén have mortality rates higher than the national average (Roco et al., 2013[10]). The incidence rate of colon cancer is highest in southern regions of Chile, while skin cancer incidence is high in the northern region of Antofagasta at 60 per 100 000 women and 75 for men while it is as low as 8 and 10 respectively, in Bio Bio, and 21 and 19 in Los Ríos (The Government of Chile, 2010[9]).

Figure 3.6. Cancer mortality rates by region in Chile, 2014



Source: (Ministry of Health, 2014[3]).

Cancer mortality rate is also different by individual's ethnic and socio-economic background. Cancer mortality is higher among those with lower education, and mortality differences by socio-economic background are particularly prominent for gallbladder, gastric, cervical and prostate cancer (The Government of Chile, 2010[9]). Mortality rates are also sometimes different by ethnic group. For example, mortality from gallbladder cancer is high in rural areas particularly among indigenous people with Mapuche descent who also have a higher incidence rate of gallbladder cancer than other population groups (Moore et al., 2014[11]). Within-country variations in mortality may be related to differences in modifiable lifestyle factors and genetic predispositions but they are associated at least partly with variations in other factors such as screening coverage and access to and quality of cancer diagnosis and treatment.

Cancer screening structures are in place but could be strengthened Across OECD countries, strong cancer care systems share some common characteristics. They have solid governance structures and policy tools such as having a responsible person or institution for cancer care, implementing comprehensive cancer care policies, setting cancer-specific goals with defined timeframe, allocating adequate level of resources for achieving policy goals, embedding effective incentives for improving quality of cancer care, periodically monitoring and reporting progress on cancer control and giving feedback to different stakeholders for continuous improvement (OECD, 2013[12]). Across countries, these governance structures and policy tools are associated with better cancer outcomes. This section evaluates the current state of Chile's cancer care system based on its governance structures, policy tools and cancer care outcomes, relative to other OECD countries.

3.2.5. Chile has developed its cancer care system incrementally to tackle the increasing burden of cancer

Chile has been strengthening its cancer care system incrementally over the past several decades. Since the late 1980s, Chile has developed several programmes to reduce the burden of cancer; Chile's National Cancer Programme is now composed of five discrete programmes. The first programme is the National Cervical Cancer Programme introduced in 1987, relatively early compared to most OECD countries. Then, in 1988, two

programmes, the National Programme of Cancer Drugs for Adult and the National Programme of Cancer Drugs for Children were implemented, and in 1995, another two programmes, National Breast Cancer Programme, and National Pain Relief and Palliative Care Programme were introduced (Ministry of Health, 2015[13]). The National Cancer Programme has an emphasis on health promotion, prevention and early diagnosis, and it developed guidelines for delivering cancer care. This programme also aims to assure equitable access to cancer care among patients and to improve continuity and quality of care throughout patient pathway while responding to the need of patients and their families.

Since the 2000s, Chile has been tackling cancer as one of the major diseases in the country. In 2000, the national health strategy called Health Priorities 2000-2010 was introduced with an aim of tackling risk factors for non-communicable diseases, in particular diseases with high burden which included cancer, cardiovascular disease, respiratory diseases, diabetes, mental health and dental health. The subsequent Health Priorities 2011-2020 also aims to reduce the burden of major diseases and focuses on cancer as the second priority disease. In addition, in 2005, in view of achieving universal health care, Universal Access with Explicit Guarantees (AUGE) was introduced to improve access, quality, financial protection and timeliness of health care for priority diseases including cancer (see Chapter 1). Initially, AUGE included 10 cancers including paediatric, breast, cervical, prostate, gastric, prostate cancer, acute and chronic leukaemia, lymphoma and primary tumours of the central nervous system. Since then, the type of cancer and cancer care interventions covered by AUGE have increased and as of 2018, 17 interventions related with cancer are included.

Box 3.2. Universal Access with Explicit Guarantees (AUGE) for cancer

In 2005, Chile introduced the Universal Access with Explicit Guarantees (AUGE) and access to care, quality of care, financial protection and timeliness of care for 80 priority health conditions including different types of cancer, diabetes, hypertension are assured legally for all population insured either by FONASA or ISAPRES (see also Chapter 1). Quality of care is assured through registration and accreditation of providers delivering AUGE-covered services, and medical protocols need to be followed for AUGE-covered interventions. Patients are guaranteed to receive care within defined waiting time which is set for each health condition, and if the public sector is not able to provide care within the waiting time guarantee, patients can seek care in the private system and the cost of private health services is covered by FONASA. Studies show that AUGE has contributed to improving health outcomes and equity (Bitrán, Escobar and Gassibe, 2010[14]; Frenz et al., 2014[15]).

Over years AUGE-covered cancers have been progressively expanded. For example, AUGE initially covered breast and cervical cancers in 2005, coverage was expanded to gastric and prostate cancers from 2006 and bladder and colorectal cancers were included in 2013. Childhood cancer is also covered. However, as of 2018, among cancer with high disease burden, lung cancer is not included in AUGE. while care for lung cancer is still available in public hospitals within the limit of their yearly budget and in private hospitals. Table 3.1 shows the waiting time guarantee set in relation to diagnosis, treatment and follow-up care for AUGE-covered cancers.

Table 3.1. AUGE coverage and waiting time guarantees for cancer care

	Starting year	Screening	Diagnostic confirmation	Suspected case to specialist consultation	Biopsy and other tests	Treatment	Follow-up care
Cervical cancer	2005	30 days of suspected case	40 days		20 days	30 days if pre-invasive, 20 days if invasive, complementary treatment within 20 days	First control within 90 days
Breast cancer	2005		45 days	45 days		30 days since diagnostic confirmation, complementary treatment within 20 days of medical indication	First control within 90 days
Gastric cancer	2006		30 days since specialist referral	30 days		Surgery within 30 days of diagnostic confirmation, eradication treatment within 7 days, and specialist care within 60 days if peptic ulcers and confirmation of H. Pylori bacteria	
Prostate cancer	2006				60 days since diagnostic confirmation	60 days since biopsy and other tests	First control within 45 days
Gallbladder cancer	2013		30 days for patients age 35-49 with gallstones in gallbladder or bile ducts			Surgical removal of gallbladder within 90 days of diagnostic confirmation	
Colorectal cancer	2013				45 days since diagnostic confirmation	30 days of medical indication	First control within 90 days

Source: (Ministry of Health, 2015[13]).

Like Chile, many OECD countries initially implemented specific cancer programmes. However, OECD countries such as the Czech Republic, France and the United Kingdom then introduced overarching and comprehensive cancer control policies through National Cancer Strategies or National Cancer Plans, starting in the 2000s. These strategies or policies initially focused on prevention and screening but have since been expanded to cover treatment, follow-up, care co-ordination, palliative care, patient-centred care and monitoring. Although an introduction of the national strategy or plan is not a prerequisite for building strong cancer care systems, a number of OECD countries have leveraged the introduction of National Cancer Control Strategies or Plans by undertaking a number of reforms needed to tackle cancer control simultaneously. For example, countries have simultaneously put in place policies or strategies such as improving access to cancer care and resource allocation, promoting quality of cancer care throughout patient pathway and driving efficiency gains in cancer care delivery, and have also focused on involving different stakeholders in the cancer care system (see Box 3.3).

Box 3.3. National Cancer Plans in several OECD countries

In recent years, a growing number of OECD countries have introduced National Cancer Control Plans to strengthen the governance of cancer care, and over time, policy focus for cancer control has changed across countries.

Several OECD countries such as Belgium, the Czech Republic, Italy, the Netherlands and Sweden implemented various discrete cancer policies before introducing a comprehensive national plan. In the Czech Republic, for example, cancer policy in the early 2000s focused on screening programmes for breast and cervical cancers; later in the decade, in 2005, a more comprehensive effort, the National Cancer Control Programme, was introduced to improve the quality of care and cancer survival more broadly.

Several OECD countries changed the focus of National Cancer Control Strategies to continue tackling emerging policy challenges in recent decades. In England, for example, the NHS Cancer Plan was introduced in 2000, and outlined the government's comprehensive national programme for investment in and reform of cancer services. Building on the progress made since the NHS Cancer Plan, in 2007 the Cancer Reform Strategy was introduced to set a direction for cancer services over the next five years. It focused on preventing cancer, diagnosing cancer earlier, ensuring better treatment, living better with and beyond cancer, reducing cancer inequalities and delivering cancer care in the appropriate settings through better use of information and stronger commissioning and funding.

To give another example, in France, the first Cancer Plan with a comprehensive approach was implemented between 2003 and 2006, and was followed by the second Cancer Plan 2009-2013 that dealt with emerging challenges such as research, monitoring, prevention, screening, patient care and life during and after cancer. The third Cancer Plan was introduced in 2014 and is effective until 2019. This Plan focuses on prevention, early diagnosis, access to high quality care and innovations and more patient-centred care. It also aims to tackle inequalities in cancer incidence and cancer outcomes. The governance of cancer care has been also strengthened by establishing an independent body (Institut National du Cancer) to oversee the overall implementation of cancer control, allocating additional resources to achieve specific objectives, and monitoring and evaluating the progress made (OECD, 2013[12]; OECD/European Observatory on Health Systems and Policies, 2017[16]).

In some OECD countries, involvement of different stakeholders including regional authorities was key for the success of nationwide cancer control. For instance, the cancer care strategy in the Spanish National Health System, first introduced in 2006 and updated in 2009 with new policies and strategic goals, was designed through close collaboration with all key stakeholders including civil society. It was a co-ordinated effort between the Minister of Health and the regional governments and such stakeholder involvement facilitated the implementation of cancer care strategy across health authorities in regions. In Italy, regional governments participated extensively in the development of the first National Cancer Control Plan in 2006, which was adopted and implemented much more consistently at the local level than earlier initiatives were. Regional authorities have been key players in cancer control in a few other countries such as Canada and Sweden, which developed regional plans first and then National Cancer Plans, and countries such as

Australia and Korea developed regional plans outlining the implementation strategies for local stakeholders, based on the National Cancer Plans (OECD, 2013[12]).

3.2.6. Key governance structure and policy tools already exist in Chile for cancer control

Although Chile has not introduced overarching National Cancer Strategies or Plans, it has a cancer care system supported by a clearly defined governance structure and policy tools for cancer control.

Responsibility for cancer care is clearly set out in Chile, and the Ministry of Health has the overall responsibility for the governance of cancer care system. In particular, within the Ministry, the National Cancer Plan Unit is in charge of defining cancer care policies and supervising its compliance. There are also departments which take charge of specific issues; the Department in charge of the National Immunization Program (PNI) is responsible for all immunisation schemes which include HPV and hepatitis B vaccinations; the Department of Primary Health Care within the Ministry is in charge of the implementation of PNI and screening for cervical, breast, colon and stomach cancer provided at primary health centres. In other OECD countries too, the responsibility of cancer control often falls to the Ministry of Health and it is held accountable for meeting the targets it set. In addition, in Chile, regional health authorities and health care professionals are responsible for implementing cancer screening programmes in particular for cervical cancer, based on the primary care system goals set at the regional level.

As in other OECD countries with strong governance of cancer care systems, Chile has established some cancer-specific targets or objectives at the national level, and timeframes were specified for achieving them. For example, targets of Health Priorities 2000-2010 included targets such as decreasing age-standardised mortality rate by 40% for cervical cancer, by 25% for breast cancer and by 25% for gallbladder cancer during the implementation period. Although targets were not necessarily met, some progress was made for these cancers particularly for cervical and gallbladder cancer. Other time-bound targets included areas of early detection, screening, reduced waiting time and improved treatment. Health Priorities 2011-2020, which is currently in place, also sets a goal of decreasing cancer mortality by 5% by 2020, and between 2011 and 2015, Chile has already decreased mortality rate by 4.1% (OECD, 2018[1]).

Additional resources were also made available to improve access to cancer care in Chile recently. Chile spends about 1% of GDP on cancer care (Jimenez de la Jara et al., 2015[8]) which is higher than the spending level in most OECD countries. Part of this investment was made to improve the availability of specialised care for different types of cancer. The number of public cancer care centres were increased from 19 in 2002 to 21 in 2010 (OECD, 2013a), and as of 2017, there were also 7 radiotherapy units, 29 chemotherapy units, 12 oncohematology units, 1 centre providing bone-marrow transplant for adults, and 1 centre providing bone-marrow transplant for children. Additional public funding was also made available to pay for procedures and treatment covered by AUGE, as its coverage has expanded in recent years (Box 3.2).

Chile has taken multiple approaches to assure financial access to cancer care among patients and their family. Primary care provides services for different health conditions including cancer, such as screening and diagnosis tests, palliative care and many routine blood tests, and all these services are provided free of charge. For AUGE-covered services a co-payment of 20% of the total cost is required by patient but a maximum payment limit is set for health care, including pharmaceuticals. To assure access to health

care among the poor no co-payment is required for AUGE-covered services by low income patients if they are insured by FONASA or ISAPRES (OECD, 2013[12]). In addition, according to the Ricardo Soto law, certain cancer patients can also seek additional financial support for exceptionally high cost treatment, in which the Central Commission, composed of oncologists in the capital Santiago, evaluates the eligibility of each cancer case. For example, inclusion criteria are examined for the use of Herceptin, and approximately 120 to 140 breast cancer patients are allowed to receive the treatment for free every year (OECD, 2013[12]).

The Chilean cancer care system has also sought efficiency gain and quality improvement through improved resource allocation and reorganised cancer care delivery in recent years. For instance, Chile has centralised cancer care delivery by concentrating resources and expertise at specialised institutions as seen in other OECD countries. Cancer networks have been also established in order to facilitate co-ordination among professionals engaged in oncology care (OECD, 2013[12]).

Chile also implemented several additional policies focusing on improving the quality of cancer care. First, the Central Commission of Experts, established in 1988 and now called the *Programa Adulto Nacional de Drogas Antineoplásicas* – PANDA, develops clinical guidelines to standardise and assure quality of cancer care. Second, reimbursement is linked with evidence-based care delivery and only those treatments and procedures that comply with the guidelines are reimbursed. As a result, the compliance level and quality of cancer care are considered to be improving. Third, similar to other OECD countries, Chile developed unified licensing and certification systems to train medical professionals with specialised expertise and skills in cancer care and started cancer service accreditation system in 2005, although there is a report that professional licensing has not been implemented systematically within the country (OECD, 2013[12]). Finally, for types of cancer covered by AUGE, the patient pathway is organised based on an optimal treatment plan which also includes follow-up and palliative care in a timely manner based on waiting time guarantee (Box 3.2). Palliative care, for instance, is provided systematically in a co-ordinated manner to all cancer patients, either in hospitals or at home, by multidisciplinary team composed of physicians, nurses, psychologist, kinesiologists and other health professionals working together with patients and their caregivers.

3.2.7. Cancer care in Chile is better organised for some cancers than for others

Cancer care is organised relatively well for certain cancer such as cervical, breast and childhood cancer, which are all covered by AUGE. Given a long history of prioritising women's health, the network of gynaecologists and midwives is well established and distributed all over the country in Chile. As for childhood cancer, since its inclusion in the AUGE, infrastructure and medical equipment have been improved in most centres providing care. Consequently, cancer care is provided to all children in need of care in a relatively timely manner and the quality is considered similar across providers despite a shortage of qualified health professionals at medium and high complexity establishments such as hemato-oncological and paediatric oncologist nurses, paramedical technicians, psychologists and social workers.

For other cancers, however, access to care is patchy. The availability of cancer care institutions such as facilities providing radiotherapy and chemotherapy still varies across regions, and travel to specialised care facilities is often difficult. According to the most recent data available the number of certified oncologists per capita was also low in Chile,

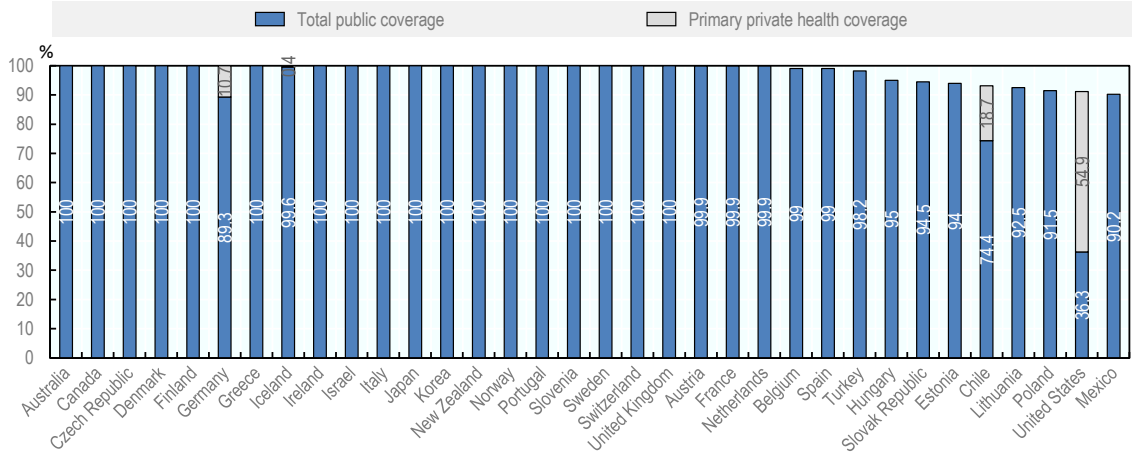
at below three per million population in 2009 while the density was higher in other OECD countries. For instance, Sweden has as high as over 60 certified oncologists per million population. In addition to oncologists, there is also a need for radiologists, pathologists and surgeons including thoracic surgeons in Chile, and the availability of health care professionals is particularly low in smaller cities and rural areas. For example, surgeons who can treat lung cancer patients appropriately are concentrated only in a few big cities, leading to geographic inequality in access to care among patients (OECD, 2013a). Some reports also suggest that access to care is not assured sufficiently for cancer such as stomach and gallbladder cancer (Jimenez de la Jara et al., 2015[8]).

3.2.8. Chile still faces many challenges in cancer control

Despite the progress made in strengthening governance of the cancer care system and delivery of cancer care particularly for priority cancers, data suggests that Chile still lags behind many OECD countries in terms of cancer control. As shown before in the Section 3.1, despite its very low cancer incidence, cancer mortality in Chile is only slightly lower than the OECD average. Over recent decades, among men, cancer mortality rates declined more slowly in Chile compared to most OECD countries. Among women, although the decline in the mortality rates was faster than in most OECD countries, the mortality rate in Chile continues to be higher than the OECD average.

These data reflect a number of following challenges that the Chilean health system faces. First, as described in Chapters 1 and 2, among its population, risk factors are increasing, leading to an increasing burden of non-communicable diseases including cancer. Second, while most OECD countries have achieved universal health coverage already in the 1970s and 1980s and hence have a more established health system to tackle different policy areas including cancer control, Chile still continues aiming at achieving universal health coverage (Figure 3.7) and assuring access to health care through AUGE. Although slowly decreasing, the share of those with unmet health care needs is still high at around 8% in 2015 (Ministry of Health, 2015[13]), so it is more challenging to focus on its fight against cancer in Chile, compared to many other OECD countries.

Figure 3.7. Population coverage for a core set of services, 2016 (or nearest year)



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

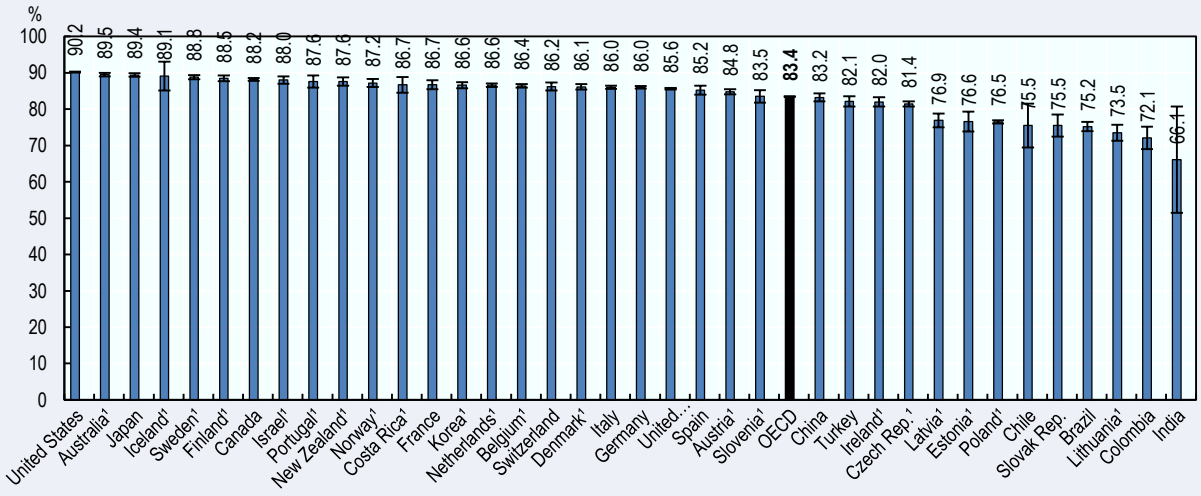
Third, as discussed in *Cancer Care: Assuring Quality to Improve Survival* (OECD, 2013[12]) a full suite of policies need to be implemented to improve cancer-related outcomes, but challenges still remain in Chile's health system despite the efforts made to improve cancer care delivery and to strengthen the governance of cancer care in recent years. For example, monitoring of cancer control is essential for identifying issues in cancer care, and improving quality of cancer care, but despite some important progress made, monitoring mechanisms for cancer care are still weak in Chile. For childhood cancer, an integrated information system has been developed, allowing an assessment of clinical management and outcomes in the country. In addition, hospital cancer registries, implemented in 2011, monitor the quality of cancer care at an increasing number of providers. Chile also participates in the international surveillance and monitoring of cancer care through its participation to the OECD, WHO including Pan American Health Organization and the CONCORD Programme. However, despite these developments the current health information system in Chile still does not enable regular monitoring and reporting of some key data in cancer care, such as cancer survival estimates across all regions and over time at the national level beyond childhood leukaemia and cervical cancer (see Box 3.4), or more modern forms of data such as patient experiences (PREMs) with cancer care and cancer outcomes including patient-reported outcomes (PROMs) which cover quality of life and functional ability (OECD, 2017[17]).

Box 3.4. Cancer survival estimates for Chile

Chile participates in the CONCORD programme, the global programme for the surveillance of cancer, led by the London School of Hygiene and Tropical Medicine (Allemani et al., 2018[18]). While Most OECD countries participate in the CONCORD programme at the national level, allowing nationally-representative survival data to be reported for international comparisons. However, Chile participates based on four regional registries developed which cover less than 20% of the population (Jimenez de la Jara et al., 2015[8]).

Despite the data coverage, the CONCORD data are considered the best available Chilean cancer survival data for international comparisons, and according to this programme, survival prospect of cancer patients, which is often used as a proxy for assessing effectiveness of cancer care, is still one of the lowest in the OECD. Five-year net survival was 75.5% for breast cancer patients who were diagnosed between 2010 and 2014, and this is much lower than the OECD average of 83.4% (Figure 3.8). For the same period, five-year net survival for cervical cancer was 56.7%, about 10 percentage points lower than the OECD average of 65.6%. Similarly for acute lymphoblastic leukaemia for children, this data source reports five-year net survival at 63.9%, much lower than the OECD average of 86.3% and for colon cancer, the survival estimate remains one of the lowest in the OECD (OECD, 2018[1]; OECD, 2017[17]).

Figure 3.8. Breast cancer five-year net survival, 2010-14



Note: 95% confidence intervals represented by H. 1. Data with 100% coverage of the national population.
Source: CONCORD programme, London School of Hygiene and Tropical Medicine.

These data available for international comparisons depict a rather worrying picture of the current state of cancer care in Chile but a caution is needed to interpret Chilean data from the CONCORD programme. For childhood leukaemia, one of the priority cancers in the country, Chile has a nationwide established health information system and this allows reporting of national survival estimates. According to this national source, survival of childhood leukaemia has improved substantially between the periods 2000-2004 and 2005-2009 (PINDA, 2009[19]) On the other hand, the data from the CONCORD programme based on four registries show that the change between these periods was not statistically significant (OECD, 2018[1]). Hence, it is possible that the data generated from four regional registries, reported by the CONCORD, does not reflect the national situation. Given this issue of data coverage, this chapter mainly uses cancer mortality to assess cancer care performance in Chile relative to other countries, even though cancer survival estimates are considered as important statistics to evaluate the effectiveness of cancer care including early diagnosis and treatment across countries.

3.3. Prevention and cancer screening have been introduced in Chile but cancer outcomes remain relatively poor

In terms of prevention and early detection of cancer, Chile made some progress. Yet, it is not generally as effective as in best performing countries in the OECD. This section summarises the progress made as well as challenges that Chile faces to advance prevention and early detection of cancer, including vaccination and screening and diagnosis for different cancer such as cervical, breast, prostate, colorectal, stomach, and liver cancer.

3.3.1. Cervical cancer screening has improved early detection but its coverage could still be increased

Chile has a well-established cervical cancer screening programme. In 1987, Chile reorganised its cervical cancer screening and introduced a nationwide screening programme, a move which was relatively early compared to other OECD countries. Previously, a cervical screening service started in 1965 took Pap smears annually from women attending the maternal and childcare units of the primary health centre. Since the service indirectly targeted women at low risk of cervical cancer but not those with potentially high risk who do not seek health care, it was considered not effective (Sepúlveda and Prado, 2005[20]). Based on the analysis of age-specific mortality rates, a nationwide screening programme was developed and rolled out. Currently a Pap smear is available to women aged between 25 and 64 every three years and annual screening is provided to women with presence of risk factors. The target age of the screening programme is slightly different from many other OECD countries, which target women aged between 20 and 69 (OECD, 2018[1]). In Chile, women in the target group can have a Pap smear taken as part of Preventive Examination (EMP) (see Chapter 1) free of charge. Cervical cancer screening is also part of AUGE, and Pap smears taken outside of the Preventive Examination are also provided free of charge.

In order to increase screening coverage, several efforts have been made, and were essential in rolling out the cervical cancer screening programme nationwide. First, Chile involved stakeholders such as regional health authorities and health care providers at the preparation stage before introducing cervical cancer screening programme, and this early stakeholder involvement has formed a critical mass of highly motivated individuals at different levels for implementing the programme. Secondly, in order to reach out effectively to target women, primary health care registries have been used to identify target population for cervical cancer screening and target women are reached by invitation letter or volunteers visiting them at home (Sepúlveda and Prado, 2005[20]). Third, to provide incentives for high quality care among primary care providers, pay for performance is in place for various goals set in Primary Health Care Indicators, and this monitoring framework includes a goal related to the coverage of Pap smear. Each of these goals is decided every year for each region based on negotiations between regional administrations (*Communas*), municipality and health care professionals to align with the availability of resources and health care plan. The full bonus payment is made only if all goals are attained, so there is a pressure to achieve these goals together among professionals at the municipality level.

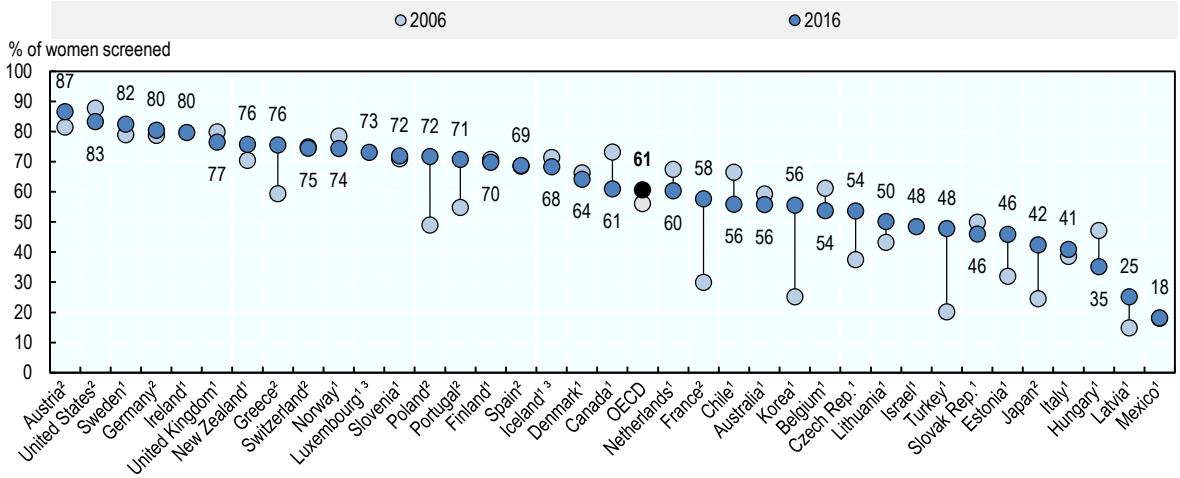
In terms of quality of diagnosis, standards for cervical cancer screening and quality assurance procedures in Chile are similar to those in other OECD countries. For example, peer review is performed to verify Pap smear results and the Cancer Prevention Centre of the Clinical Hospital of the University of Chile provides quality assessment of these results, contributing to the effective early diagnosis of cervical cancer in the country.

These efforts contributed to increased cervical cancer screening coverage and better outcomes for cervical cancer initially. Cervical cancer screening coverage in Chile increased, and women diagnosed with early stage of cervical cancer increased while those diagnosed with more advanced cervical cancer decreased. Together with policies aiming at improved health care access though AUGE and higher quality of care, systematic approaches taken for cervical cancer screening may have contributed to a mortality decline (Figure 3.4), although this decrease may be also related to changes in the patterns

of reproductive health such as reduced parity and postponed child-bearing) (Sepúlveda and Prado, 2005[20]).

However, in the past decade screening coverage has decreased, and the incidence and mortality rates of cervical cancer remain higher in Chile than in many other OECD countries. The average national screening rate peaked at 68.0% in 2008 and since then it has declined, reaching at 55.9% in 2015 which is lower than the OECD average of 61.1% and well below Chile's national goal of 80%, a level which a few countries such as Austria, the United States, Sweden and Germany have achieved in the OECD (OECD, 2018[1])(Figure 3.9). Although mortality rates declined by 63% since the start of screening programme in 1987 while the OECD average has declined by only 41%, mortality rate in Chile (7.8 deaths per 100 000 women) continued to be higher than that of the OECD average (4.1 per 100 000) in 2015 (Figure 3.4 and Figure 3.5). It should be also noted that the mortality rate in Chile has increased since 2014 (7.0 per 100 000 women).

Figure 3.9. Cervical cancer screening in women aged 20-69 within the past 3 years, around 2006 and around 2016



Note: The OECD average is unweighted and only includes countries with data covering the whole time period. 1. Programme. 2. Survey. 3. Three-year average.
Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

A recent decline in screening rates could be explained by lowering public awareness on the benefit of regular Pap smear. Among women aged between 25 and 65 who not undergo Pap smear, over a quarter reported that it did not apply to them, another quarter thought it was not needed, while about 10% forgot about the test and another 10% did not have time. In addition, approximately 7% reported that tests scared or distressed them and about 3% of them did not know that they had to do it (Sakellariou and Rotarou, 2017[21]).

Within Chile, screening coverage continues to vary by regions and by population group with different socio-economic background. In 2015, the lowest screening rate was found in the region of Aysen at 55% and the highest rate was observed in Los Rios at 64% (Ministry of Health, 2015[13]). Contrary to a trend on overall access to health care, cervical cancer screening coverage is higher among those in rural areas than those in urban areas. The coverage is also higher among women with higher education, private health insurance, good self-reported health status and contact with health professionals for treatment for other diseases (Sakellariou and Rotarou, 2017[21]).

3.3.2. The introduction of HPV vaccination could help reduce the burden of cervical cancer in the near future

Like a number of other OECD countries, Chile introduced a school-based HPV vaccination as part of the National Immunisation Programme in 2014 to reduce an infection of most common types of HPV and the incidence of cervical cancer, which is still substantially higher than the OECD average. The immunisation programme, which is free of charge, provides the first dose of quadrivalent HPV vaccine to girls in 4th grade (between 9 and 10 years old) and the second dose to girls in 5th grade. In 2015 and 2016, a catch-up programme targeting girls in 6th, 7th and 8th grades was also conducted. This is in line with the WHO recommendations to include HPV vaccinations as part of national immunisation programmes primarily for girls aged between 9 and 13 years old in countries where the prevention of cervical cancer is a public health priority, the introduction is feasible and financially sustainable and cost-effective (WHO, 2014[22]).

Chile has taken a comprehensive multi-stakeholder approach to assure high coverage of HPV vaccination. The vaccine introduction was planned not only with health professionals but also with the education sector, and a manual was prepared for school teachers (WHO, 2014[22]). Parents or guardians of girls at the target age are also informed about the benefits, safety and risks of HPV vaccination to their girls, and before administering vaccination, they are asked to sign an informed consent. Furthermore, for any queries, a call centre called "*Salud Responde*" is made available at the Ministry of Health.

These efforts have enhanced knowledge of HPV vaccination among the population and led to high vaccination rates since its start. In 2015, the vaccination rate was about 85% (Schilling, Gonzalez and Muñoz, 2016[23]) and vaccination coverage is equally high across regions and socio-economic groups. This consistently high vaccination coverage across population groups suggests that the incidence of cervical cancer is likely to decrease in the country in the years to come.

Nonetheless, screening programme continues to be important for early detection of cervical cancer in Chile, and this is particularly so given a relatively high incidence and mortality rates in Chile compared to most OECD countries. HPV vaccination is not sufficient to prevent cervical cancer because some parents or guardians have not given consent to administer vaccination and their girls have not received vaccination, and existing vaccines do not protect against all high-risk HPV types.

3.3.3. An increase in mammography coverage would likely reduce the burden of breast cancer

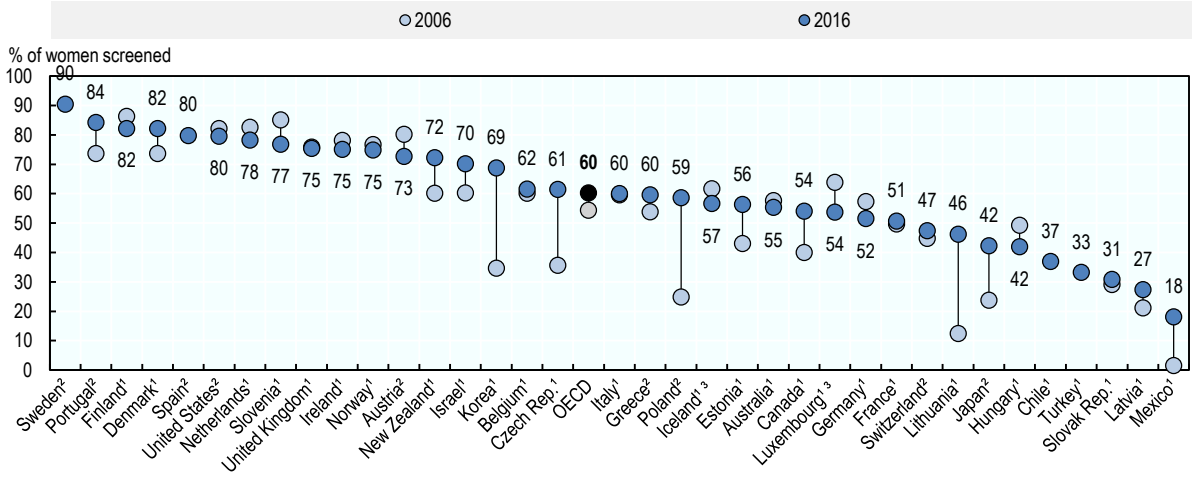
The breast cancer screening programme is relatively new in Chile, and since the introduction of the National Breast Cancer Screening Programme in 1998, screening protocols have been changed several times. The programme initially used clinical breast examination but the share of breast cancer cases diagnosed at the early stage remained very low. In 2001, mammography was introduced as part of services provided at primary health centres. Then, in 2005 mammography screening was included in the EMP every three years for women aged between 50 and 59 years old for free. Since 2014, for women covered by the public health system, mammography has been provided free of charge as part of the imaging programme at primary health centres, and the age limit for these women was extended to 69 years of age. In many OECD countries population-based mammography is provided every two years to women aged between 50 and 69, so in

Chile, the target women is limited as women who are under the private health system are covered only up to age 59 and screening is provided less frequently. Quality of breast cancer screening is considered good and Chile follows international standards such as double-reading of mammographs.

In addition to mammography, as in other OECD countries, genetic testing for breast cancer has become available to assess propensity of developing breast cancer among certain women in Chile. Fuorescen In Situ Hybridation (FISH) is available for people with HER2+ in both public and private health networks. In the public network, FISH Tests are carried out at Hospital Luis Tisné in the Metropolital Region and in Regional Hospital in the region of Valdivia. Breast cancer risk evaluation tests (BRCA) is additionally available at private health providers. But they are not provided for free to women with high risks in Chile unlike several OECD countries; for example, in Canada, BRCA is provided free to patients with specific indications including family history of breast or ovarian cancer and after genetic counselling (OECD, 2013[12]). In some OECD countries, people with genetic predispositions to breast cancer are monitored systematically but separately, outside of the screening programme.

The coverage of mammography screening continues to be much lower than the OECD average. Chile has a relatively well-distributed network of gynaecologists based on its historical focus on women's health, aiming to assure access to care among women, but the coverage of mammography is 37%, much lower than the OECD average of 60% and the national screening coverage for cervical cancer (Figure 3.10). Mammography coverage is particularly low among those with low socio-economic background including educational attainment (Puschel and Thompson, 2011[24]).

Figure 3.10. Mammography screening in women aged 50-69 within the past 2 years, around 2006 and around 2016



Note: The EU average is unweighted and only includes countries with data covering the whole time period. 1. Programme. 2. Survey. 3. Three-year average.
Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en.

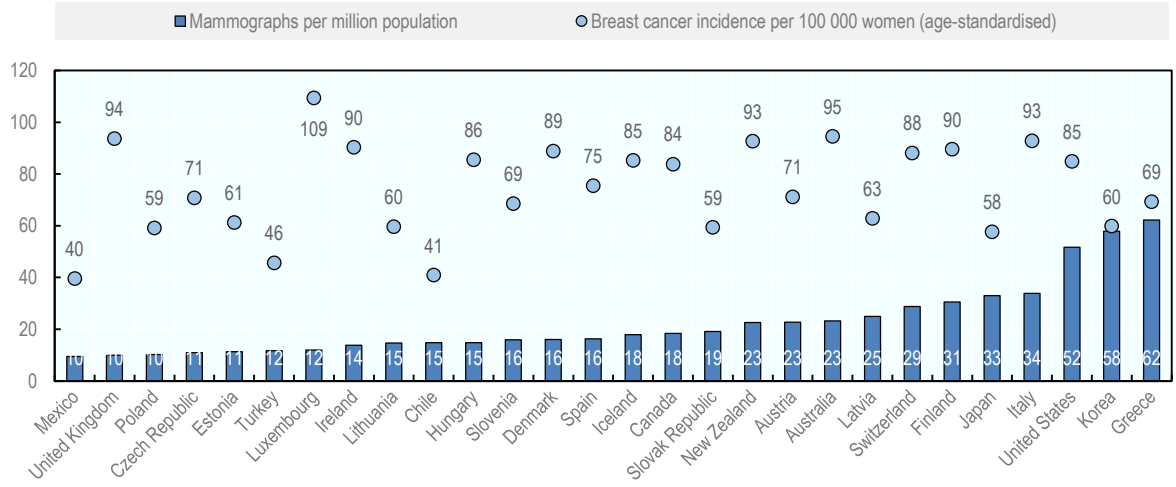
Since the introduction of the screening programme in 1998 in Chile, breast cancer mortality rate has declined but not as fast as in most OECD countries. The mortality rate for breast cancer decreased by 9% between 1998 and 2015 but across OECD countries

the decline was 22% during the same period, and while the incidence rate in Chile is about half of the OECD average, the mortality rate in Chile is only 21% lower than the OECD average in 2015 (OECD, 2018[1]; IARC GLOBOCAN, 2018[2]). This may be due to factors such as lifestyle changes and relative progress in the quality of breast cancer care compared to other OECD countries, but the low screening coverage also poses a question of the screening programme's effectiveness in reducing the burden of breast cancer in the country.

Low screening coverage for breast cancer can be explained by different factors and as seen for Pap smear, it is partly due to low public awareness on the benefits of mammography. One study suggests that among women aged between 50 and 75 who did not undergo mammography, more than half of them believed that they did not need it or it did not apply to them, or did not know that they needed to do it, and about 30% of women forgot to do it, did not have time or reported that the test scared or distressed them (Sakellariou and Rotarou, 2017[21]). Another study also found that secrecy, shame, fear and fatalism were associated to mammography and people continued to have greater confidence in breast self-examination (BSE) which was previously promoted as the appropriate screening method (Puschel and Thompson, 2011[24]). Related to this, the public may not be well informed about current screening protocols following a number of changes made in the National Breast Cancer Screening Program, which also includes target age.

Limited physical access to mammographs is also associated with a low coverage of breast cancer screening. In 2016, the number of mammographs in Chile was 15 mammographs per million population in Chile, which was lower than the OECD average of 23, although this may reflect a relatively low incidence rate in Chile compared to most OECD countries (Figure 3.11) (OECD, 2018[1]). Among women between 50 and 75 years of age who did not undergo mammography, more than 6% could not schedule an appointment, but for aPap smear, the share of target women who did not undertake the test due to not being able to schedule an appointment was lower at less than 3% (Sakellariou and Rotarou, 2017[21]). This suggests that compared to Pap smear, access is an issue for mammography in Chile. To overcome geographic challenges, a mobile mammograph, a truck carrying mammographs, is available in Chile, but access remains challenging in isolated regions.

Figure 3.11. Mammographs, 2016 (or nearest year available) and breast cancer incidence, 2018



Source: OECD Health Statistics 2018, https://doi.org/10.1787/health-data-en and IARC GLOBOCAN 2018.

Furthermore, low mammography coverage could be explained by the lack of incentives for providers such as peer pressure and financial remuneration. For instance, unlike cervical cancer screening, specific goals are not set in relation to mammography coverage for local health systems as part of Primary Health Care Indicators, and pay for performance is not available for health care professionals providing mammography screening. Hence, low policy focus on mammography at the health system level, compared to cervical cancer screening, is also likely to be related to low awareness not only among the public but also among health care professionals and subsequently leads to low mammography coverage.

3.3.4. For other cancers, preventive vaccinations and screening tests are also available but access to screening and diagnostic tests vary

Prostate cancer has the highest cancer incidence and mortality in Chile, but as in other OECD countries a screening programme does not exist. Population-based prostate cancer screening programme is not recommended internationally because even if detected, the majority of prostate tumours are not harmful and although some benefits of prostate cancer screening in reducing mortality risk have been observed across countries, harms such as unnecessary anxiety and treatment often lead to distressing side effects including impairment in sexual, bladder and/or bowel functions, and they are considered to outweigh benefits (IARC, 2016[25]). In Chile clinical examination and imaging is provided for symptomatic benign prostate hypertrophy as an AUGE condition.

For colorectal cancer, which has the third highest cancer incidence and mortality rates in Chile, opportunistic screening is available. It is either faecal occult blood Test (FOBT) every two years to people aged 50 and over, or colonoscopy every 10 years to people older than 50. However, an increasing number of OECD countries have introduced a population-based colorectal cancer screening programme for free to target population in recent years, and in many of these countries target population is those in their 50s and 60s often with an upper age limit ranging between 64 and 74 (OECD, 2013[12]). In view of identifying ways to reduce the increasing burden of colorectal cancer, Chile has

undertaken analyses recently to assess cost-effectiveness of implementing a population-based colorectal cancer screening programme, and a pilot screening programme was conducted in three cities and found effective in detecting colorectal cancer at the early stage (López-Kostner et al., 2018[26]). These findings support the advantages of introducing population-based colorectal cancer screening programme in Chile.

As for stomach cancer, while screening programmes are not common in the OECD, given high incidence and mortality rates (fourth highest for both incidence and mortality among all cancers and both rates above OECD average), people who are 40 years of age and over with related symptoms can undergo selective upper endoscopy and *H. pylori* detection test at primary health centres for free in Chile. This is in line with the recommendations given by the IARC, the specialised cancer agency of the WHO to countries with high burden of stomach cancer. In particular, IARC recommends that these countries explore the introduction of population-based *H. pylori* screening and treatment while considering local contexts such as health priorities and cost-effectiveness (IARC Helicobacter pylori Working Group, 2014) because *H. Pylori* infection is one of the important risk factors for stomach cancer among others including dietary and behavioural, and genetic factors (Forman and Burley, 2006[27]) (Box 3.1). A few OECD countries with high burden of stomach cancer also have screening; while a nationwide screening programme is available in Korea, similarly to Chile Japan does not have an organised screening programme (OECD, forthcoming[28]).

In terms of lung cancer, anti-smoking policies can contribute to its prevention and Chile has a range of anti-smoking policies as described in Chapter1. But unlike many OECD countries, smoking cessation treatment is not publicly-funded health service in Chile.

Liver cancer also has one of the highest cancer incidence and mortality in Chile, and several public health policies have been implemented to reduce its disease burden. As in the majority of OECD countries, Chile provides vaccinations against Hepatitis B as part of the National Immunisation Programme since 2005 for free at primary health centres to reduce a risk of acute and chronic liver diseases including liver cancer. The vaccination rate has been high, covering over 90% of children with four doses at 2, 4, 6 and 18 months of age (OECD, 2018[1]). Hepatitis B vaccination is also provided to all health professionals and other population at risk based on epidemiological situation. The quality of vaccination has been monitored and assured by the Public Health Institute, a designated agency responsible for its quality assurance. In relation to liver cancer, Hepatitis C virus infection is also one of the main causes together with cirrhosis and steatosis of liver and infection of Hepatitis B in Chile, so at blood bank, all liver donors can also undertake a detection test for Hepatitis C virus infection.

Chile makes efforts to assure quality of screening for these cancers. Quality assurance of screening is done at the centres performing tests and supervised by national and international centres. In addition, when it was found that the quality of cancer screening could be further improved, Chile has followed necessarily steps to assure high quality cancer diagnosis. For instance, after some questions on the quality of colorectal cancer diagnosis were raised based on the comparisons between practice in Chile and international standards (Okada et al., 2016[29]), Chile has taken steps to standardise and improve the quality of colorectal cancer diagnosis through international collaboration.

3.3.5. Some efforts to build public awareness of cancer screening and prevention have been made

In order to build public awareness of the prevention and early detection of cancer, Chile has carried out several initiatives. Awareness-building campaigns are undertaken periodically such as International Day for specific cancer throughout a year. Over the past decade, together with all stakeholders involved, the Department of Cancer within the Ministry of Health has also organised The Week of Cancer Prevention annually, to build awareness on cancer through more education and enhanced communication. It also provides an opportunity for cancer screening. In addition, health care providers usually inform patients and their families in the target age to undergo vaccinations and cancer screening during their medical consultation.

However, access to these cancer screening tests is considered low. Since the information system is not established for opportunistic screening tests, screening coverage is not well understood. Challenges raised in the previous section for mammography coverage are relevant also for these cancers, and low public awareness of the importance of early detection of cancer and the lack of provider incentives for increasing the coverage of screening tests also point to low coverage of these screening services. In addition, long waiting time in primary care also lead to challenges in accessing these tests as they are provided in primary care settings.

Partly reflecting such challenges, outcomes of prostate, colorectal, stomach, lung and liver cancers are relatively poor in Chile compared to other OECD countries. These relatively poor outcomes suggest that further efforts concerning prevention and early detection of these cancers can be made.

3.4. Chile needs to further strengthen its effort in cancer prevention and screening

In order to reduce the burden of cancer, Chile could to do more in the areas of cancer prevention, cancer screening and early detection of cancer. This section focuses on advances that Chile could make in view of improving cancer screening coverage and promoting early detection of cancer, particularly in areas such as stakeholder engagement, communication strategies, resource allocations, quality assurance and monitoring. These recommendations could be incorporated either in an overarching National Cancer Strategy or Plan with consolidated efforts or with specific policy focus, or they could be incorporated as part of specific policies, for instance, for cancer screening programmes and/or the development of a national cancer registry. Recommendations related to risk factors which are relevant for reducing risks of developing cancers among people in Chile, for instance smoking, harmful alcohol consumption, or obesity, and approaches that Chile can take with regards to expanding the role of genetic tests to complement existing cancer screening and other diagnostic services, are discussed in the other chapters of this review.

3.4.1. Systematic involvement of key stakeholders needs to be encouraged to further develop strategies for cancer prevention and screening

With a view to further enhance cancer strategies such as cancer prevention and screening nationwide, Chile could involve key local stakeholders during the policy development and decision-making processes as done in other OECD countries. As mentioned in Section 3.2, in countries with decentralised health systems including Australia and Spain, an involvement of different key local stakeholders including regional authorities and civil society has led to a successful nationwide implementation of cancer strategies.

In fact, Chile already has a good example of stakeholder involvement for cervical cancer and such efforts should be extended when developing prevention and screening strategies for other cancers. Key local stakeholders need to be involved in developing and strengthening screening strategies for other cancer such as breast, colorectal and stomach cancer because barriers to accessing cancer screening may be specific to regions and different among people with different cultural and socio-economic background within the country. Voices of local stakeholders such as regional administrations, health care providers and representatives of the civil society need to be sought in order to identify specific barriers to accessing cancer screening and to address specific needs particularly among the disadvantaged. The goal should also be ensuring that all stakeholder are be better informed, and therefore more engaged in providing diagnostic services effectively to the target population. This could indirectly help to build the public awareness on the importance of early detection of cancer.

3.4.2. More systematic personalised invitations could improve cancer screening coverage

In order to improve coverage of cancer screening, Chile could adopt a more systematic and personalised approach in inviting target populations, as has been implemented in many OECD countries. An increasing number of OECD countries identify each individual in the target group and send a personal invitation letter for cancer screening, issued through a registry in a systematic manner. In Chile, however, an invitation letter is sent only for cervical cancer screening and information provided in the letter may not be sufficient. In the majority of OECD countries, the invitation letter includes information on the benefits and potential harms of cancer screening such as false-positive screening results, over-diagnosis and over-treatment, and asks for either signed or verbal informed consent for screening (European Commission, 2017[30]). This practice is in accordance with international recommendations as the WHO recommends organised population-based mammography screening programmes to provide information on both benefits and risks of mammography screening so that target women are able to make an informed decision before undergoing mammography (WHO, 2014[31]). In many OECD countries, additional efforts are also made to invite people with positive screening results in the past for follow-up assessment, and in some countries such as Denmark, Finland, Germany, Ireland, Italy, the Netherlands, Spain, Sweden and the United Kingdom, appointment date is fixed for mammography in the letter to further facilitate access to cancer screening (European Commission, 2017[30]; IARC, 2015[32]).

As additional cost is associated with these invitation strategies, cost-effectiveness approaches would need to be applied in Chile. Several studies have been undertaken and assessed the effectiveness of invitation strategies in increasing cancer screening. For example, a systematic review of different studies conducted in various countries found that effective screening invitations include a postal invitation and telephone reminders, primary care physician's signature on invitation letter, and scheduled appointment instead of open appointment (Camilloni et al., 2013[33]). In addition, a Chilean study undertaken in one of the underserved municipalities in the region of Santiago found that cancer screening invitation by postal mail already increased screening coverage, but a postal invitation, complemented by telephone call and face-to-face intervention, substantially increased the coverage (Puschel and Thompson, 2011[24]). Future studies would also need to examine the cost associated with each of the invitation options and its impact in order to identify the most appropriate cost-effective strategies which may be different across regions.

3.4.3. Better communication and information-sharing strategies could improve public awareness and health literacy

Alongside more personalised invitation to cancer screening, Chile could develop further communication and information-sharing strategies to improve public awareness on cancer prevention and screening and health literacy of the population. In this context, the Ministry of Health in Chile has developed manuals for informing the public in the community and at work about healthy lifestyles to prevent cancer and the importance of early detection for cancer. However, these manuals are extensive and include information for various different audiences all together, for instance, to be used by health professionals for diagnosis and referral and to guide patients through pathway. It may be more effective in increasing public awareness if separate materials are developed specifically for the public.

As systematic sharing of information related to cancer is limited, particularly for cancer without organised screening programmes, Chile could also better develop information-sharing strategies to help patients to seek care, including cancer diagnostic services, at the right place at the right time. In this context, an increasing number of OECD countries have developed information-sharing platforms to better involve and enable patients in taking care of their own health and navigating through health care systems for their conditions. For example, some OECD countries including Denmark (see Box 3.5), England and Estonia have developed a platform such as a website or e-Health account to share evidence-based information on health care for different diseases including cancer throughout patient pathway with a view to promoting health literacy of the population and to support them to seek health care including cancer screening, diagnosis and treatment appropriately in a timely manner.

Box 3.5. Sundhed.dk, the Danish e-health portal

Sundhed.dk, the Danish e-health portal, is the official portal for the public Danish health care services and enables patients and health care professionals to find information and communicate. It is a public, internet-based portal that collects and distributes health care information among citizens and health care professionals. In a secure part of the portal the patient has access to:

- Personal health data on treatments and notes from hospital records, information about medication and visits to the GP;
- Various e-services including making appointments with GP's, prescription renewals and electronic communication with the GP;
- Information on waiting times at all public hospitals and ratings of hospitals in terms of patient experienced quality;
- Patient networks and the sundhed.dk handbook for patients.

This portal brings the entire Danish health care sector together and provides an accessible setting for citizens and health care professionals to meet and efficiently exchange information. By servicing both the citizens and the health professionals, the portals aim is to enable the two to achieve cooperation based on the same data. This empowers the citizen and gives the health professionals better tools to improve quality in care (OECD, 2013[12]).

3.4.4. Chile should explore ways to improve access to cancer screening and diagnostic tests across regions and population groups

There are some signs that low access to cancer screening and diagnostic tests are related to unequal availability of resources across regions. To improve geographic access to diagnostic services including cancer screening, Chile could consider taking following approaches, likely in tandem.

First, Chile could seek to ensure that necessary medical technologies are in place across all regions. For instance, the number of colonoscopes is not adequate in some regions and waiting time is long, so Chile needs to assure access to medical technologies across regions and population groups.

Second, innovative technological solutions could be explored as they can help overcome geographic challenges in assuring access, and can also be cost-effective. Although still limited, Chile already uses mobile mammography, and could seek other more mobile solutions to increase cancer screening. For instance, Turkey also faces geographic challenges and it increased the use of mobile screening units and tele-radiology (OECD, 2014[34]). Chile could also consider utilising high-quality self-sampling tools for cancer screening. Some countries such as the Czech Republic, Denmark, Finland and Norway have undertaken trials to send self-sampling device for cervical cancer screening such as lavage and brush devices to target age women who had previously declined screening participation and these targeted trials using new device were found effectiveness at reaching out to non-participants. In addition, women's experiences were generally positive and sample devices were well received (Burger et al., 2017[35]; Enerly et al., 2016[36]; Ondryášová et al., 2015[37]). A systematic review of studies conducted in various countries found that for colorectal cancer, mailing a self-sampling kit to target population was an effective way to improve screening coverage (Camilloni et al., 2013[33]).

Third, given the geographic characteristics of Chile, financial support to cover travel cost may be needed, particularly among low-income groups with high risks to assure access to different diagnostic tests if geographic access is still considered problematic even after expanding the use of technological solutions. Unmet health care needs are high among those with low income group living in isolated areas (Ministry of Social Development, 2015[38]), but so far, financial support for travel cost is available only for child patients and one adult guardian for distances longer than 500km. Other patients and their guardians still need to bear the travel cost completely and the existing infrastructure does not sometimes allow easy access to health care including diagnostic services for cancer. Some OECD countries also face such geographic challenge and to assure access to cancer care, Finland, for example, provides a subsidy to cover travel cost to all cancer patients. It may be too costly to cover the entire cost, so an adequate level of cost-sharing and target population group would need to be identified in the Chilean context.

3.4.5. Comprehensive information systems can help manage screening programmes more effectively

Chile has developed a monitoring system for cancer screening and cancer care system based on population surveys and some cancer registries, but its coverage is limited in terms of type of cancer and regions. For breast and cervical cancer, population-based surveys regularly collect screening coverage and barriers to screening in view of seeking ways to increase screening coverage. However, such data collection efforts are not being made for other cancer such as colorectal cancer. In relation to cancer registries, the first

regional registry was developed in the region of Los Ríos in 1989, followed by Antofagasta in 1998 and Biobío in 2006. However, cancer registry has not been established at the national level, so even after all these regional registries become fully operational, they will cover only about 18.5% of the population in Chile (Jimenez de la Jara et al., 2015[8]). For cervical cancer and childhood cancer, however, an integrated information system has been developed at the national level. The information system for cervical cancer has been expanded and data are linked across providers in the private and public sectors and registries. For childhood cancer, data from private and public sectors have been integrated in the national cancer registry since 2011.

A comprehensive information system based on registries is essential for efficient management of screening programmes and cancer care delivery. It can identify target population who have and have not participated in the screening programmes, those who are monitored outside of the programme due to their previous diagnosis of cancer and/or genetic predisposition to specific cancer and those who do not consent to do screening. Using such a system, personalised invitations and reminders for cancer screening, which are important for increasing screening coverage, can be sent systematically to target population. In the majority of OECD countries, national cancer registries have been established and their information systems allow monitoring cancer incidence and survival at the national as well as regional levels for a number of cancers. For example in New Zealand, the Cancer Registry Act, introduced in 1993, aims to improve information base for cancer prevention and research. Its cancer registry collects data including date of diagnosis, site of primary care, type of cancer test, morphology, grade, staging information and site-specific information, and monitors incidence, mortality and survival regularly by cancer and also by region (Ministry of Health, 2014[3]).

To develop population-based screening programme further, Chile would also need to integrate individual-level data collected within and outside of cancer screening programmes around screening, diagnosis and treatment in a more systematic manner across regions and providers for different cancer. Such information can increase efficiency and effectiveness of cancer screening. If Chile decides to include genetic information in the integrated information system, regulations specific to genetic data would need to be developed also. As a development of integrated information system can be costly, Chile could prioritise the information needs as has been done in other OECD countries. For example, in New Zealand, due to concerns over cost, data on certain cancer such as benign neoplasms are not collected (Ministry of Health, 2014[3]).

Rich data generated from integrated information system need to be analysed periodically to assess the effectiveness of existing cancer screening protocols such as target group, screening frequency and/or methods and across population with different background. Chile has started assessing the effectiveness of screening programmes for breast and cervical cancer based on information collected at registries including stage information, and such efforts need to be extended to other cancer.

Several OECD countries also use information around cancer screening to improve quality of screening programmes (OECD, 2012[39]) (Box 3.6). They provide feedback to individual providers and benchmarking is also possible. A systematic literature review supports these additional efforts as it found that provider assessment and feedback contribute to increased coverage for cervical, breast and colorectal cancer screening (Sabatino et al., 2012[40]). Based on these initiatives elsewhere, Chile could explore ways to effectively utilise data to drive improvement in cancer screening quality across providers.

Box 3.6. Quality Assurance system for cancer screening in Israel

A comprehensive quality assurance mechanism has been developed in Israel for breast cancer. Every entry to the cancer detection centre is registered in a centralised electronic database, which was established in the mid-1990s. The database contains screening information from all public and private providers, and over 90% of diagnosis test results for individuals who had a mammography. Data including detection rates, recall rates, further examination rates, and staging information, and negative/positive test result rates are provided to all providers every year so that they can compare their performance relative to the national average and to other providers in the country. Using the database, every care pathway is monitored, and providers receive a report in case of an irregular pathway. A similar system exists for colorectal cancer, but there is a need to improve the collection of colonoscopy data (OECD, 2012[39]).

Furthermore, Chile may wish to explore effective ways of reporting key health information such as screening coverage to improve public awareness on cancer screening. Many OECD countries make these data available in the public domain in a user friendly manner. In the similar vein, Chile also reports screening coverage for breast and cervical cancer in the public domain. However reporting of these data can be improved. For example, even though the breast cancer screening programme in Chile targets women aged between 50 and 69 years, survey reports published by the Ministry of Social Development include screening coverage referring to women aged 35 and over (Ministry of Social Development, 2015[38]). Similarly, for cervical cancer, even though the screening programme targets women between 25 and 64 years of age, screening coverage of women aged 15 and over is reported. Chile may want to consider reporting data consistently for their analyses and reports.

3.4.6. Effective detection of cancer at an early stage requires strong primary care and standardised and high quality diagnosis

In Chile, cancer screening is provided at primary health centres or provided based on referrals from these centres, so access to primary care and its quality are essential for successful cancer screening. However, resources are stretched, resulting in long waiting time in primary care, short consultation time and poor care coordination. While strategies to improve prevention and cancer screening are critical, improvement in cancer survival will also depend on having an effective and high quality primary care sector.

For effective detection of cancer at early stage, Chile also needs to continue assuring the quality of diagnosis. Chile already follows international standards in assuring quality of screening for breast and cervical cancer, and has also taken steps to standardise and improve the quality of diagnosis through clinical guideline developments based on international collaboration for colorectal cancer, genetic testing for breast cancer and leukaemia. Such efforts ought to be continued for different types of cancer in order to provide high quality diagnostic services.

3.5. Conclusion

In Chile, cancer could become the first cause of mortality in the near future because while overall mortality rates from cancer are declining, they are not falling as fast as mortality due to other diseases, and risk factors for cancer are also increasing among the population. In order to tackle the burden of cancer, Chile has strengthened cancer care governance and delivery, and introduced cervical and breast cancer screening programmes. However, more still needs be done in order to strengthen Chile's cancer screening programme. There is scope to expand the coverage of screening – notably by improving stakeholder engagement in developing cancer screening strategies, introducing more systematic personalised invitation for cancer screening, developing better communication strategies to increase public awareness. As primary care is a key for providing cancer screening in Chile, primary care strengthening should not be overlooked as a part of cancer prevention and detection strategies. Chile should also look to improve geographic access to screening and diagnostic tests for instance through innovative solutions and financial support for the disadvantaged. Meanwhile, developing a more comprehensive monitoring system for cancer screening would help Chile in both the administration of the cancer screening programme – assuring effective target population coverage – and be a rich source of data with which Chile could periodically assess the effectiveness of existing cancer screening protocols.

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Chapter 4. Developing public health genomics to strengthen preventive care in Chile

A well-designed national strategy on using public health genomics to strengthen public health and preventive care could make Chile a regional leader in this emerging field. Although the global trend of increasing use of genomic testing improving diagnosis and treatments for the sick and preventive measures for the healthy, Chile lacks of a national plan for implementing precision medicine in the clinical practice or public health policies. International efforts in OECD countries can provide good examples of government-industry system structures that have been successful in the expansion of genomics services, particularly for informing public health and preventive care. Regulation, rigorous empirical evidence, development of the genetics workforce, genetics education for health professionals and the public as well as careful attention to equitable service design is necessary to achieve widespread public health and preventive care applications in Chile.

4.1. Introduction

A number of public health priorities in Chile have the potential to benefit from wider application of precision medicine. From a public health and preventive care point of view, precision medicine is most likely to offer benefit in those conditions which generate a sizeable burden of disease; which have a significant inherited component; and whose prevention, early diagnosis or management could be influenced by knowing the genetic associations in a given individual or community.

In choosing to engage, at this stage, with the role of precision medicine and public health genomics in health and disease, Chile is showing a clear understanding of the potential for genomic science to both benefit and transform the field of preventive medicine. Taking steps to consider the role of precision medicine for public health care at this point should leave Chile well-prepared for the rapid ongoing expansion of available genetic tests.

This chapter discusses, firstly, the potential for public health genomics to improve public health and preventive care in Chile, including the challenge of combining genetics information with environmental and behavioural risks. Secondly, the chapter examines the current precision medicine services in Chile, and current plans to develop clinical genetics and services. Finally, the chapter makes a series of recommendations for ways in which Chile could accelerate the provision of precision medicine and public health in a sustainable, equitable way.

4.2. The potential for clinical genetics and genomics to improve public health and preventive health care in Chile

This chapter discusses the potential of public health genomics to improve public health and preventive health care in Chile. Other important applications of genomics such as therapeutics are considered where appropriate and relevant.

4.2.1. Precision medicine and public health genomics

The completion of the Human Genome Project in 2003 has dramatically increased our understanding of the role of genes and their influence on health and the biological mechanisms of disease (Green, Watson and Collins, 2015[1]). Over the last two decades – in a context of scientific and technological advancements – the concept of precision medicine has emerged as a new approach that takes into account variability in genes, environment, and lifestyle factors to determine individual risk of disease, and design optimal prevention and treatment strategies.

The field of genomics can be understood as the study of all of an organisms' genes and relationships between the genes; genetics addresses the functioning and composition of a single gene (WHO, 2016). In health, genomics is being used in different ways, including around screening, testing, therapeutic development and treatment, policies and research, related to the human genome. The National Human Genome Research Institute in the United States defines genomic medicine as follows: "Genomic medicine is an emerging medical discipline that involves using genomic information about an individual as part of their clinical care (e.g. for diagnostic or therapeutic decision-making) and the health outcomes and policy implications of that clinical use." (National Human Genome Research Institute, 2016). Public Health Genomics has been understood as the integration of genomic-based knowledge into public health policy and population health (Boccia

et al., 2009; Bellagio Statement, 2005; Burke et al., 2006). For example, public health genomics could include the integration of population-based information on genetic variation and gene-environment interactions to develop stronger health improvement and disease prevention. There are a number of common terms in the field of genomics, including precision medicine, stratified medicine, and genetic counselling (see Box 4.1).

Along with the term public health genomics, this chapter primarily uses the terms 'precision' medicine, in particular following the definition established by the United Kingdom's Programme Coordination Group, and repeated in the OECD's 2017 publication on New Health Technologies: "[refining] our understanding of disease prediction and risk, onset and progression in patients, informing better selection and development of evidence-based targeted therapies and associated diagnostics. Disease treatment and other interventions are better targeted to take into account the patient's genomic and other biological characteristics, as well as health status, medications patients are already prescribed and environmental and lifestyle factors" (Innovate UK, 2016) (OECD, 2017[2]).

Box 4.1. Genomics and public health genomics – key terminology

There are a number of commonly used terms in the field of genomics, including precision medicine, stratified medicine, genomic medicine, or personalised medicines, some of which are equivalent.

Precision medicine is relates to the tailoring of therapies and interventions based on a patient's genomic and other biological characteristics (which can include health status, existing medications, environmental and lifestyle factors) ((Phillips et al., 2014[3]); OECD, 2016; Innovate UK, 2016). Precision medicine can be used as an all-encompassing term that includes more specific terms, including personalised, stratified, and genomic medicine. Personalised medicine is a widely used term, but has been criticised for the suggestion that it entails the development of unique therapies designed for each individual, and amongst experts a preference for more specific terminology has emerged (Doble et al., 2017). **Genomic medicine** is the use of genetic information (for instance gleaned from genomic sequencing) to a determine individuals' disease risk, diagnosis, and treatment. Genomics addresses all genes and their inter relationships, while genetics scrutinizes the individual gene, its composition and functioning. **Genetic testing** looks at an individual's genetic code to identify changes – variants or mutations – which could indicate health conditions. Until recently genetic testing has been performed on a small number of known genes, for example analysis of genes known for determining certain cancer risks (for example BRCA1 and BRCA2), but recent developments have made it possible to rapidly sequence far larger amounts of DNA (Phillips et al., 2014[3]).

'**Sequencing',** which is also referred to as **next-generation sequencing (NGS), parallel or high-speed sequencing** refers to a number of different modern sequencing technologies to sequence DNA and RNA much more quickly and cheaply than before. Sequencing includes targeted sequencing which targets one or two genes, including as a panel of multiple genes, whole exome sequencing which involves the DNA sequencing of the exome (about 1% of the genome), and whole genome sequencing (WGS) which entails the sequencing of the entire genome (about 22 000 genes) (Phillips et al., 2014[3]) (OECD, 2016; Doble et al., 2017).

Stratified medicines refers to the grouping of patients based on their disease risk or

likely responsiveness to treatment, based on the use of a biomarker diagnostic test to determine the target population (a biomarker is a biological molecule found in blood, other body fluids, or tissues that is a sign of a normal or abnormal process, or of a condition or disease) (Doble et al., 2017[7]; OECD, 2016). Such a test is used to identify before or during treatment patients who are most likely to benefit from the corresponding medical product or patients likely to be at increased risk of serious adverse reactions. Biomarker diagnostics include single tests to establish risk or disposition to treatment, or as increasingly the case, multiplex tests testing several biomarkers simultaneously.

Genetic counselling can be used to understand an individual's disease risk, based on their family history, and an understanding of different hereditary risks, and patterns of genetic transmission. Genetic counselling does not need to involve genetic testing.

Precision medicine is also an exploding field. Since 2003 and the mapping of the human genome the availability of genetic testing has grown rapidly; recent estimates suggest that there are currently 75 000 genetic tests on the market, and a further 10 are appearing on a near-daily basis (Phillips et al., 2018[4]). While developments in the field of genomics are potentially game-changing for patients – a recent study found that between 2013 and 2017, 48% of FDA-approved precision medicines could be considered 'breakthrough therapies' (Pregelj et al., 2018[5]) – these new and rapid developments nonetheless pose new challenge for health policy makers, many of which this chapter seeks to explore.

4.2.2. Precision medicine can be used as a powerful diagnostic tool

Precision medicine can be used as a powerful diagnostic tool. One of the most widespread uses of genomic testing is to identify congenital abnormalities and diagnose other conditions. Between two to three per cent of children are born with a major congenital abnormality, Of these, around one third will have a genetic component such as Trisomy 21 (Down's Syndrome). The identification of the underlying genetic cause is important to understand prognosis, guide treatment decisions, and support parents when considering having additional children. A very small number of these genetic cases (less than 5%) may be detected by one of the oldest and most basic genetic tests, karyotyping. Karyotyping simply involves examining the number and morphology of chromosomes in a cell using a light microscope.

Improving the detection rate of other genetic components for major congenital abnormalities – which again can guide treatment decisions and help parents when considering having additional children – requires more sophisticated tests, such as molecular karyotyping (where DNA probes are labelled with fluorescent tags, for example). In addition, full sequencing of all genes that have been previously associated with diseases can now be performed simultaneously by Next Generation Sequencing – a technology that allows the rapid sequencing (i.e. determining the order of the DNA building blocks) of large amounts of DNA. Negative results can be further studied by extending sequencing to all genes in the genome (i.e whole-geome sequencing). Such newer techniques can increase detection rate by up to 30%. Whole-genome sequencing for example can be a vital tool for establishing diagnosis when previous targeted test has failed, and some studies have shown it to be cost effective (Nambot et al., 2018; Walsh et al., 2017; Valencia et al., 2015).

4.2.3. Newer genomic technologies may advance preventive health care and public health more broadly

At this point, common diseases including, but not limited to, cancers and many cardiovascular diseases, have been found to be vastly more genetically complex than was first anticipated. Considerable investments have been made in investigating the role of genomics in common cancers, for instance Lynch syndrome or Breast cancer susceptibility genes (BRCA) 1 and 2 for breast cancer.

Sequencing (for example, targeted sequencing, whole exome sequencing or whole genome sequencing, see Box 4.1) can be very valuable in paediatric disorders, where clinicians are searching for a diagnosis with very little sense of where to look. For example, Next Generation Sequencing (NGS) makes it possible to compare one individual's genes' with a panel of genes from close relatives to look for possible indicators of rare diseases.

In terms of public health, the value of genomics is evident when tests can provide reliable information on individual risk of disease, which in turns can inform the design of targeted prevention strategies at the population level. For instance, using genomics to identify people carrying genetic mutations that predispose them to a very high risk of developing colorectal or breast cancer can allow screening programs to offer more aggressive screening and surveillance regimen to these groups. (Pashayan et al., 2013). Furthermore, it is plausible that this increased precision could offset other unnecessary tests and yield cost savings.

4.2.4. Applied genomics could bring benefits to a number of Chilean public health priorities

From a public health and preventive care point of view, genomic testing is most likely to offer benefit in those conditions which:

1. generate a sizeable burden of disease (whether measured in terms of mortality, morbidity or cost);
2. have a significant inherited component; and/or whose prevention, early diagnosis or management could be influenced by knowing the genetic associations in a given individual or community.

These criteria apply to cancers where, for example, 10-20% of cases may have a hereditary component.

Another area of potential benefit from genetic testing relates to congenital anomalies. Around 2-3% of children are born with a major congenital abnormality, which represents approximately 7 500 births in Chile each year. Around a third of these anomalies will have a significant genetic component. Identification of any genetic basis has a potentially important preventive aspect, because parents' family planning may be influenced by understanding the risk of having further children affected by the condition. Achieving a molecular (genetic) diagnosis also has public health implications, given the money potentially saved by avoiding a prolonged "diagnostic odyssey". Examples would include the lysosomal storage disorders (such as Gaucher's disease) whose treatment in Chile is currently funded through the Ricarte Soto Law.

Genetic testing is currently less relevant to other major public health concerns in Chile, such as obesity. While genetic testing around obesity is a compelling area of research, at present the identified genetic variants associated with obesity and overweight are so

strongly eclipsed by environmental and behavioural factors that genetic information has little predictive value. Other conditions, such as some forms of lymphoma, have stronger genetic associations, however for these conditions there is limited knowledge about how to translate awareness of the genetic antecedent(s) to a public or preventive care strategy.

4.2.5. Combining genetic information with environmental and behavioural risks

The public health challenges Chile faces, like other OECD countries, are dominated by non-communicable conditions, which tend to have a complex natural history and aetiology. That is, genetics offers only part of the information to complete a complex picture of disease risk.

Ischaemic Heart Disease (IHD) for example, has a hereditary component which may be revealed by genetic testing, however alone, this information is less predictive than blood pressure, blood cholesterol or body mass index at determining IHD disease risk (Howson et al., 2017; Khoury, Iademarco, & Riley, 2016). Further, social, cultural and environmental determinants cannot be revealed through genetic testing, and the expression of a hereditary tendency towards high blood pressure for instance may be influenced (to an extent) from building healthy workplace and community environments. Thus in the case of IHD, to determine risk and identify preventive approaches, genetic information needs to be combined with phenotypic information, as well as broader socio-cultural information to be used effectively.

Screening for some cancers can be informed by genetic information if biomarkers are used to target programmes to those at greatest risk of developing particular forms of cancers. This can improve both efficiency and early detection, minimise adverse events, and may assist in personalising treatment options if a cancer diagnosis is made (Chief Medical Officer, 2017).

4.3. Current clinical genetics and genomics services in Chile

4.3.1. Chile benefits from a specialist clinical genetics workforce, although it is small by international standards

There are currently 33 clinical geneticists working in Chile, equivalent to roughly 1 geneticist per 650 000 inhabitants (Superintendencia de Salud, 2018[6]). Clinical geneticists are required to do a three-year post-graduate residency, and be formally registered with the Superintendency of Health to offer specialist care. There is currently one post-graduate residency programme available in Chile, with around 7 students enrolled. In addition to clinical geneticists, some oncologists (cancer specialists) also offer genetic screening—for the common translocations that are associated with leukaemia, for example. A small number of paediatricians and/or obstetricians specialising in foetal medicine and pre-natal care may also offer relevant genetic tests to potential parents.

Around three quarters of clinical geneticists in Chile are located in Santiago. The unequal distribution of this workforce may be less of a problem than in other specialities, since clinical genetics lends itself well to being provided through telemedicine. All work is conducted in both the private and public sectors.

There is, however, a shortfall in specialist numbers, according to international comparisons. Several OECD health systems employ three or more clinical genetics consultants per million population (and some, such as Norway and Finland, have more

than five). By comparison, in 2013 there was one geneticist per 120 000 population in England, 1 per 196 000 in France, one per 176 000 in Finland and 1 per 90 000 population in Norway (The European Society of Clinical Genetics, 2013). Comparatively Chile is lacking at least half the specialist workforce it needs. Furthermore, Chile currently does not have any recognised genetics counsellors. These are individuals trained in explaining genetic risk to patients, combining this information with knowledge of an individual's behavioural, social and environmental risk, and helping them make decisions (regarding starting a family, for example, or prophylactic surgery) based on that information. Plans are underway however, to develop this workforce, and some qualifications are already offered even if they are not accredited as a medical speciality. For example, the medical faculty at the University of Chile (MEDICHI) offers a diploma in genetic counselling.

4.3.2. Genetic services offered in Chile

At least six institutions in Chile currently offer genetic testing services, including the Laboratorio de Biología Molecular y Citogenética at Pontificia Universidad Católica (LBMC-PUC), the Centro de Genética y Genómica at the Universidad del Desarrollo (CGG-UDD), the Laboratorio Clínico de Biología Molecular, Hospital del Salvador (LCBM-HS), the Instituto de Nutrición y Tecnología de los Alimentos at Universidad de Chile (INTA-UCH), Universidad del Desarrollo (UDD), and Genética Molecular, Laboratorio Biomédico, ISP (GMLB-ISP).

There are a few companies that are currently offering genomic services in Chile, both for the research and clinical practice. However, all these companies are international, and send samples abroad for sequencing and data analysis.

Some domestic laboratories offer genomics services, all of which function within research institutions, in particular out of universities. Namely, INTA-UCH and CGG-UDD offer gene expression profiling, genotyping and molecular karyotyping by microarray technology. GMLB-ISP, LBMC-PUC, LCBM-HS and CGG-UDD are the only laboratories certified for clinical services that have NGS capabilities, but as yet no genomic services for the clinic with this technology, except for microbial genetic typification done by GMLB-ISP. For research applications, Austral-omics at Universidad Austral offers sequencing of gene panels and the ChileGenomico Laboratory at the Universidad de Chile can sequence gene panels, transcriptomes, and whole exomes. Despite these institutional efforts, there is no national network of genomic services, and due to high costs for the average patient, the demand for genomic services remains restricted to the high-income fraction of the population. However, the presence of these nodes of technological and human-capital development in genomics creates an opportunity for broadening the availability of genomic medicine when conditions improve and demand increase.

4.3.3. Very few precision medicine services are covered by the public insurance system, leading to access inequalities

There are two clinical genetics services currently covered by FONASA, both falling within the sphere of cytogenetics: i) karyotyping (for chromosomal abnormalities, such as trisomy 21 (also known as Down's syndrome); and, ii) Fluorescent in situ hybridization (FISH), used to detect specific DNA sequences that are associated with some congenital syndromes (such as Prader-Willi syndrome) and some leukaemias. Newborn screening for phenylketonuria (always genetically determined) and congenital hypothyroidism

(sometimes genetically determined), is also well-established, and there are plans to expand testing. There are no molecular genetics or genomic analyses offered within the public insurance system. Furthermore, because private insurers take their cue from the public system, no molecular genetics or genomic analyses are generally offered by ISAPRES either. This means that only those who can afford to pay out-of-pocket for private consultations and testing in independent laboratories can benefit from newer technologies.

The importance of access to more advanced genetic tests and analyses can be illustrated by considering the proportion of children born each year in Chile with a major congenital abnormalities—several thousand in number. Only a small minority (less than 5%) of genetic causes can be detected through the cytogenetics currently on offer. Detection rates for these congenital conditions increases by 20-30% with more advanced techniques offered by molecular genetics, including genome sequencing. However, only parents concerned about inherited conditions in their children can receive genetic testing and counselling in the private sector. In exceptional cases (where the child's life depends on a molecular diagnosis of their disorder), FONASA may cover costs. But in most cases, parents will have to pay around USD 2 000 out-of-pocket for genetic tests more advanced than those currently offered in the public system.

Furthermore, there are several clinical conditions (notably several cancers), with an important genetic component that are included within the GES but where genetic testing is not covered. The Ricarte Soto Law (see also Chapter 1) established coverage for some rare inherited diseases, including some lysosomal storage diseases (such as Fabry's or Gaucher's disease), other inherited disorders of metabolism (such as tyrosinemia), and HER2+ breast cancer. As of 2018 more than 10 000 people had benefited from the Law's provisions. Although there are some exceptions, for example molecular testing is covered for women with suspected Fabry's disease, for many thousands of patients GES manifests a discord: treatments are offered, but genetic testing that could offer a quicker and more precise diagnosis is not. Independent genetics laboratories report a 10-15% annual increase in demand in recent years illustrating the size of unmet need in this area.

While not necessarily addressing financial access difficulties, telemedicine has played a significant role in reducing barriers associated with geographical access to genetic specialists and services. Indeed, genetic consultations held through videoconferencing is common and patients reported high levels of satisfaction with telegenetics in general (Iredale, Hilgart, Hayward, & Coles, 2012). Beyond patient interactions, telegenetics is also common between professionals with genetics labs often located a distance away from health services where data may be interpreted or stored, as in the case of the 100 000 genomes project in the UK.

Finally, public-private partnerships have supported the majority of developments and advancements in clinical genomics services in other OECD countries. For instance, the WGS project in Australia is supported by a range of public and private organisations including not-for-profit organisations. For the US, genomics development has involved pharmaceutical companies. Similarly, although the UK genomics initiative (100 000 Genomes Project) is based in the NHS and thus is publicly funded, private input is also evident through research organisations as well as pharmaceutical companies and the same is true for Canada (Genome Canada, 2017; Genomics England, 2017). Such public-private partnerships do not currently exist in the precision medicine field in Chile. The state has invested in a handful of small-to-medium size private initiatives to implement genetic testing in health For example, the Government of Chile partially funded the

creation of Pfizer's Center of Excellence in Precision Medicine (CEMP) based in Santiago, Chile.

4.3.4. There are limited efforts to build professional and public knowledge about the role of precision medicine in health care

So far, limited systematic efforts have been undertaken to improve the knowledge and understanding of precision medicine and public health genomics amongst doctors, nurses and other health care professionals in Chile. Education is a critical issue if the aim is for genetic services to inform public health and preventive care, in addition to supporting diagnosis (Burke & Korngiebel, 2015). The provision of the genetics services (test or otherwise) can only yield benefits when the information is used to inform preventive or early intervention efforts. Such action requires knowledge among health professionals in primary and secondary care, as well as the public health policy community (Beskow, Khoury, Baker, & Thrasher, 2001; Burke & Korngiebel, 2015; Syurina, In den Bäumen, Feron, & Brand, 2012). In some OECD countries, including but not limited to the United Kingdom, capacity development for health professionals in the area of interpreting and translating genetic information to patients in a way that supports comprehension has been undertaken and is recommended (Relling & Evans, 2015).

Genetics literacy can be considered one aspect of health literacy, that is, individuals with high levels of health literacy have more capacity to comprehend genetic information. However, specific attention needs to be dedicated to educating the public to understand genetic information and critically, the implications of this information for their health, and the health of their family (Roberts, Dolinoy, & Tarini, 2014). There is a role for genetic counsellors in this process at an individual and family level. However, at a population level investment is also warranted for building genetic literacy more broadly (Burke & Korngiebel, 2015; Relling & Evans, 2015).

4.3.5. Regulation has not kept up with clinical advances in the clinical genetics field

Chile has established some key regulatory elements covering clinical genetic services, such as the requirement for clinical geneticists to be registered with the Superintendency of Health. However, important gaps are also apparent. Minimum standard and quality assurance requirements for clinical labs are generic, for example, with no specific requirements relating to genetics tests. This is a concerning deficiency because of the rapid development of genetic techniques, and the potentially devastating consequences of being given an incorrect analysis or a misleading interpretation. Furthermore, in Chile as elsewhere, an increasing number of commercial labs are being established and some offer direct-to-consumer testing, underlining the importance of robust regulation to protect the public. Currently commercial and academic labs in Chile send samples abroad for processing, so domestic capacity would need to be developed.

Chilean laws governing personal health data also do not adequately reflect the emerging landscape of genetic technologies. Current regulations allow sharing of individuals' health data only in very limited circumstances. This, however, may hinder growth of clinical genetics, because research and development in the speciality depends upon the analysis of patterns of genetic markers at population level and their correlation with disease.

The Personal Data Protection Project (PLDP) was registered under the instructions of the Chilean President in March 2017 (Bulletin No. 11144-07), and would update the current

data protection regulation (Law 19.628) and align it with OECD data protection standards. The PLDP includes specific provisions for the treatment of personal data related to health, biometric data and data related to the human biological profile, as well as for the use of personal data for various research purposes, and the treatment of personal data that shows location or history of movement.

The proposals set out under the PLDP likely need to be expanded, or added to under separate regulation, to ensure sufficient rigour when it comes to the handling and storage of genetic data. For example, the project does not cover the storage of data and their use in research or biobanks.

While the PLDP may be a good first step, further provisions may nonetheless be needed for the better protection of personal health data, including genetic data. A number of countries have introduced specific legislation covering the protection of personal health data (see (OECD, 2015; OECD, 2017). Such legislation could also cover the interoperability of health data, for example clinical records, prescribing, and eventually genomic records. Such data linkage could have the potential to increase the positive public health impact of genetic testing in Chile, both for individuals, and from a research and public policy perspective. Chile may wish to standardise the protocol for collection and use of genetic information sooner rather than later, and could look to the United Kingdom's consent form process as a possible model to follow (see Box 4.2).

A proposal has already been developed for the establishment of regulation of the use of samples and the sharing of data derived from biobanks in Chile. This regulation would cover the procedural and ethical aspects of the use and storage of human samples in biobanks for research purposes, and was drafted to reflect the perspectives of leading Chilean experts, as well as experts from countries such as Brazil and Spain.

Box 4.2. Consent form process for protecting and sharing personal genetic information in Genomics England

Assuring and gaining informed consent for the collection, use and storage of personal genetic information and where possible linkage of this information with other data sources is vital to the advancement of genomics. In Genomics England, arguably largest Whole Genome Sequencing project in the world (100 000 genomes project), the consent process involves the consent process involves giving information about participation in a routine medical appointment, potential participants are also asked to consider a range of factors in making their decision, including but not limited to: Linking participants' lifetime health records being linked to their genome sequence; Third parties accessing anonymised samples.

The participation of children under 16 is decided by their parents however, health professionals also work to help the children understand and seek their agreement to participate. When these children reach the age of 16, they will have an opportunity to make their own decision about continuing to remain involved, and consenting for their data to be shared.

It is also important to note that Genomics England provide a specific training course on obtaining informed consent for genetic testing for health professionals.

Source: Genomics England, 2018.

4.4. Current plans to develop precision medicine and genomics services

4.4.1. Chile is already giving serious thought to the future development of genetics and genomics at national level

The *Sociedad de Genética de Chile,* both a scientific society and a professional body, and the Ministry of Health jointly produced an analysis of Chile's needs in the field, publishing recommendations in December 2016. The joint review was comprehensive, identifying strengths and weaknesses in service provision, research, public education and awareness, regulation and international collaboration. Several of the findings and policy recommendations are reiterated in this Review.

Chile's goal to become a regional leader in the provision and research of clinical genetics services is ambitious. The collaboration between the government and genetics professionals, resulting in the 2016 report, is an important step in realising this goal. Likewise, public-private research collaborations (discussed below) are also indicators of a mature system.

However, translation of ambitions into policy remains partial. For example, there are currently no policies in place to promote the integration of genomics into routine clinical practice, even though this bottom-up activity must clearly be the foundation of any national roadmap. Similarly, there has not yet been any systematic effort to improve knowledge and understanding of genetics and genomics services amongst doctors, nurses and other health care professionals, nor the public. This limits the potential uptake and impact of new genetic technologies in the health system.

4.4.2. Countries where clinical genetics is more robustly embedded within the health system may offer an example for Chile to follow

The national approach to clinical genetics in the United Kingdom is based on genomics and precision medicine. The work and developments in genetics are all grounded firmly in the NHS and managed through Genomics England, which has been established as an entity to guide this work. Specifically, the approach involves conducting the 100 000 genomes project, which is described in further detail later in this chapter, establishing Genomic Medicine Centres and developing a Personalised Medicine Strategy for the NHS. Further, while the research and work is being trialled and conducted, a National Genomic Data Centre is being built to ensure all data is stored safely, and is available for research purposes in the future (Hill, 2016). Lack of budgeting and limited evidence of the cost-effectiveness or efficiency of genetic testing established.

There have been no studies of the historical evolution or estimated future evolution of health system spending in relation to clinical genetics and genomics services in Chile. There are also no mechanisms to contain growth in spending related to clinical genetics and genomics. While this is currently not a priority (given that so few services are publicly-funded), it might be an issue in the future, particularly considering the focus on genomics and preventive health care and public health. Experience from other countries shows that low-value care (such as unnecessary testing) can become an important issue.

In addition to cost containment, and the challenges of managing inefficiencies, and appraising costs against benefits, are critical steps in making decisions on funding and budgeting. Unfortunately, there is a significant lack of studies on the cost-effectiveness of genetics testing, particularly for newer technologies and for the use of genetic testing to inform preventive or public health care (Wideroff et al., 2009; Payne et al., 2018).

The Centers for Disease Control and Prevention in the United States have developed a model designed to evaluate the use of genomics applications, and a similar institutional actor may be needed to play a similar role in Chile. The Centers for Disease Control and Prevention in the United States developed a model designed to appraise genetic tests and technology for translation to clinical applications and public health. The Evaluation of Genomics in Practice and Prevention (EGAPP) initiative produces recommendations on the utility and validity of specific genetic tests, and with regards to preventive care, the US Preventive Services Taskforce took the recommendations from the EGAPP, and applied them to screening for colorectal cancers, breast cancers and haemochromatosis. It is worth noting the EGAPP model provided a framework for systematic evaluation of genetic tests that considers clinical efficacy, cost-effectiveness, and broader societal and public health benefits.

The Chilean Ministry of Health already has in place a system for systematic evaluation of the properties, effects, benefits, risks and costs of a health technology (ETESA for is acronym in Spanish: *Evaluación de TEcnologías SAnitarias*). With sufficient political will and appropriate guidance from both national and international experts, the same system could be implemented for genetic and genomic testing. Partnerships with research institutions could facilitate systematic validation of test results in the Chilean population, and public support could facilitate the development of evaluation and economic evaluation of genomic technologies in the national health care system. Resources will need to be directed not just to building genomic research and screening capacity, but also to the technical, practical and organisational challenges of bringing such tests to the Chilean population (Payne et al., 2018). It is important to note that newer techniques including but not limited to DNA chip and massive sequencing methodologies are being developed which could minimise costs, as this methodology allows multiple tests to be performed simultaneously (Drummond, Hill, & Barton, 2003). However, the overall scarcity of evidence on tangible health and societal outcomes from investing in genomics against the costs of investment, means that Chile has very little evidence to base investment decisions on.

4.4.3. Chile has an active research community in the field of genetics

Scientific research in Chile is principally funded by the *Comisión Nacional de Investigación Científica y Tecnológica* (CONICYT, hosted by the Ministry of Education and soon to be moved to the newly created Ministry of Technology) and the *Corporación de Fomento de la Producción* (CORFO, hosted by the Ministry of Economy). Both offer support to research teams for up to five years, via various calls that research teams respond to through open competition, for funds up to around USD 1 million.

These, and other funds, have allowed Chile to develop a substantial research base in clinical genetics and the basic science underlying it. The country, in fact, has more sequencers per capita than any other Latin American country, supported by a network of high performance computing capacity. One particularly promising development is *Chile Genomico* (see Box 4.3). This is a research platform that investigates population genetics. Its findings may help this and other programs in the identification of inherited risk-factors for disease, including diabetes, hypertension and several types of cancer in the Chilean population. The research uses biomarkers in clinical samples held in various biobanks (and has not, as yet, created a biobank of its own).

Box 4.3. ChileGenómico

ChileGenómico is a collaborative research network bringing together geneticists, sociologists, mathematicians and public health professionals. The project is managed by the University of Chile, and also has leadership from the Ministry of Health and support from the *Fondo de Fomento al Desarrollo Científico y Tecnológico* (FONDEF), as well as from the University of Tarapacá, and National Committee for Science and Technology (CONICYT). ChileGenómico's network of experts aims to study and build knowledge of the genome of the Chilean population, investigating different genetic biomarkers and documenting the extent of population genetic diversity.

More than 3000 people have participated, and researchers are developing a set of ancestry-informative markers. Currently, these genetic markers are being used to validate the predictive power of published genetic markers of risk for common diseases while considering the mixture of ancestries in Chileans. This information could be combined with social and environmental factors to inform public health and prevention strategies.

The rationale behind the project is that a greater understanding of the genetic profile of the Chilean population will increase the efficacy and targeting of preventive programs and health care.

Research collaboration with the private sector is also emerging. In particular, CORFO has recently established a Centre for Excellence in Precision Medicine with Pfizer Chile.

4.5. Accelerating the provision of clinical genetics and genomics services in a sustainable, equitable way in Chile

Chile starts from a strong position in seeking to develop its clinical genetics to become a regional and global leader. There are nevertheless substantial further steps that need to be taken to realise this ambition. First and foremost, a coherent and comprehensive national strategy should be agreed on to steer development of clinical genetics and genomic services over the coming years. One key component of this will be to agree on the right degree of regulation that underpins the analysis and – critically – sharing of individuals' genetic data. Another key component will be agreement on incrementally expanding the range of diagnostic genetic services covered by insurers; GES will need to keep pace with developments in the field of genomics, in particular where clear therapeutic benefit and value-for-money can be demonstrated. Ambitious goals to increase "genetic literacy" amongst both health professionals and the public should be also pursued. Alongside all this, it will be important to renew emphasis on the core public health activities of social, environmental and behavioural change, and not allow them to be overshadowed by newer genetic technologies.

4.5.1. A Ministerial working party should develop a national strategy for clinical genetics and genomic services in Chile

The development of precision medicine services in Chile should be underpinned by a national strategic plan, whose development should be directly overseen by the Minister of Health. Core tasks would include determining the expansion of genetic services to be included in GES; deepening collaboration between existing labs (public, private and academic) and rationalising the provision of key genetic tests across laboratories as

appropriate; ensuring that regulations (particularly around laboratory quality assurance, data sharing and consent) are fit for purpose; and, developing a programme of public and professional education around the role of genetic medicine. Most critically, a health system (especially one with relatively few resources) should only invest in new technology with a robust and detailed cost-effectiveness and budget-impact analysis, as well as business case. Chile's national strategic plan should ensure that this principle is adhered to.

A key element of the national plan should be to plan to concentrate selected genetic tests into specialist laboratories. At present, clinical genetics services in Chile are offered by a handful of public, private and university laboratories. These have arisen largely through individual initiatives, rather than a pre-planned approach. Such somewhat accidental arrangements are found in most health systems, but typically mean poor coordination and service gaps or duplication. Chile should bring order and coherence to the current landscape by agreeing a national strategy for clinical genetics services over the coming years.

Concentration and specialisation have the twin aim of improving quality and efficiency, and is increasingly pursued across OECD health systems in areas such as cancer care. As mentioned earlier, Chile is well supplied with sequencers. The working party that agrees such consolidation should involve all stakeholders (and clinicians and laboratory scientists in particular), but be led, and have Terms of Reference set, by the Ministry of Health. Given the importance of such a strategy, chairing by a Minister or Vice-Minister of Health would be appropriate; this would mirror the approach recently recommended in England.

Another key priority for the national strategy should be to identify and fund one laboratory to provide whole-genome sequencing. Currently Chile has limited capacity for clinical-grade WGS, meaning that samples are sent abroad for analysis. WGS is a core technology, so it seems that expertise and capacity in the technique need to be developed if Chile intends to become a regional leader in clinical genetics. The need for WGS arises relatively rarely, so a single national laboratory providing it should be sufficient. Other genetic tests that are indicated more often (such as panel testing for cancer susceptibility) would ideally be allocated to more than one laboratory, with different labs specialising in different services.

Additionally, all clinical genetics laboratories should be networked into a national virtual lab. Concentration of selected activities into selected laboratories does not imply fragmentation of services. On the contrary, rationalisation should be used as a lever to deepen collaboration between public, private and university research laboratories. In particular, a core task of Chile's national strategy should be the creation of a single, national virtual laboratory. The key activities of the virtual lab would include: providing advice to clinicians on appropriate tests in particular situations; ensuring rapid allocation of tests and samples to the appropriate specialist lab; the creation of national registers of the results of genetic analyses and linked phenotypic data; and planning a coordinated national research effort. Together, these activities should accelerate Chile's progress toward becoming a regional leader in both clinical genetics services and scientific research.

The Ministry of Health should also accelerate investment in telemedicine, as well as the development of interoperable electronic health records, in particular making effective linkages with the current broader development agenda around telemedicine. In parallel to the creation of a single, national virtual laboratory, other steps will need to be taken to

underpin a unified national genetics service. In particular, concentration of selected activities into fewer laboratories implies greater use of telemedicine to facilitate face-to-face communication between clinician, laboratory and patient. Telemedicine is developing rapidly in Chile (given the considerable geographic isolation of many communities), and benefits from a dedicated Division within the Ministry of Health. Clinical genetics should be a priority area for the further development of telemedicine in Chile, supported by national clinical frameworks and guidelines. Likewise, the need to share the results of genetic analyses and linked phenotypic data across Chile should be used as an impetus to drive development of interoperable electronic health records.

4.5.2. Appropriate regulation should underpin analysis and sharing of individuals' genetic data

Regulations specific to genetic data should be developed that permit sharing whilst protecting confidentiality. Genetic data is not the same as other types of personal health data. To approach a diagnosis, an individual's genetic (and phenotypic) data must be compared to the wider population, so that relevant variants linked to particular diseases can be found. Currently, Chile has strict regulations governing how personal health data can be shared. The current framework treats all personal health data equally, and is reported to be overly restrictive with regards to genetic data, risking progress in the field. Revised regulations that specifically relate to the sharing of genetic information would be welcome, therefore, to supplement the current regulatory framework. This would enable sharing of genetic data whilst protecting the privacy of identifiable personal data. As is already well understood in Chile, a red line is that individuals are not discriminated against (whether in terms of access to insurance, employment of other markets) because of their genetic profile. Patients should be involved in revising the regulatory framework that applies to genetic data.

Chile should build a national register of genetic variants, linked to phenotypes, to better understand inherited causes of disease. As a first step the registration platform for rare diseases, the Registry of Rare Diseases, which was presented in March 2018 but has yet to be enacted, should be linked with relevant genetic records and databases. As part of the unified national genetics service discussed earlier, and underpinned by revised regulations governing the sharing of genetic data, Chile should start to build a national register of genetic variants linked to phenotypes. This will need to be a dynamic register, continuously updated as individuals' phenotypes evolve and as the population's distribution of genetic variants extends. Linkage with *Chile Genómico* should be another priority, at the very least for research purposes. Informing the general public of the value of sharing genetic data, and the safeguards in place to protect against discrimination, will be vital.

Robust quality assurance should guarantee minimum standards across all laboratories undertaking genetic analysis. To ensure public confidence in a consistent standard of quality, robust quality assurance for clinical genetics laboratories and services should be developed. The precise approach should be agreed by all stakeholders in the Ministerial working party discussed earlier, and may involve peer-review or accreditation. Accreditation standards developed elsewhere are available to support this, such as those developed by the American College of Pathology. The College of American Pathologists holds a laboratory accreditation program, in collaboration with the American College of Molecular Genetics. This program outlines standards (and a checklist), that laboratories need to meet in a two-year period in order to be accredited to perform tests on human. Non-US laboratories can also be accredited with the Colleges. To-date the college has

accredited close to 8000 laboratories in 50 countries worldwide. Some academic laboratories in Chile (LGDM.PUC and CGG-UDD) are already participating in College of American Pathologist proficiency testing for genetics. This is a promising sign that such engagement could be broadened in Chile.

For Chile, this accreditation program may support the development of quality assurance processes, although investment in developing context-specific standards may be warranted (Grody & Richards, 2008). Rather than one-off assessment of minimum standards, however, it may be more effective to develop a programme of continuous quality improvement for labs and services, underpinned by regular audit cycles and other techniques, such as those developed by the Institute for Health Care Improvement.

4.5.3. The range of clinical genetic services covered by health insurers should be incrementally expanded

Incremental expansion of the range of clinical genetics services included in the GES is warranted, because the GES has not kept up with novel diagnostic technologies offered in other health systems. Furthermore, several conditions with an important genetic component are included in GES, but genetic tests that could speed up, or clarify, their diagnosis are not included. Clearly, expansion of GES needs to be sustainable and incremental, guided by cost-effectiveness and budget-impact analyses. Again, this is work that could be undertaken by the Ministerial working party described earlier.

An increasing body of research and international experience is available to support the task. It is recognised, for example, that whole genome sequencing (WGS) should be limited to rare or complex disorders whose diagnosis via non-genetic pathways would otherwise be lengthy. In more common disorders, more focussed analysis of the selected regions of the genome is more efficient in determining genetic antecedents. Likewise, population-wide sequencing is also poorly cost-efficient, with targeting to specific groups first stratified by phenotype, again being more efficient. Although such techniques (set out in Box 4) may capture the public imagination less that WGS, it is important that Chile should work to ensure equity, quality and sustainability of access to these "silver-level" technologies, and not invest inappropriately in "next generation sequencing".

Box 4.4. Going deep rather than wide: focused priorities in expanding the genetics component of GES

As has been alluded to across OECD countries, the development of genomics currently is quite focused and guided by strategic priorities for the health system overall. With the evolution of 'Next-Gen' sequencing methods, genomics has moved from sequencing being an arduous process that took considerable time, to rapid whole exome and whole genome sequencing being a possibility. However, with the breadth of possibilities in genomics there is a need to be focused in the priorities, for ethical and social reasons as well as economic ones. For instance, Next-Gen sequencing methods can assist with patients who may have symptoms within a disease family, but diagnosis of a specific disease has not been possible until genetic information is identified. These methods also help with identifying a susceptibility to certain cancers, e.g. BRCA (Scheuerle, 2017).

However, one of the challenges with these methods is that information can only be interpreted when compared with data from a broader population, and often that population is limited with respect to ethnic diversity, age and so forth. Despite the limited

diversity in these populations, there has been commercial testing and pharmaceuticals developed based on this information, which may have varying levels of effectiveness for individuals with different characteristics, and hence existing ethnic disparities in health outcomes are at risk of widening (Haga, 2010).

Therefore, Chile's commitment to genome sequencing and identifying ancestral history on a considerable population sample is a step towards ensuring that gene panel testing, or other genetics testing using Next-Gen methods will be more likely to reflect the true population characteristics.

In determining additional genetics tests to be included in GES, Chile again is starting from a good position. Professional and scientific associations have already drawn up a list of priority services to be added to GES. In terms of disease areas, the stated priorities with an important public health or preventive care component include breast, gastric, colorectal and prostate cancer. In terms of new techniques, priorities include MLPA, Sanger sequencing (which can analyse contiguous DNA sequences beyond 500 nucleotides), and molecular karyotype, which can identify Copy Number Variations.

The capacity of the Chilean health system to take action on significant genetic findings should be explicitly addressed. A key criterion in determining the expansion of GES's genetic component should be the actionability of abnormal results. A different – and more critical – aspect of actionability arises when a result becomes effectively unactionable because the health system in Chile is not configured to deliver an intervention that is known to offer benefit. For example, if BRCA1 and BRCA2 testing were to be introduced, GES's omission of prophylactic mastectomy for women who want it, renders BRCA testing effectively unactionable. Hence, the capacity of the wider system to take action on results needs to be explicitly addressed when considering expansion of the genetic component of GES.

4.5.4. Ambitious goals to increase "genetic literacy" amongst both professionals and the public should be pursued

Clinicians, including those working in primary care, should be offered training in when and how to refer patients for genetic analysis. Expansion of services will require workforce development, across both specialists (such as oncologists) and the primary care workforce. Properly training primary care clinicians in the potential of genetic analysis is critical, particularly if the objective is to improve preventive care and early diagnosis. This need not be highly technical, one of the most useful genetic "investigations", for example, is a thorough and well-documented family history. This can be easily performed in primary care practitioners, for example, and may reveal increased likelihood of cardiovascular disease, cancer or other important conditions. Equipped with this knowledge, personalised advice on prevention and early diagnosis can be offered. The United Kingdom offers a model here: 700 person-hours professional training in clinical genetics will be funded as part of a national strategy to increase genetic literacy.

The protocols and guidelines within GES should be updated to include a stronger focus on when a genetic component is likely, when and how to record a family history, and when and how to refer for further genetic analysis. From a preventive and public health angle, such updating of GES guidelines is particularly important for cancers or cardiovascular disease presenting at a young age. A particular priority, for example, is breast cancer where 10-20% of cases may have a hereditary component. GES guidelines should require, therefore, that a detailed family history should be taken in every new case,

so that early diagnosis or preventive care can be offered to family members at high risk. Similar considerations apply to gastric, colorectal and ovarian cancer. Guidelines that support the identification of hereditary cases of these cancers have been developed in other countries (such as the National Comprehensive Cancer Network guidelines of the United States, or the National Institute for Health and Care Excellence guidelines in the United Kingdom), and provide models for Chile to consider.

Developing genetic counselling services should be a priority for Chile. Interpreting genetic risk, considering this information alongside an individual's associated environmental risk, and explaining the combined risk and management options to patients is highly complex. As a result, a number of OECD health systems are investing in training more genetic counsellors to help patients make informed decisions with regards to prevention and treatment strategies. Chile, has recognised the importance of doing the same, and plans to establish genetic counselling services.

Educational initiatives for the general public should explain the role of genetic analysis, and the value of sharing individuals' genetic data. Initiatives to increase public understanding of clinical genetics will be just as important as initiatives directed toward professionals. Key objectives in increasing public understanding should be to explain role of genetics in disease aetiology and how that information can be used to improve disease prevention and treatment options, with a particular emphasis on the fact that pursuing a healthy lifestyle will always be necessary, irrespective of genetic risk. Encouraging data sharing, and addressing public concerns about genetic discrimination, should also be emphasised. The model of counselling and consent used at the point of genetic testing will be critical here. Again, the United Kingdom offers one approach to consider (see Box 5). There, consent is essentially permissive (allowing individuals' data to be used for research and quality improvement), but consent forms and linked educational resources are very detailed. Finally, public education should also address the emergence of commercial genetic testing. In some cases, this is of dubious scientific validity; in other cases, the lack of accompanying professional counselling risks creating anxiety or misunderstanding. As mentioned earlier, patient groups should be fully involved in developing a programme of public education.

Box 4.5. UK 100 000 Genomes project and United States All of Us initiative

A growing number of OECD countries have been large scale population level precision medicine initiatives. Canada, China, Estonia, France, and Korea have all been advancing precision medicine at a national level (OECD, 2017[2]). The United Kingdom and the United States also have very significant precision medicine initiatives, which are informing health policy and research in significant ways.

The United Kingdom established Genomics England within the National Health Service to deliver the 100 000 genomes project, which is focused on sequencing 100 000 genomes from approximately 70 000 patients and their families who live with rare diseases, as well as those with common cancers.

The aim of the project is to not only yield genetic information, it also involves linking this data with other health data at an individual level, including interviews with patients. Hence, the genetic information is combined with rich phenotype information. Further, within the project there are clinical interpretation partnerships where health professionals as well as geneticists work together to interpret all of the data. To enable further research

an anonymous version of all data is shared with researchers, to investigate potential clinical applications.

One of the main enablers, or features fundamental to the design and success of the 100 000 Genomes project is the design of the NHS itself, that is, there is an interoperable system in place where information from a variety of sources about an individual can be shared, and linked. Leaders of the project note that this is fundamental to its implementation and design, but a similar project in Chile would require significant investment in system structures to enable data linkage between clinical and genetic information, development diagnostic-level genomic services in private and public health care providers, and effective interaction between research and health care professionals and objective. If Chile was to implement a national initiative of genomic medicine new and adapted government-industry structures would be need to reach these goals.

The United States' All of Us initiative (formerly know as the Precision Medicine Initative) is run by the National Institute of Health and began in 2015 with a significant investment of USD 215 million, and had the aim of collecting genetic and environmental information for one million people (OECD, 2017[2]). The initiative is designed to collect data over a decade-long period drawing from sequencing, Electronic Medical Records (EMRs), personally reported information, personally reported information, and digital health technologies (Ginsburg and Phillips, 2018[7]). Participation is open to all, and participants will have access to information gathered about them.

Although the health system in the United States is organised very differently than in the United Kingdom, the initiative was also launched because of changing possibilities in the field of personalised medicine, as well as health care system design conditions. Most notably, part of the motivation behind the launch of All of Us was the changing cost of DNA sequencing, alongside the growth of other data sources (e.g. EMRs) (Ginsburg and Phillips, 2018[7]).

4.5.5. Core public health goals of bringing about social, environmental and behavioural change should not be overshadowed by new genetic technologies

A major challenge for Chile and other countries is the translation of the increasing amount of new knowledge produced by genomic technologies into public health policies and whether it will lead to improved population health. For a proper understanding of an individual's or community's risk of disease, genetic information must be combined with the information provided by behavioural, social and environmental risk factors to estimate an overall level of disease risk.

Decisions to invest in new genomic technologies will need to be carefully balanced against the need for investment in other parts of the health system. Chile is a relatively under-resourced health system, compared to OECD peers, in terms of workforce numbers, hospital bed density and the supply of key technologies such as CT and MRI scanners. Therefore, investment decision in these technologies should be based on strong evidence of effectiveness and cost-effectiveness. Turning to public health specifically, the core activities of risk-factor surveillance, screening, regulation, persuasion, education and so on will never diminish in importance, despite the growing profile of public health genomics. Chile should balance overall investment in genetic technologies with recommendations for strengthening traditional public health made in the other chapters of this report.

4.6. Conclusion

The potential for the role of precision medicine in supporting the public health and preventive care efforts in Chile has been explored in this chapter. The current work and plans for the growth of precision medicine in Chile is encouraging, and the work of academic, clinical and other research labs are critical not only for the Chilean population, but hold potential to valuably contribute to broader research in this field. However, there remains particular system challenges for Chile in broadening public health genomics and informing public health and preventive care.

The from this chapter recommendations focus on addressing these challenges. Specifically, the clinical genetics workforce is lacking a necessary group of expertise, that is, genetics counsellors. Further, the proportion of genetics laboratories in Chile is small, and they are also not widely located or linked throughout the country. In addition, most of the genetics testing is using older methods, and these are often not funded within the public or private health insurance system in Chile. Addressing access (financial and geographical) inequalities and establishing quality methods and regulation for laboratories is necessary. Regulation is also required for health professionals and precision medicine specialists on data sharing, confidentiality, safety, linkage and management. Patient consent procedures need to be standard, particularly if genomics work is occurring across the country, and health professionals and genetic workers need to be educated in these procedures. Further, consideration to investing in genetics literacy and the information dissemination process of the potential and value of genomics is warranted, as it is only when this process is successful that clinical applications and public health advancements through genomics can occur. Finally, and critically, to take maximum advantage of the potential of public health genomics Chile should look to establish a comprehensive governance framework, addressing issues such as quality control, regulation, privacy, data management and research. With sufficient commitment – from the Ministry of Health in Chile as well as from genetics specialists –expansion and continued growth of precision medicine could make Chile a regional leader in this area, with the potential to contribute to tackling some of the most complex public health challenges of our times.

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