OECD Health Policy Studies

Geographic Variations in Health Care

WHAT DO WE KNOW AND WHAT CAN BE DONE TO IMPROVE HEALTH SYSTEM PERFORMANCE?

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Foreword

Whether or not you will receive a particular health service depends to a very great extent on the country in which you live – even countries with similar standards of living deliver very different packages of health services – but also on the region where you live within a country. To the extent that variations in the use of different diagnostic or therapeutic procedures reflect differences in health needs or patient preferences, there is no cause for concern. But if they do not, they are *unwarranted,* signalling either under- or over-utilisation of care in some areas, which in turns raises questions about the equity and the efficiency of health systems and overall health system performance.

This book presents, for the first time, information on geographic variations in health care, both across *and* within countries. It presents comparable information on the extent of regional variations on a selected set of high-volume and high-cost health care activities, including hospital medical admissions and ten specific diagnostic and surgical procedures.

The evidence provided in the report suggests that the very large geographic differences observed in some countries are not consistent with differences in need or patient preferences. Rather they seem to point to the fact that either unnecessary care is being delivered in areas of high activity, or there is unmet need in regions of low activity. In either case, health systems are not achieving the level of performance they should.

This report also discusses a range of policy options that have been used to promote the delivery of appropriate levels of care and better take into account patient preferences, with a potential to reduce unwarranted variations. Public reporting through atlases of health care variations or regional targets has been used in Belgium, Canada, England, Finland, Italy, Spain and the United States, for example. Other countries have developed clinical guidelines targeting providers or used financial incentives to reduce high rates of procedures like caesarean sections. Others again have focussed on patient-related policies including decision aids to help patients make more informed decisions. Despite such policies, there remain large variations for certain procedures in most countries.

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Acronyms and abbreviations

ABS	Australian Bureau of Statistics
ACHI	Australian Classification of Health Interventions
ACSC	Ambulatory care sensitive conditions (Canada)
AGENAS	National Agency for Regional Health Services (Italy)
AHS	Area Health Service (Australia)
ALOS	Average length of stay
AO	Hospital trusts (Italy)
AOS	Mandatory basic health insurance (Switzerland)
AQUA	*Institut für angewandte Qualitätsförderung und Forschung im Gesundheitswesen GmbH* (Institute for Applied Quality Improvement and Research in Health Care GmbH, Germany)
AMIS Plus	National registry of myocardial infarctions (Switzerland)
ARS	Regional Health Agencies (France)
ASGC-RA	Australian Standard Geographical Classification – Remoteness Area
ASL	Local Health Authority (Italy)
ASSM	Swiss Academy of Medical Sciences
ATIH	Technical Agency on Hospital Information (France)
BPT	Best Practice Tariff
CABG	Coronary artery bypass graft
CBS	Central Bureau of Statistics (Israel)
CCAM	Classification of procedures (France)
CCI	Canadian Classification of Health Interventions
CDS	Swiss Conference of Cantonal Health Directors
CfV	Commissioning for Value
CHOP	*Classification Suisse des Interventions Chirurgicales* (Swiss Classification of Operations, Switzerland)
CHSPR	Centre for Health Services & Policy Research (Canada)
CIHI	Canadian Institute for Health Information
CNAMTS	Statutory Health Insurance Fund
CCG	Clinical Commissioning Group (England)
CQC	Care Quality Commission (England)

CT	Computed tomography
CV	Coefficient of variation
C-section	Caesarean section
Destatis	Federal Statistical Office (Germany)
DRG	Diagnosis related group
ECHO	European Collaboration for Healthcare Optimization
EFFECT	Enhanced Feedback for Effective Cardiac Treatment (Canada)
ERP	Estimated Resident Population (Australia)
FFS	Fee for service
FHF	French Public Hospital Association
FinOHTA	Finnish Office for Health Technology Assessment
FMH	Federation of Swiss Physicians
FSO	Federal Statistical Office (Switzerland)
FTE	Full-time equivalent
G-BA	Federal Joint Committee (Germany)
GP	General practitioner
HAS	*Haute Autorité de Santé* (National Authority for Health, France)
HCQI	OECD Health Care Quality Indicators
HIP	Health Investment Pack (England)
HMDB	Hospital Morbidity Database (Canada)
HRR	Hospital referral region (United States)
HTA	Health Technology Assessment (Finland)
ICD-9-CM	International Classification of Diseases, Ninth Revision, Clinical Modification
ICES	Institute of Clinical Evaluative Sciences (Canada)
INAMI	National Institute for Health and Disability Insurance (Belgium)
Insee	National Statistical Institute (France)
IQWiG	Institute for Quality and Efficiency in Health Care (Germany)
IRDES	*Institut de Recherche et Documentation en Économie de la Santé* (France)
ISHMT	International Shortlist of Hospital Morbidity Tabulation
IUD	Intrauterine device
LA	Local Authorities
LEA	Essential levels of care (Italy)
LHN	Local Hospital Networks (Australia)
MOH	Ministry of Health
MRI	Magnetic resonance imaging
MSAH	Ministry of Social Affairs and Health
mSv	Millisieverts

NACRS	National Ambulatory Care Reporting System (Canada)
NHDD	National Hospital Discharges Database (Israel)
NHI	National health insurance
NHMD	National Hospital Morbidity Database (Australia)
NHPA	National Health Performance Authority (Australia)
NHS	National Health Service (England)
NICE	National Institute for Health and Care Excellence (England)
NKCHR	National Cardiac Registry (Czech Republic)
NMD	National Mortality Database (Australia)
NRHOSP	National Register of Hospitalised Patients (Czech Republic)
NRKN	National Register of Joint Replacements (Czech Republic)
NRROD	National Register of Mothers at Childbirth (Czech Republic)
NSW	New South Wales (Australia)
NUTS	Nomenclature of Territorial Units for Statistics
OKS	Oxford Knee Score
ONS	Office of National Statistics (England)
OOP	Out of pocket
OPCS	Office of Population Censuses and Surveys (England)
P4P	Pay for performance
PbR	Payment by Results (England)
PCI	Percutaneous coronary intervention
PCT	Primary Care Trusts (England)
PHI	Private health insurance
PHN	Primary Health Networks (Australia)
PMSI MCO	*Programme de Médicalisation des Systèmes d'Informations. Médecine, Chirurgie, Obstétrique* (France)
PROM	Patient Reported Outcome Measure
PSA	Prostate-specific antigen
PTCA	Percutaneous transluminal coronary angioplasty
RCT	Randomised clinical trial
SCV	Systematic component of variation
SHA	Strategic Health Authorities (England)
SHI	Statutory health insurance
SHI	Social Health Insurance (Czech Republic)
SII	Social Insurance Institution (Finland)
SIRIS	Swiss Registry of Implants
SiVeAS	Italian health surveillance
SLA	Statistical Local Area (Australia)

SROS	Strategic Regional Health Plan (France)
SSN	National Health Service (Italy)
STAKES	National Research and Development Centre for Welfare and Health (Finland)
SÚKL	State Institute for Drug Control (Czech Republic)
T2A	Activity-based payment system (France)
THL	National Institute for Health and Welfare (Finland)
URS	Urgency rating score

Executive summary

Geographic variations in health care use across and within countries have been widely documented, for a limited number of countries including the United States, Canada, the United Kingdom and Nordic countries. While some of these variations reflect differences in patient needs and/or preferences, others do not. Instead, they are due to variations in medical practice styles, the ability of providers to generate demand beyond what is clinically necessary, or to unequal access to health care services. These *unwarranted* variations raise concerns about the equity and the efficiency of health systems.

This report presents new information on geographic variations in health care utilisation within and across 13 OECD countries: Australia, Belgium, Canada, the Czech Republic, Finland, France, Germany, Israel, Italy, Portugal, Spain, Switzerland and the United Kingdom (England). The analysis focusses on a selected set of high-volume and high-cost health care activities. Data are reported for the most recent year (often 2011) and sometimes for several years, allowing some analysis of trends. Health care utilisation is recorded at the patient's place of residence. Hence, the level of use in a given area cannot be explained by patients receiving treatment in other geographic areas. Utilisation rates have been standardised by age and sex to remove the effect of differences in population structures. The report considers possible causes of these variations and explores health policies expected to reduce unwarranted variations.

Key findings

Geographic variation in health care use persists, across and within countries, even after taking account of differences in demographic structures

- *Cardiac procedures rates show the highest level of geographic variations.* They vary by more than three-fold *across* countries and have the highest level of *within-country* variation for more than half of the countries. The latter are particularly high for coronary bypass in Spain and Portugal.
- *Knee replacement rates display high levels of variations.* They vary by more than four-fold across countries. They also vary by two- to three-fold across geographic areas in most countries, and by more than five-fold in Canada, Portugal and Spain.
- *Variations in hysterectomy rates are relatively high, in a context of declining use of this intervention.* The prevalence of hysterectomy is 75% higher in Canada and Germany (above 350 per 100 000 females) than in Israel, Spain, Portugal or the Czech Republic. Most countries have two- to three-fold variation across geographic areas but Canada and the Czech Republic have higher levels of variation (close to four-fold).
- *Hospital medical admission rates are twice as high* in Israel, Germany or Australia (around 12 000 per 100 000 population) than in Canada. While within-country variations are lower than for other procedures, Canada, Australia, Finland

and England display the highest levels of variation (from 2.4 to 3.6-fold), partly due to outlying regions.

- *Caesarean section rates are as much as 50% higher* in Italy, Portugal, Australia, Switzerland and Germany (above 300 per 1 000 live births) than in Finland. Within-country variations are relatively low, except in Italy where caesarean section rates vary by six-fold across regions.
- *Rates of admissions/surgery after hip fracture are about twice as high* in Germany and Switzerland (more than 150 per 100 000 population) than in Belgium and Finland. They show the lowest level of within-country variations (less than two-fold), with the exception of Australia, where one area has a very high rate.

These large geographic variations can only in part be explained by differences in morbidity or patient preferences. The data used in the report were adjusted for differences in age and sex, which removes some of the variation in morbidity across regions within a country. Others factors play a significant role, such as differences in supply of services (e.g. for hospital medical admissions) or variations in medical practices (e.g. hysterectomy). These are unwarranted and ought to be tackled if health systems are to deliver the high-quality care that patients need.

Key recommendations

The primary objective of health policies is to promote appropriate care, including by responding better to patient preferences, not to reduce variations in health care. However, a number of interventions or initiatives can have an impact on addressing *unwarranted* variations in health care use. This report identifies several policy options.

"Soft touch" policies, such as public reporting and target-setting, can be catalysts for change

- *Countries should publish information on geographic variations in health care use*. Canada, the Netherlands, Spain and the United Kingdom already publish "Atlases" of variations in health care, building on the pioneering work of the Dartmouth Institute for Health Policy and Clinical Practice in the United States. These atlases mainly serve to identify potential under or over-use, and raise questions about why such variations take place. In and of themselves, however, Atlases can change nothing. Rather, they provide the basis for starting discussions and actions involving key stakeholders, notably health care providers, as to why these variations exist and what should be done to address them.
- *Countries could consider setting targets where appropriate*. For instance, Belgium developed a strategy with stakeholders to reduce exposure to ionising radiation from imaging tests by 25%. Italy set regional targets for caesarean section rates which probably contributed to the decline in rates observed in 2012, particularly among regions with the highest rates.

Policies targeting providers can improve the appropriateness of care

- *The development and monitoring of clinical guidelines is a key policy lever to standardise clinical practices.* In almost all countries, physician societies and/or health authorities have produced clinical guidelines for many of the procedures examined in this report. The public expenditure constraints that have recently affected health systems have given an additional impetus to the development of such guidelines. Rigorous monitoring systems may help to promote compliance with the established standards. In Spain, some hospitals used a tool to assess the need for caesarean section, which led to a small reduction in their use.

- *Provider-level reporting and feedback, which can be delivered privately to reduce resistance from providers, shows promising results.* In Canada, a recent report by a Cardiac Care Network on variations in the ratio of coronary bypass to coronary angioplasty across different hospitals in Ontario identified opportunities to improve transparency and consistency in decision making for coronary revascularisation. In Belgium, hospitals received feedback on variations in caesarean section rates, which led to a convergence in rates among hospitals with both high and low rates.
- *A few countries have introduced financial incentives to reduce the use of unnecessary caesarean sections.* France reduced the gap between the prices paid by health insurance for caesarean sections and normal delivery, while England decided to align the prices of the two procedures. Korea implemented a pay-for-performance scheme for hospitals, which slightly reduced caesarean section rates.

Shared decision making between patients and providers and patient outcome measurement are needed to reduce unwarranted variations

- *Comparing patient outcomes across geographic areas or over time helps to assess the appropriateness of care.* Over-utilisation of health care can lead to diminishing outcomes. Sweden and the United Kingdom have led the way by collecting systematically *patient-related outcomes* after certain surgical procedures such as knee and hip replacement.
- *The diffusion of decision aids for patients can help patient preferences to be taken into account.* The United States and the United Kingdom publish decision aids for a range of procedures (e.g., knee replacement). These tools complement information provided by physicians and help patients assess the potential benefits and risks of different treatment options. In some cases, they can reduce the use of resource-intensive interventions.

Chapter 1

Geographic variations in health care use in 13 countries: A synthesis of findings

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This chapter summarises the main findings of this project on geographic variations in health care use across and within a number of OECD countries, and identifies a range of policy levers that can be used to reduce unwarranted variations, defined as variations that cannot be explained by patient needs and/or preferences. This summary draws mainly on the 13 national reports from Australia, Belgium, Canada, the Czech Republic, Finland, France, Germany, Israel, Italy, Portugal, Spain, Switzerland and the United Kingdom (England) which are published in the following chapters. The analysis focusses on a selected set of health care activities and procedures, including hospital medical admissions and some high-volume and high-cost diagnostic and surgical procedures. The results show that large variations in health care use persist, across and within countries, even after taking into account differences in demographic structures. While the analysis in this study does not allow to determine precisely how much of these variations are unwarranted, some of these variations are too large to be explained solely by patient needs and/or preferences. A number of policy interventions have been used in different countries to address unwarranted variations in health care use, including public reporting, the development and monitoring of clinical guidelines, the diffusion of decision aids for patients to complement the information they receive from physicians, and changes in financial incentives to try to reduce the inappropriate use of certain procedures.

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

Geographic variations in health care use within countries have been widely documented, but only for a limited number of countries including the United States, Canada, the United Kingdom and Nordic countries. While some of these variations reflect differences in patient needs and/or preferences, others do not. Instead, they are due to other factors, such as variations in medical practice styles, the ability of providers to generate demand beyond what is clinically necessary, or unequal access to health care services. These *unwarranted* variations raise concern about the equity and the efficiency of health systems.

Geographic variations in health care use have been observed for a long time in some countries. As early as the 1930s, there has been evidence of large variations in the rates of tonsillectomy in England, which varied widely across English districts in a way that "defies any explanation, save that of variations of medical opinion on the indications for operation" (Glover, 1938). A well-known study carried out in the United States in the 1970s found similarly wide variations in tonsillectomy rates, with the probability of children having had their tonsils removed by the age of 20 ranging from 16% to over 66% in different areas of the State of Vermont (Wennberg and Gittelsohn, 1973).

Building on the pioneering work of the Dartmouth Institute for Health Policy and Clinical Practice in the United States, research on medical practice variations has been growing in recent years in many countries, covering a growing number of health care activities and procedures, with a view to identify possible inappropriate use (Corallo et al., 2014). Some of the geographic variations in health care are certainly related to different health needs: for example, part of the variations in revascularisation rates in France is related to differences in incidence and mortality rates from heart attack, which in turn is related to differences in socioeconomic status and risk factors (Gusmano et al., 2014). But the variations are often too large to plausibly be explained solely by differences in needs. A large proportion of the differences in health care use, either across geographic areas or providers, remains unexplained (Appleby et al., 2011; IOM, 2013; Corallo et al., 2014; Sundmacher and Busse, 2014).

This report focusses on geographic variations in the use of a selected number of health care activities and procedures, across and within OECD countries. It draws on 13 national reports from Australia, Belgium, Canada, the Czech Republic, Finland, France, Germany, Israel, Italy, Portugal, Spain, Switzerland and the United Kingdom (England). These countries differ with respect to the stage of development of research on variations in health care use, with some countries documenting geographic variations for the first time.

This chapter summarises the main findings of this report. The subsequent chapters present country-specific analyses and results. Section 1.2 presents some analytical frameworks which help to distinguish different types of medical practice variations and define "unwarranted" variations. Section 1.3 describes the scope and methods used in this OECD project, including the selected set of health care activities and procedures. Section 1.4 provides a summary of the main findings from the 13 country reports. Section 1.5 identifies a range of policy options that have been used or might be used to reduce unwarranted geographic variations in health care use.

1.2. Two main analytical frameworks to understand geographic variations in health care use

At least two analytical frameworks have been developed to analyse variations in health care use. The first framework was developed by the Dartmouth Institute for Health Policy and Clinical Practice in the United States (Wennberg et al., 2002). It distinguishes three categories of care:

- *Effective care*: Evidence-based interventions for which the benefit exceeds the harm so that all (or almost all) patients should receive the service (e.g. childhood immunisations or beta-blockers following heart attacks). Variations in the use of such treatments among eligible patients reflect a failure to deliver needed care, or underuse of effective care.
- *Preference-sensitive care*: Treatment options exist but carry different benefits and risks, and patients' attitudes towards these benefits and risks may vary. This is the case for instance of prostate-specific antigen (PSA) screening for prostate cancer, where uncertain survival benefits need to be weighed against the risk of needless biopsies and treatment for low-grade malignancies. If it was possible to identify the choices that well-informed patients would make, then this could become the reference to which actual usage could be compared.
- *Supply-sensitive care*: Services where the supply of a specific resource has a major influence on utilisation rates (e.g. diagnostic tests), in the absence of evidence for the need of these additional services. Variations in supply-sensitive care are largely due to differences in local supply of health care resources (e.g., number of doctors or hospital beds per capita) as well as reimbursement or budgeting systems that incentivise volume rather than quality/outcome of services. The reference rate should be the rate beyond which additional services do not result in better outcomes, but this requires good information on health outcomes.

In this framework, *unwarranted* variations are defined as medical practice variations that *cannot* be explained on the basis of patient needs or preferences.

The second framework was developed more recently in Europe by the European Collaboration for Health Optimisation (ECHO). It characterises health care activities according to the health benefit they bring to the patient (ECHO, 2014):

- *Effective care*: Procedures or activities with proven effectiveness for any patient.
- *Effective care with uncertain marginal benefit*: Procedures or activities whose risk-benefit balance depends on patient characteristics.
- *Lower-value care*: Procedures or activities with no evidence-based effectiveness.

This framework is used to interpret geographic variations in the use of services and make judgments on appropriateness of care, at least in the first and third categories.

These two frameworks emphasise that the available evidence on risks and benefits of different procedures is likely to have an important impact on utilisation rates by affecting medical opinions and patient preferences. Even if the indication for a certain surgical treatment can be generally agreed upon at a given point in time – for instance, the use of less invasive laparoscopic procedures – constant improvements in surgical techniques and other possible non-surgical treatments may require rapid changes in practice style to adopt the most appropriate and less risky treatment.

1.3. Scope and methods of the OECD project

The OECD project focusses on geographic variations in health care utilisation within countries, based on the patient's place of residence, not on the location of health care facilities (except in Spain, where all procedures but cardiac care are recorded based on the location of providers). It draws on 13 national reports, drafted in most cases by national experts, as well as on literature reviews and desk research. An expert group, which met twice, assisted in the design and implementation of the project.

The expert group selected a set of 11 health care activities and procedures, based mainly on the criteria of high-cost and high-volume, policy relevance and data availability. These included a general measure of hospital medical admissions, and ten specific diagnostic and surgical procedures, with some of these procedures identified as a lower priority (see Box 1.1 and Annex 1.A1).

Box 1.1. List of procedures selected in this project

Hospital medical admissions (i.e. not surgical)

Cardiac procedures

- Coronary artery bypass graft (CABG)
- Percutaneous transluminal coronary angioplasty (PTCA)
- *Cardiac catheterisation*

Joint procedures

- Admission/surgery after hip fracture (selected as an expected low-variation procedure, given that there is little discretion to admit and operate a patient after hip fracture)
- Knee replacement
- *Knee arthroscopy*

Gynaecologic procedures

- Caesarean section
- *Hysterectomy*

Diagnostic imaging procedures

- *Magnetic resonance imaging scan (MRI)*
- *Computed tomography scan (CT)*

Note: Procedures in italics were presented as optional.

Source: OECD project on Medical Practice Variations.

The data for most countries was drawn largely from hospital discharge databases, and included at least one recent year (generally 2011). Some countries (Czech Republic, Finland, Israel, Italy, Portugal and Switzerland) were also able to provide some time series covering up to ten years. Most participating countries reported data on hospital medical admissions and many of the surgical procedures. Table 1.1 summarises data availability for different procedures.

Table 1.1. Coverage of health care activities and procedures in national reports

Country	Hospital medical admission	CABG	PTCA	Catheterisation	Surgery after hip fracture	Knee replacement	Knee arthroscopy	Caesarean section	Hysterectomy	MRI & CT
Australia	•	•	•	•	•	•	•	•	•	
Belgium	•	•	•	•	•	•	•	•	•	•
Canada	•	•	•		•	•		•	•	•
Czech Rep.	•				•	•		•	•	
Finland	•	•	•	•	•	•	•	•	•	
France	•	•	•		•	•	•	•	•	
Germany	•	•	•		•	•		•	•	
Israel	•	•	•	•	•	•	•	•	•	
Italy	•	•	•	•	•	•	•	•		
Portugal	•	•	•	•	•	•	•	•	•	
Spain	•	•	•	•	•	•	•	•	•	
Switzerland	•	•	•	•	•	•	•	•		
United Kingdom (England)	•	•	•		•	•		•		•

Source: National reports included in this volume.

Countries selected their preferred geographic unit for analysis, based on data availability and/or policy relevance (see Table 1.2). Canada, the Czech Republic, Germany, Italy and Spain reported information for two different geographic levels. The number of geographic units ranges from a low of seven in Israel to 151 in England. In some cases, geographic units represent authorities with broad administrative competences in health policy, for instance *Länder* in Germany or *cantons* in Switzerland. In other cases, they are health care decision-making authorities, as was the case for Primary Care Trusts at the time of reporting[1] in England. In Italy, regions also have autonomy in health policy. In Belgium, provinces are grouped within three regions which have authority in health care decision making.

The population size of these geographic units varies widely. The smallest area considered is a Swiss canton with a population of 16 000 people and the largest is a German Land (North Rhine-Westphalia) with a population of almost 18 million people. When only the lowest geographic level is considered in each country, the largest geographic unit is the Community of Madrid in Spain (almost 6.5 million people). The average size of territorial units (based on the lowest level in each country) varies from 270 000 in Finland to 1 000 000 in Israel (see Figure 1.1).

The size of the geographic unit *matters* for the analysis and interpretation of variations within and across countries. Health care utilisation rates observed in large territorial units will tend to be closer to the country's average while those in some less populated areas are more likely to deviate from this average for different reasons. This means that countries with smaller geographic areas are more likely, statistically speaking, to display higher variations across areas than countries with larger units. For example, the Czech Republic is divided into 14 administrative regions and 77 districts. The coefficient of variation for caesarean section at the administrative region level (0.11) is lower than at the district level (0.20). For countries who reported procedure rates for two levels of territorial units, this chapter only refers to the smallest territorial unit (except for Germany).

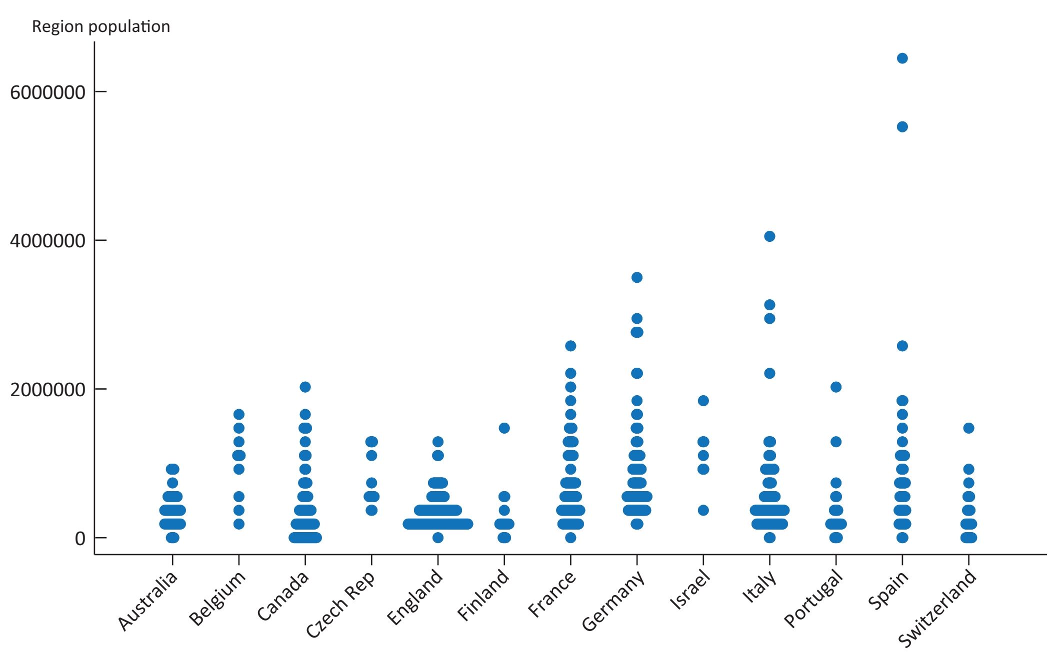
Table 1.2. Geographic units used for analysis in national reports and period covered

Country	Geographic units	Health decision making	Years
Australia	Medicare Locals (61)	No	2010/11
Belgium	Provinces (11)	No	2009
Canada	1. Provinces/territories (13) 2. Health regions (83)	Yes	2003/04 or 2006/07 and 2010/11
Czech Republic	1. Regions (14) 2. Districts (77)	Yes (Regions)	2007-10
Finland	Hospital districts (20)	Yes	2001-11
France	Administrative departments (95)	No	2005-11
Germany	1. Länder (16) 2. Spatial planning regions (96)	Yes (Länder)	2011
Israel	Districts (6)	No	2000-11
Italy	1. Regions (20) 2. Provinces (110)	Yes (Regions)	2007-11
Portugal	Grupos de municipios (28)	No	2002-09
Spain	1. Autonomous communities (17) 2. Provinces (50)	Yes (AC)	2000, 2005, 2010
Switzerland	Cantons (26)	Yes	2005-11
United Kingdom/England	Primary Care Trusts (PCTs) (151)	Yes	2010

Note: Some countries (Canada, Finland, France, Portugal and Switzerland) have merged or excluded some small units to obtain statistically significant results. Australia and Germany also analysed several years but only reported on the most recent year as the size of the within-country variation in the previous years was similar.

Source: National reports included in this volume.

Figure 1.1. Population size of geographic units in participating OECD countries, 2011 or latest year



Note: Each dot represents a territorial unit. This figure does not include the population for the largest units in Canada (provinces and territories), Germany (Länder), Italy (Regions) and Spain (Autonomous communities).

Source: National data submitted for the OECD project on Medical Practice Variations.

Countries were invited to report on a core set of statistics frequently used in medical practice variation measurement (see Annex 1.A2). These included: the unweighted average of geographic areas' standardised rates, the minimum and maximum rates across geographic areas, the 10th and 90th percentiles of their distribution (which limits the impact of "outlier" regions), the coefficient of variation (i.e. the ratio of the standard deviation to the mean), as well as the systematic component of variation (SCV). The SCV allows removing the random component of variation, that is the share of variation which is due to chance rather than to structural differences between regions.

In this chapter, the data were standardised using the OECD population structure as set out in Annex 1.A2, to remove the effect of differences in population structure in geographic areas across countries.[2] The standardisation by age and gender is expected to remove part of the variation explained by morbidity, especially for conditions which are age-dependant. However, this does not remove *all* the variation due to differences in morbidity across geographical areas. This implies that procedure rates presented in figures below are not totally adjusted for population needs.

Geographic variations in health care are explained by both demand and supply-side factors. The strategy used in this study to explain some of the variations had two steps: first potential determinants of procedure rates have been identified in the literature and second, measures of ecological relationships by countries have been used wherever possible. The OECD Secretariat carried out a non-exhaustive literature search on the determinants of variations for the set of activities and procedures analysed. This research included both studies performed at the regional level and studies performed at the provider or patient level. Factors which were significant in econometric models or had significant correlations are presented.

1.4. Substantial variations across and within countries for all activities and procedures

A summary of key findings

Across countries, the national average rates of procedures vary from nearly two-fold for caesarean section (from 181 per 1 000 live births in Finland to about 350 in Australia, Italy and Portugal) to nearly five-fold for knee replacement with the lowest standardised rates in Israel and the highest rates in Australia and Switzerland (Table 1.3).

As to ***within-country variations***, there is broad consistency across countries in the ranking of procedures. Cardiac procedures, knee replacement, MRI and CT scan were consistently ranked as "high" variation across geographic areas. Conversely, hospital medical admissions and hysterectomy were generally in the middle range. Surgery/admissions after hip fracture and caesarean section were generally ranked as having low variation (Table 1.3). These results are consistent with existing research.

Cardiac procedures rates show the highest level of geographic variations. They vary by more than three-fold *across* countries and have the highest level of *within-country* variation for more than half of the countries. The latter are particularly high for coronary bypass in Spain and Portugal. In both countries, however, outlying (low) values may partly result from partial coverage of data since Spain and Portugal only reported activities of public hospitals.

Knee replacement rates display high levels of variations. They vary by more than four-fold *across* countries. They are highest in Australia, Switzerland, Finland, Canada and Germany (above 200 per 100 000 population over 15-years old) while they are below 150 in other countries, with Israel having the lowest rate (56 per 100 000). Knee replacements also vary by two- to three-fold across geographic areas in most countries; and by more than five-fold in Canada, Portugal and Spain.

Table 1.3. National average rates and within-country variations in health care use, by procedure, 2011 or latest year

Summary statistics	Country	Hospital medical admission (per 100 000 pop.)	CABG (per 100 000 pop.)	PTCA (per 100 000 pop.)	Admission/surgery after hip fracture (per 100 000 pop.)	Knee replacement (per 100 000 pop.)	C-section (per 1 000 live births)	Hysterectomy (per 100 000 females)
Unweighted national average	Australia	12033	72	208	121	257	343	330
	Belgium	9723	84	261	78	186	206	308
	Canada	5717	75	212	-	213	292	394
	Czech Rep.	-	-	-	-	105	243	197
	England	10585	-	-	-	-	-	-
	Finland	8962	59	189	81	213	181	254
	France	8805	28	247	118	135	194	209
	Germany	12267	69	370	176	209	324	376
	Israel	12755	59	340	140	56	207	128
	Italy	6370	41	187	114	96	346	207
	Portugal	5245	26	111	108	74	349	175
	Spain	5121	27	135	108	98	189	172
	Switzerland	7662	52	242	151	230	332	-
Ratio 90th/10th percentile	Australia	1.5	1.8	1.8	1.5	1.7	1.3	1.6
	Belgium	1.3	1.7	1.7	1.6	1.5	1.3	1.5
	Canada	2.4	2.0	1.7	-	2.5	1.5	2.0
	Czech Rep.	-	-	-	-	1.6	1.4	3.0
	England	1.6	-	-	-	-	-	-
	Finland	2.1	2.4	2.9	1.4	1.6	1.6	1.8
	France	1.3	2.2	1.8	1.3	1.7	1.3	1.6
	Germany	1.4	2.0	1.8	1.3	1.5	1.4	1.5
	Israel	1.4	2.0	1.4	1.4	2.3	1.6	-
	Italy	1.4	2.1	1.8	1.4	1.7	2.0	1.5
	Portugal	1.5	3.2	1.9	1.4	3.2	1.5	2.1
	Spain	1.5	6.0	2.2	1.7	2.2	1.9	1.7
	Switzerland	1.5	2.3	1.7	1.8	1.6	1.5	-
Ratio Max/Min value	Australia	2.5	3.4	3.4	5.0	2.3	1.6	2.6
	Belgium	1.3	1.8	1.8	1.7	1.6	1.3	1.6
	Canada	3.6	4.0	4.0		5.7	2.8	4.1
	Czech Rep.	-	-	-	-	1.8	1.4	3.6
	England	3.2	-	-	-	-	-	-
	Finland	2.4	4.0	3.5	1.6	2.0	2.1	2.0
	France	1.7	5.4	2.8	1.5	2.8	1.9	2.4
	Germany	1.9	2.9	2.9	1.9	2.4	2.2	2.1
	Israel	1.4	2.0	1.4	1.4	2.3	1.6	2.1
	Italy	2.2	7.0	3.6	2.8	3.1	6.0	2.6
	Portugal	2.6	17.6	3.9	1.9	8.6	1.6	2.7
	Spain	2.0	**	5.2	2.6	5.6	3.6	3.5
	Switzerland	1.7	3.3	1.8	2.1	2.0	2.2	-
Coefficient of variation	Australia	0.20	0.21	0.24	0.23	0.19	0.10	0.20
	Belgium	0.08	0.17	0.18	0.16	0.14	0.09	0.13
	Canada	0.34	0.25	0.22	-	0.32	0.16	0.27
	Czech Rep.	-	-	-	-	0.16	0.11	0.39
	England	0.19	-	-	-	-	-	-
	Finland	0.20	0.34	0.30	0.13	0.18	0.18	0.20
	France	0.11	0.29	0.23	0.09	0.19	0.12	0.18
	Germany	0.14	0.24	0.22	0.11	0.17	0.13	0.14
	Israel	0.12	0.27	0.12	0.14	0.28	0.16	0.23
	Italy	0.15	0.30	0.23	0.14	0.20	0.29	0.17
	Portugal	0.21	0.41	0.27	0.15	0.39	0.13	0.27
	Spain	0.14	0.50	0.30	0.20	0.31	0.25	0.21
	Switzerland	0.13	0.26	0.17	0.20	0.17	0.15	-

Note: Rates are standardised using the 2010 OECD population. The coefficient of variation is the ratio of the standard deviation to the mean. Darker shaded cells refer to within-country variation that is more than two-fold and to the coefficient of variations equal or higher than 0.2 and "-" signals data that were not reported or not comparable. Data for Canada, Germany, Italy and Spain refer to the smaller territorial unit (see Table 1.2 for details). (**) Spain has a minimum value of 0 and so the ratio cannot be calculated.

Source: Authors' estimates based on data submitted by countries for the OECD project

Variations in ***hysterectomy rates*** are relatively high, in a context of declining use of this intervention. The prevalence of hysterectomy is 75% higher in Canada and Germany (above 350 per 100 000 females) than in Israel, Spain, Portugal or the Czech Republic. Most countries have two- to three-fold variation across geographic areas. Canada and the Czech Republic have higher levels of variation (close to four-fold), due to some high extreme values in certain areas.

Hospital medical admissions rates are twice as high in Israel, Germany or Australia (around 12 000 per 10 000 population) than in Canada. While within-country variations are lower than for other procedures, Canada, Australia, Finland and England display the highest levels of variation (ranging from 2.4 to 3.6-fold), partly due to outlying regions.

Caesarean section rates are as much as 50% higher in Italy, Portugal, Australia, Switzerland and Germany (above 300 per 1 000 live births) than in Finland. Within-country variations are relatively low, except in Italy where caesarean section rates vary by six-fold across regions.

Rates of ***admissions/surgery after hip fracture*** are about twice as high in Germany and Switzerland (more than 150 per 100 000 population) than in Belgium and Finland. Most countries have low variation across geographic areas (less than two-fold variation), with Australia having the highest levels of within-country variation (five-fold). In Australia, the wide variation is due to an extremely high value in one Medicare Local.

Some of the variations observed might be due to differences in health needs, not totally captured by demographic adjustments, or by differences in patient preferences. Others are explained by differences in the supply of services or variations in medical practices. These supply-related variations are deemed to be unwarranted and should be addressed to improve health system performance.

Hospital medical admissions vary by two-fold or more across and within countries

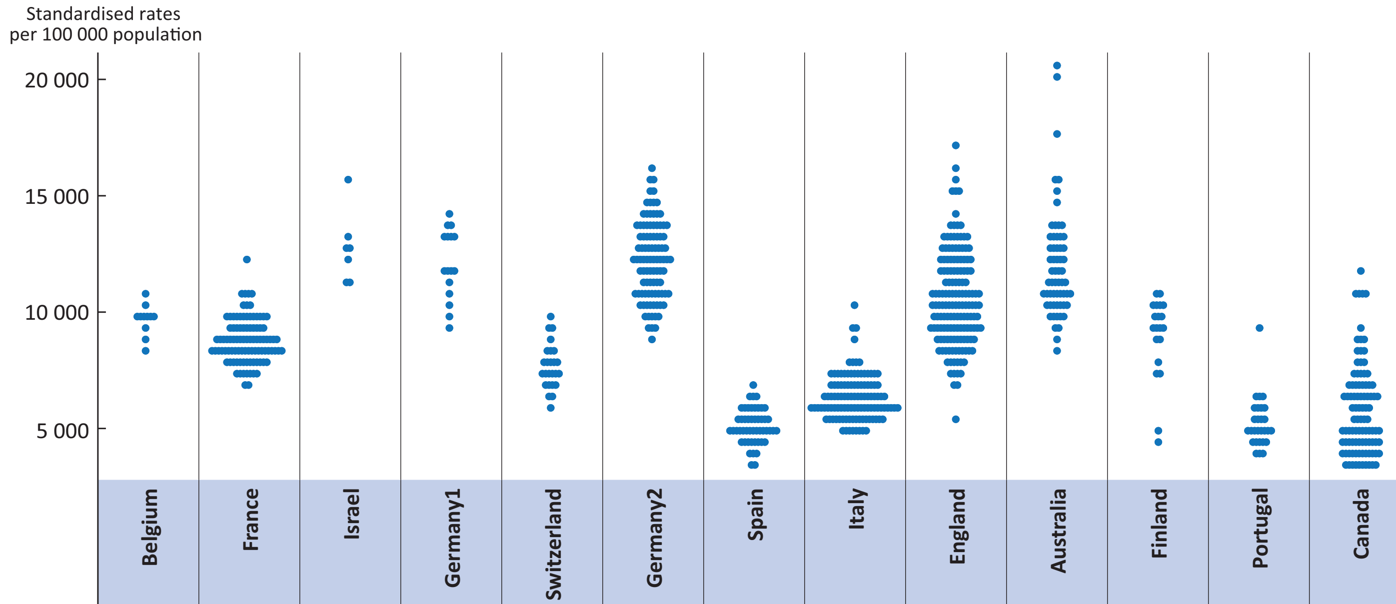
Hospital medical admissions refer to patients admitted for at least one night in hospital but who do not undergo any surgical procedure.[3] While indications to hospitalise patients are very clear for a few conditions, the rules are less clear for others, leaving much room to clinicians' discretionary decisions.

Hospital medical admission standardised rates are twice as high in Israel, Germany or Australia (around or above 12 000 per 100 000 population over 15 years) than in Spain,[4] Portugal,[5] and Canada,[6] where they stand at around or below 6 000 (see Figure 1.2). The low rates observed in Spain and Portugal, however, are partly explained by the fact that both countries only reported activities in public hospitals.

Hospital medical admission rates also vary within countries. Canada shows the highest level of variations, with admissions being more than three times higher in certain regions compared to others. Australia, Portugal, Finland and England also display high levels of variations, ranging from 2.4 to 3.2-fold, around very different average rates. Some of these variations are explained by extreme values: two territories in Canada (Nunavut and the Northwest Territories) and three Medicare Locals in Australia have very high rates of hospital medical admissions, while two districts in Finland have very low rates by comparison with other Finnish districts (Figure 1.2).

Hospital medical admission rates tend to decline in most OECD countries but not uniformly across geographic areas. In Finland, for instance, where the average standardised rate declined by 22% in the last decade, variations between districts increased due to diverging trends. Medical admission rates decreased sharply in two districts with university hospitals (by 50 to 60%) (Chapter 6 in this volume). In Canada, where the average standardised rate declined by 9% between 2006 and 2010, the range of variations across regions remained stable over the period (Chapter 4). This suggests that hospital medical admissions have declined everywhere at the same rate. In Italy, both the average rate and the coefficient of variation decreased between 2007 and 2011 (Chapter 10). This means that the reduction has generally been greater in regions that had high rates. Similarly, Portugal experienced a slow decline in the average rate (-3%) and variation (-12%) between 2002 and 2009 (Chapter 11). By contrast, the average rate of hospital medical admissions increased in France between 2005 and 2011, but the range of variations across departments decreased (Chapter 7). The average rate also went up in Switzerland, driven by a surge in hospital medical admissions in two cantons with initial high rates, which remains unexplained so far (Chapter 13).

Figure 1.2. Hospital medical admission rate across and within selected OECD countries, 2011 or latest year



	Belgium	France	Israel	Germany1	Switzerland	Germany2	Spain	Italy	England	Australia	Finland	Portugal	Canada
Crude rate	10 337	8 802	11 878	13 342	7 047	13 342	5 244	7 403	10 276	10 986	8 168	5 277	4 376
Std rate	9 723	8 805	12 755	12 102	7 662	12 267	5 121	6 370	10 585	12 033	8 962	5 245	5 717
Coeff. of variation	0.08	0.11	0.12	0.12	0.13	0.14	0.14	0.15	0.19	0.20	0.20	0.21	0.34

Note: Each dot represents a territorial unit. Rates are standardised using OECD population >15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Germany 1 and 2 correspond respectively to Länder and Spatial Planning Regions. Canadian data do not include mental hospital admissions in general hospitals leading to a relatively small under-estimation. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based on the province where the hospital is located.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Hospital bed supply and inadequate primary care services explain part of the variations in hospital medical admissions

The influence of hospital supply on overall admission rates has been widely documented, generally confirming Rohmer's law that a "built bed is a filled bed". For instance, Fisher et al. (2000) analysed the relationships between resources and use in 313 hospital referral regions (HRR) in the United States. They showed that the number of beds per capita varied by more than two-fold across regions and that Medicare patients in areas with more beds were up to 30% more likely to be hospitalised, controlling for socio-economic characteristics and disease burden.

Other studies suggest that the availability and quality of primary care services can make a difference. For some chronic conditions, such as diabetes, good-quality care in the community is expected to prevent hospitalisations (Gibson et al., 2013). In Canada, the rate of ambulatory care sensitive conditions (defined as conditions that might be otherwise managed in primary care) in 2006 was more than 60% higher in rural areas compared with urban areas (CIHI, 2008). Similarly, the remoteness of hospitals and the lack of primary care providers in Nunavut and the Northwest Territories explain part of the variations in admission rates (CIHI, 2009, quoted in Chapter 4 in this volume).

On the demand side, several studies have showed the influence of socio-economic factors. For instance, Majeed et al. (2000), analysing admission rates across 66 primary care groups in England, showed that hospital admission rates were strongly correlated not only with the prevalence of chronic illness but also with social deprivation. In Canada, poor neighbourhoods have a higher rate of hospitalisations for ambulatory care sensitive conditions (more than two-times higher) than the wealthiest neighbourhoods (Chapter 4).

Strategies aiming to reduce unnecessary hospital admissions focus on closing hospital beds and strengthening primary care

Countries generally seek to reduce unnecessary hospital admissions through two strategies: closing hospital beds and strengthening primary care.

In the United States, since the 1980s, efforts have been made to close hospital beds or implement tighter regulation of hospital expansions. The Certificate of Need programme is one example. These efforts likely contributed to the reduction in bed supply and resulted in the United States having a low bed supply and low medical admission rates compared to other OECD countries.

The other strategy to reduce hospital admission rates is to reduce the number of avoidable admissions through quality improvement in primary care. England, for instance, introduced initiatives to reduce unnecessary hospital admissions such as self-management of certain chronic conditions (e.g. asthma and chronic obstructive pulmonary disease). However, the evidence on the impact of changes to GP practice service characteristics and quality improvement initiatives such as the Quality and Outcomes framework on unnecessary hospital admissions is mixed (Purdy, 2010). More recently, a pilot in London was set up in January 2011 to integrate care for people with diabetes and those aged 75 and over. This initiative has brought together GP practices, mental health care trusts, community health care trusts, local authorities and voluntary associations to set-up a more integrated health care system outside of hospital, thereby reducing unnecessary admissions (Harris et al., 2012).

Cardiac procedures show high levels of geographic variations irrespective of the national average

Revascularisation procedures (angioplasty and coronary bypass) are used to treat patients suffering from ischemic heart disease. They are among the most frequent surgical procedures performed in OECD countries, and they are costly (Koechlin et al., 2010). Coronary bypass (CABG) is an open-chest surgery that is used to divert blood around narrow or clogged arteries (blood vessels), and involves taking a blood vessel from another part of the body (usually chest or leg) to use as a graft to replace any hardened or narrowed arteries to the heart. Coronary angioplasty (PTCA) is used to widen the blood vessel to increase blood flow to the heart, and is usually accompanied by the insertion of a stent to keep the blood vessel open.

The use of angioplasty has increased rapidly over the past two decades in most OECD countries. On average across OECD countries, angioplasty now accounts for 75% of all revascularisation procedures (OECD, 2013). Although angioplasty has in many cases replaced bypass surgery, it is not always a substitute since bypass surgery is still the preferred method for treating patients with multiple-vessel obstructions, diabetes and other conditions. The choice between these procedures depends on physician preferences and differs across hospitals (Tu et al., 2012). It may also be sensitive to patient preferences because each procedure carries different benefits and risks: heart attacks, stroke or even death for PTCA, with higher risks and longer hospital stays for CABG (Brownlee et al., 2011; NHS Choices, 2014).

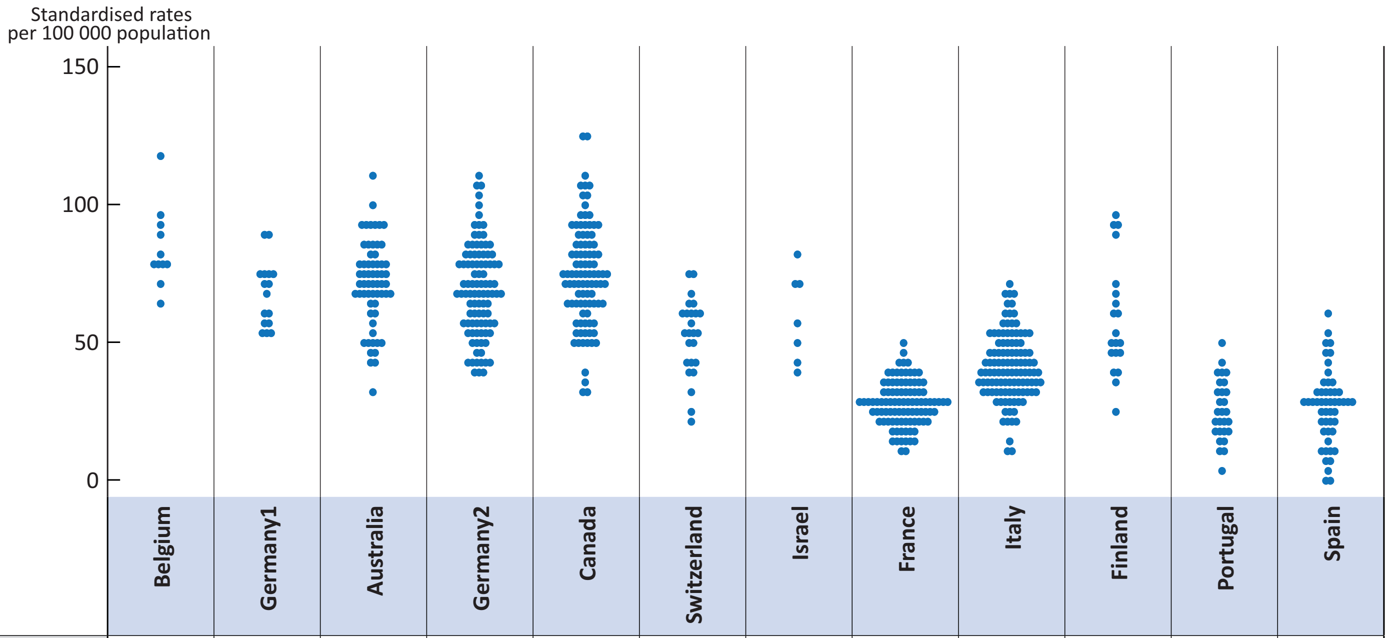
CABG and PTCA rates vary widely between countries and across smaller geographic areas (Figures 1.3 and 1.4). The average rate of revascularisation (CABG + PTCA) is high in Germany, Israel and Belgium (with rates above 300 per 100 000) and the lowest in Portugal and Spain (less than 200 per 100 000), but the latter might be under-estimated since both countries reported data only for public hospitals (Figures 1.3 and 1.4).

Cardiac procedures display some of the highest levels of within-country geographic variations across the set of reported procedures in many participating countries: Finland, France, Germany, Italy, England, Portugal and Spain. These results confirm findings reported in the literature that cardiac procedures generally show wide within-country variations (Corallo et al., 2014).

Belgium, Canada and Australia have high CABG rates (more than 70 per 100 000) Belgium shows small within-country variation around the average rate (1.8-fold). Spain and Portugal have low average rates but high levels of variation across geographic areas with ratios of 90th to 10th percentiles of respectively 6.0 and 3.2. Germany and Israel have high PTCA rates (340 or more per 100 000) while Portugal and Spain had the lowest rates (below 140 per 100 000). Variations in PTCA rates across geographic areas were somewhat smaller than for CABG, but still rates were more than five times higher in regions with the highest rates compared to those with the lowest rates in Spain. Portugal and Finland have the highest variations across geographic areas, in part due to very low procedure rates in some areas.

Geographic variation in each cardiac procedure could be related to some substitution between bypass and angioplasty. In such a case, regions with low rates of CABG would have high PTCA rates and the correlation between rates of the two procedures would be negative. Alternatively, regions with high CABG rates could also have high PTCA rates (positive correlation), which would suggest that rates are related to other supply factors (Hannan et al., 2006). The correlation between the two procedures was tested for all countries. There was no correlation in most countries and a small positive correlation in Belgium and Switzerland.

Figure 1.3. CABG rate across and within selected OECD countries, 2011 or latest year

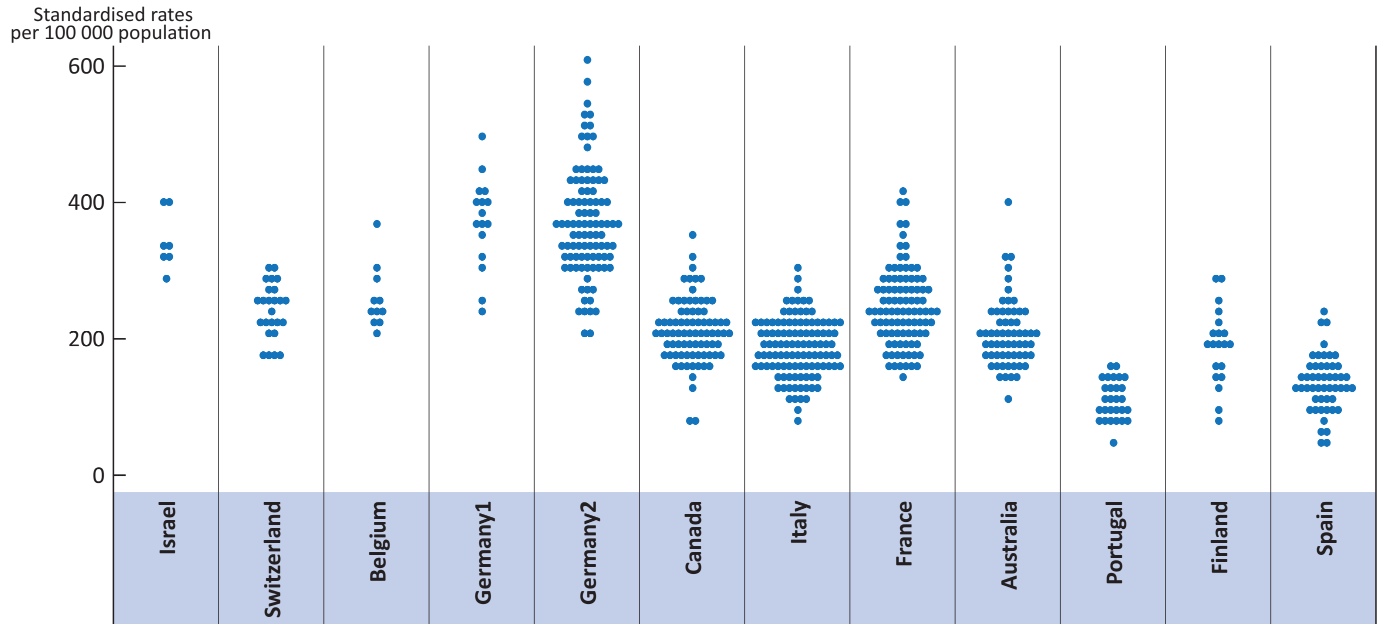


	Belgium	Germany1	Australia	Germany2	Canada	Switzerland	Israel	France	Italy	Finland	Portugal	Spain
Crude rate	90	66	73	66	75	49	49	29	47	66	30	19
Std rate	84	68	72	69	75	52	59	28	41	59	26	27
Coeff. of variation	0.17	0.17	0.21	0.24	0.25	0.26	0.27	0.29	0.30	0.34	0.41	0.50

Note: Each dot represents a territorial unit. Rates are standardised using OECD population over 20 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions. Data for Portugal and Spain only include public hospitals.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Figure 1.4. PTCA rate across and within selected OECD countries, 2011 or latest year



	Israel	Switzerland	Belgium	Germany1	Germany2	Canada	Italy	France	Australia	Portugal	Finland	Spain
Crude rate	301	235	275	358	358	207	225	272	226	120	179	145
Std rate	340	242	261	371	370	212	187	247	208	111	189	135
Coeff. of variation	0.12	0.17	0.18	0.18	0.22	0.22	0.23	0.23	0.24	0.27	0.30	0.30

Note: Each dot represents a territorial unit. Rates are standardised using OECD population over 20 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions. Data for Portugal and Spain only include public hospitals.

Source: Authors' estimates based on data submitted by countries for the OECD project.

The average rate of CABG decreased or remained more or less stable over time, but this trend was not uniform in all geographic areas: variations increased in some countries (Israel, Italy, Portugal), decreased in others (Canada, France, Spain, Switzerland), and were relatively stable in England. For PTCA, country trajectories were more uniform. Country average rates increased and geographic variations decreased in most countries (Canada, England, France, Portugal, Spain and Switzerland), suggesting a convergence in practice. Israel and Italy observed a reduction in PTCA average rates with little or small changes in the coefficient of variation. Finland experienced an overall increase in revascularisation procedures rates over time while variations between hospital districts increased.

Lower economic status leads to lower revascularisation rates

Several studies on the determinants of variations in revascularisation procedures suggest that they are not fully explained by clinical factors, raising questions about appropriateness of care and equity in access. For instance, Pilote et al. (2004) found large variations across provinces and regions of Canada in the probability to undergo revascularisation after an acute myocardial infraction at the end of the 1990s. Germany carries out a lot of revascularisation though the national rate of ischemic heart disease mortality is similar to the OECD average (OECD, 2013). Research conducted in 2003 in more than 100 German hospitals concluded to a 10% overuse of revascularisation procedures, as well an additional quarter of cases in which appropriateness was uncertain (Gandjour et al., 2003).

Several studies suggest that other demand-side factors influence revascularisation rates. In France, Gusmano et al. (2014) compared local revascularisation rates, adjusted for the burden of ischemic health disease (measured by hospital admissions for this cause), between and within three regions. They found lower odds of receiving revascularisation rates in regions with low population density, a lower level of education, and lower income. Testing simultaneously the influence of demand-side and supply-side factors on revascularisation rates in 11 US states, Hannan et al. (2006) showed a positive influence of the proportion of the white population on procedure rates.

The role of supply factors seems to depend on overall context. Analysing revascularisation rates in 42 English districts, Black et al. (1995) showed a positive correlation with the proximity to a regional revascularisation centre and the presence of a local cardiologist. By contrast, Belgium and Portugal tested the association between procedures rates and the density of specialists in this study without finding any significant association. In France, Gusmano et al. (2014) did not find any association between regional rates of revascularisation and the density of cardiologists but found lower rates in regions with more public hospitals. The study by Hannan et al. (2006) on 11 US states did not find any effect of variables linked to the density of a specialised workforce.

A study on the adoption of revascularisation procedures across 17 countries found a positive influence of wealth (diminishing over time) as well as an effect of health systems characteristics. It showed that public-integrated systems had lower procedures rates by comparison to public-contract and reimbursement-based models and that higher procedure rates were observed in countries where investments are funded through general hospital revenue rather than through applications for public funding (Bech et al., 2009).

To sum up, morbidity patterns do not fully explain variations in revascularisation rates and socio-economic factors play a significant role. The role of supply factors seems more ambiguous and context dependant. The extent to which procedure rates reflect patient preferences is generally unknown.

Clinical guidelines have been developed to promote more appropriate use of revascularisation procedures

The production of guidelines along with the involvement of physician societies has been used to address variations observed at the local level. In Canada, a network of researchers was established to study variations in cardiac care in provinces. They produced a series of studies and atlases to better identify clinical guidance. They also adopted an urgency rating score (URS) that triaged patients into three categories (elective, emergent, urgent) and uniform eligibility criteria. These measures led to a reduction in variation observed in Canada (CCORT, 2014).

Similarly, in Australia, Clinical Cardiac Networks are well developed, and promote nationally agreed cardiac care guidelines produced by the National Heart Foundation and the Cardiac Society of Australia and New Zealand (Chapter 2 in this volume). These societies also have collaborated with clinical networks to produce intermittent audits of care in Australia's and New Zealand's hospitals. In Western Australia, additional payments are being trialled into the activity-based funding programme including one for the treatment of acute myocardial infarction in 2013-14. The state of Victoria has established a cardiac outcomes registry among public and private providers.

In Switzerland a working group was established to monitor, report, and promote better use of cardiac interventions. These guidelines are updated periodically but they are not binding for providers (Maeder et al., 2012). Improving cardiac care in Spain is a policy priority as the mortality rate in Spain from cardiovascular disease varies substantially across provinces. The promotion of best practice by the Spanish Society of Cardiology could in part explain the reduction in variation in revascularisation procedures over time (Chapter 12 in this volume). In Belgium, the Ministry of Health introduced policies in 2012 to improve cardiac treatment and the use of diagnostic technologies. The College of Cardiac Physicians is responsible for providing feedback to hospitals for benchmarking and to encourage health service improvements in cardiac care (Chapter 3).

Variations in joint procedures are high for knee replacements but lower for admission/surgery after hip fracture

Admissions/surgery after hip fracture show little variations across geographic areas

Surgery after hip fracture was chosen for this international study with the intent to act as a reference procedure with expected low variation. Since there is little uncertainty about the diagnosis and little choice but to admit and operate a patient after hip fracture, differences in rates likely reflect the incidence of hip fractures. Several studies have used this indicator as a low-variation procedure to benchmark geographic variations in other procedures (Bevan et al., 2004; Ibáñez et al., 2009).

A number of procedures exist for the treatment of hip fracture (e.g. the use of nails/screws, total hip replacement, partial replacement), and in many countries the clinical guidelines indicate that one of these interventions should usually be performed within 48 hours. The data reported by countries under this project relate either to admissions after hip fracture or to surgery after hip fracture (excluding external causes of hip fracture such as railway, motor vehicle, road accidents in some countries at least).[7]

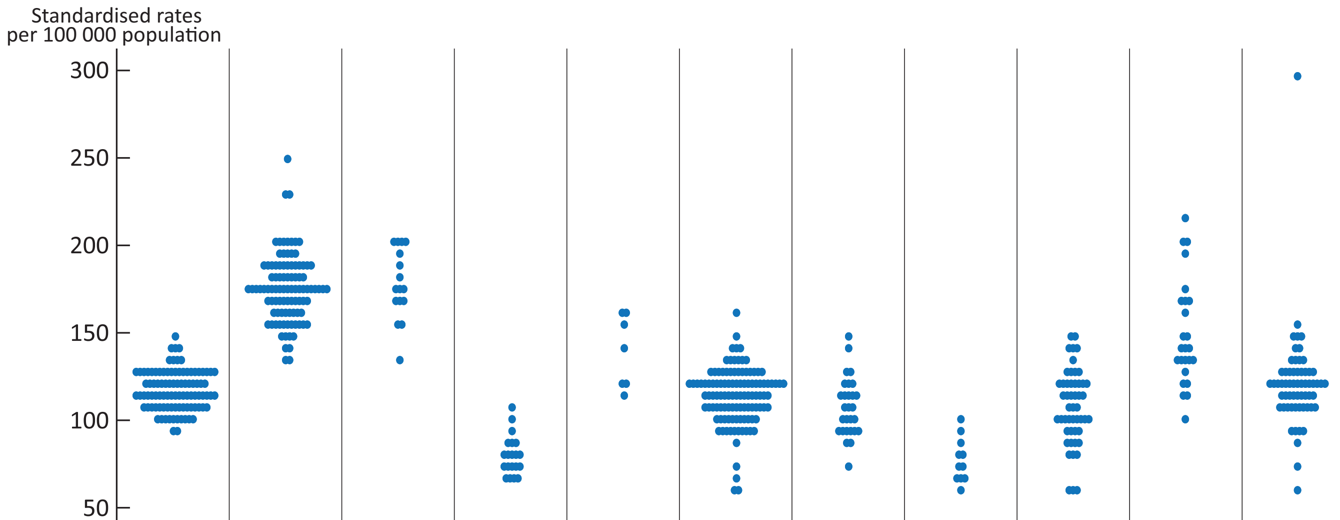
Rates of admission/surgery after hip fracture are twice as high in Germany and Switzerland (more than 150 per 100 000 population) than in Belgium or Finland (around 80 per 100 000) (Figure 1.5). As expected, most countries have low variation across geographic areas in admissions/surgery after hip fracture (less than two-fold variation). Australia has the highest levels of variation across geographic areas (five-fold), in part due to a high outlier with around 250 admissions per 100 000 (Kimberley-Pilbara). Italy, Spain and Switzerland have the next highest levels of variation (more than two-fold).

Trends in surgery/admissions for hip fracture are not homogeneous across countries and geographic areas. The occurrence of surgery/admissions after hip fractures increased in several countries, while variations slightly decreased (France, Spain and Portugal). In other countries, the average standardised rate remained more or less constant and variations were stable (Finland) or slightly decreased (Italy). Switzerland also observed stable rates and variations for most of the period except for the last two years (2010 and 2011) where a 18% rate increase was observed due to substantial increases recorded in some cantons (+30%). Israel saw a reduction in the average procedure rate but variations increased across districts.

Rates of admissions and surgery after hip fracture reflect need

Variations in surgery or admissions after hip fractures cannot be attributed to variations in medical practice *at the time the fracture occurs*. They more likely reflect variations in health needs, i.e. the prevalence of hip fracture in old age. These variations, in turn, are very much linked to the age of the population, the prevalence of osteoporosis and the prevalence of falls and accidents in the frail elderly. The prevalence of osteoporotic hip fractures is naturally increasing with the age of a population, with the prevalence of osteoporosis and with other population characteristics. For instance, in Australia, in 2006-07, Aboriginal men were twice as likely to have hip fractures as other Australian males, whereas Aboriginal women were 26% more likely to have hip fractures than other Australian females (AIHW, 2010).

Figure 1.5. Admissions/surgery after hip fracture across and within selected OECD countries, 2011 or latest year



	France	Germany2	Germany1	Finland	Israel	Italy	Portugal	Belgium	Spain	Switzerland	Australia
Crude rate	127	196	196	95	111	156	120	91	124	193	107
Std rate	118	176	178	81	140	114	108	78	108	151	121
Coeff. of variation	0.09	0.11	0.11	0.13	0.14	0.14	0.15	0.16	0.20	0.20	0.23

Note: Each dot represents a territorial unit. Rates are standardised using OECD's population over 15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Australia and Switzerland reported on admissions for hip fracture while other countries reported on surgery after hip fracture. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based on the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Countries have sought to reduce the prevalence of hip fracture

Quite recently, countries and professionals have sought to reduce the prevalence of hip fractures through guidelines supporting interventions that reduce the prevalence of osteoporosis and/or its consequences; reduce the risk of falls in older people; and reduce the risk of recurrent fracture by secondary prevention after a first fall. Australia published guidelines to promote “healthy bones throughout life” (Ebeling et al., 2013); Belgium published guidelines to promote secondary prevention of osteoporosis (KCE, 2011); and England and France published guidelines to prevent falls in older people (NICE, 2004 updated in 2013; HAS, 2005 and 2009). Internationally, the World Health Organization developed a risk-assessment tool,[8] whose use is recommended by several associations to identify older people in need for close case management.

A number of guidelines encourage prompt surgical treatment once the facture has occurred, as well as rehabilitative care including prevention of future fractures, for instance in Finland (Chapter 6 in this volume). In England (Chapter 14), financial incentives are used to encourage better quality care via Best Practice Tariffs (BPT): BPT offers additional payment for cases where the care meets agreed standards including surgery within 36 hours (Royal College of Physicians, 2013). Similarly, Israel rewards hospitals through an additional payment if the surgery is performed within 48 hours after admission and imposes a penalty when they do not (Chapter 9).

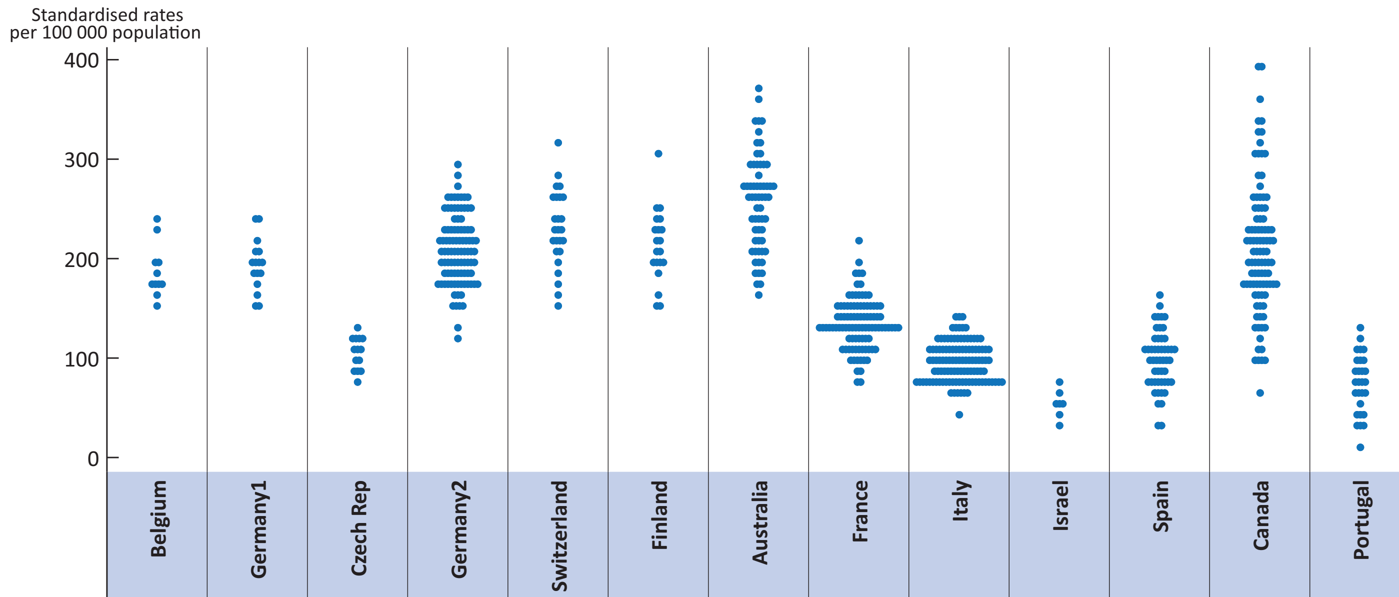
Knee replacement rates vary widely across and within countries

In knee replacement surgery, the knee is replaced with an artificial joint because it is damaged (e.g. by severe osteoarthritis). The knee can be completely or partially replaced. Knee replacement is indicated in severe osteoarthritis when more conservative treatments (including 6-month prescription drugs) have not succeeded in relieving pain and disability. However, there is no clear clinical consensus on indications for knee replacement (Dieppe, 2009). Mild symptoms are preferably treated with exercise and medications, but knee replacement usually relieves pain and improves mobility in patients with severe osteoarthritis. However, the intervention is not without risks (linked to the intervention itself or to the prosthetic joint) and imposes long periods of rehabilitation. It does not work in 10% of patients (Brownlee et al., 2011). This means that patient preferences should influence the decision to operate or use alternative treatments.

Knee replacement is a very frequent procedure and the number of knee replacements has increased rapidly over the past decade in most OECD countries. This is partly due to population ageing but also to the growing use of this intervention for people at earlier ages, due to concomitant morbidities such as rising levels of obesity which have increased need for knee replacement (Fehring et al., 2007).

Knee replacement rates display high levels of variations. They vary by more than four-fold across countries. They are highest in Australia, Switzerland, Finland, Canada and Germany (above 200 per 100 000 population over 15-years old) while they are below 150 in other countries, with Israel having the lowest rate (56 per 100 000). Knee replacements also vary by two- to three-fold across geographic areas in most countries; and vary by more than five-fold in Canada, Portugal and Spain. In these three countries, however, large variations are partly explained by outliers with very low rates (Spain and Portugal) or with both high and low rates (Canada). Low rates in Spain and Portugal may be partly explained by partial coverage of data, which only include public hospitals.

Figure 1.6. Knee replacement rate across and within selected OECD countries, 2011 or latest year



	Belgium	Germany1	Czech Rep	Germany2	Switzerland	Finland	Australia	France	Italy	Israel	Spain	Canada	Portugal
Crude rate	210	215	113	215	257	240	238	133	122	45	106	193	77
Std rate	186	194	105	209	230	213	257	135	96	56	98	213	74
Coeff. of variation	0.14	0.15	0.16	0.17	0.17	0.18	0.19	0.19	0.20	0.28	0.31	0.32	0.39

Note: Each dot represents a territorial unit. Rates are standardised using OECD's population over 15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based on the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Over the study period, rates typically increased in the participating countries. In many participating countries, the increase was dramatic: +80% in Finland between 2001 and 2011; + 83% in Spain between 2000 and 2010, + 50% in Israel between 2001 and 2011 (but starting from a very low level), +46% in France between 2007 and 2011, and more than 100% in Portugal between 2002 and 2009. Over the same period, variations across small areas increased in Israel and the Czech Republic, increased in Spain until 2005 and then decreased; remained more or less stable in France, Italy and Portugal, and fluctuated in Finland.

Medical practices and socio-economic status of patients influence knee replacement rates

Differences in morbidity patterns explain part of the geographic variations in knee replacement rates. In France, for instance, regions with high rates of knee replacement, located in the North-East, tend to have a higher prevalence of osteoarthritis. However, in Germany, Schäfer et al. (2011) showed for broad regional clusters that the variation in the prevalence of osteoarthritis was small compared to the variation in knee replacement rates, suggesting that clinical need does not explain the whole range of variations.

Variations in medical practice play an important role. Weinstein et al. (2004) analysed variations in knee replacement rates across 306 hospital referral regions in the United States for Medicare patients. The authors showed that age-sex-race-adjusted rates of knee replacement vary by 2.4-fold between contiguous HHR and found it unlikely that such a difference could be explained by differences in patient needs or preferences. They attributed them to regional "surgical signatures" which they showed to persist over time. In Canada, Wright et al. (1999), focussing on health regions in the largest province (Ontario), found that orthopaedic surgeons' opinions or enthusiasm for the procedure was the main modifiable determinant of variations and underlined the need to focus on modifying the opinions of some surgeons to reduce geographic variations in knee replacement.

The influence of the density of supply is less obvious. The Weinstein study (2004) did not find any significant effect of the density of orthopaedic surgeons on procedure rates. Similarly, Finland explored the link between standardised rates of knee replacements and the density of orthopaedic surgeons in hospital districts and did not find any systematic relation (Chapter 6 in this volume).

People living in areas with lower socio-economic status or in less populated areas are more likely to undergo knee replacement. In the United States, Weinstein et al. (2004) found that hospital referral regions with higher income and greater population density tend to have lower rates of knee replacements. In Australia, Dixon et al. (2011), analysing differences in knee replacement rates across population categories in 2005-07, found that those living in disadvantaged areas and in less urban areas were more likely to have a knee replacement. However, Steel et al. (2008), using individual data from the United States Health and Retirement Survey, found that the probability to receive joint replacement (hip or knee) for those in need was 50% lower for black people than for white people and one-third lower for people without a college education than for those with a college education.

Patient-centered policies are gaining prominence for joint procedures

Several participating countries have implemented policies to influence medical practice in knee replacements. These policies seek to ensure appropriateness of surgery and to better account for preferences of patients. They might have spill-over effects on unwarranted variations in health care use.

Some countries have set up registries (Belgium and Canada) to monitor indications for surgery, surgical techniques used and health outcomes. In Canada, the Canadian Institute for Health Information (CIHI) developed the Canadian Joint Replacement Registry in 2001 which collects data on utilisation rates, patient characteristics, clinical issues and waiting times (Chapter 4 in this volume). In Belgium, a national registry ("Orthopride") has been set up to better understand the use of knee replacements, following a publication showing geographic disparities in elective surgery (Willems et al., 2013). The registry collects information on patient characteristics, causes for joint replacement as well as types of prostheses used and revision rates. However, recording of activity is voluntary and data published so far do not provide a full picture.

In Australia, the State of Victoria developed in 2005 a programme to improve waiting list management in hip and knee replacement surgery. A multi-attribute quality-of-life questionnaire was developed to help prioritise people with hip or knee joint disease for surgery. Patients referred for assessment to a hospital clinic by their general practitioner are managed by a multidisciplinary team who provides therapeutic, non-surgical treatment options, and assesses the priority for surgery. The health status of patients on the waiting list is regularly monitored using a standard quality of life measure and patients are fast tracked for surgery if required (Chapter 2 in this volume).

In England, decision aids are published to provide patients with a better understanding of the risks and benefits associated with the intervention. From 2009, all providers of NHS-funded care are also required to collect Patient Reported Outcomes (PROMs) for a number of procedures, including hip and knee replacements. For the latter, they use the Oxford Knee Score (OKS), which is a short, practical self-completed questionnaire, which measures need before and outcome after knee replacement surgery. Patient Reported Outcome Measures (PROMs) are publicly reported in the NHS Atlases (NHS, 2013). This information is useful to determine whether rising utilisation rates of certain procedures are reaching some "diminishing returns" in terms of benefit/cost ratios. Patient-reported outcomes after knee replacements were found to be good in Primary Care Trusts in England with increasing rates of knee replacement, suggesting that the point of overuse was not reached (Chapter 14 in this volume).

In Finland, the Ministry of Social Affairs and Health updated a set of criteria in 2010 to assess the need for knee replacement and the Medical Society Duodecim updated national clinical guidelines on osteoarthritis and knee and hip joints in 2012 (Chapter 6). These two sets of policies may have contributed to the stabilisation of the rapid increase in knee replacement and levelling out of geographic variations in rates of knee replacements but there is no strong evidence of that impact. Another contributing factor may have been that by the late 2000s after the rapid increase, the country had reached a very high activity level of knee operations (among the highest in the OECD countries) which may have brought about a ceiling effect.

Provider discretion and socio-economic status can influence geographic variations in gynaecological procedures

Caesarean section rates vary little within countries but are on the rise

Caesarean sections are indicated when risk factors compromise normal delivery. They can be performed on an emergency or an elective basis.[9] The World Health Organization, using data from all countries, estimated that beyond 15% caesarean section rates, risks to reproductive health outcomes may outweigh the benefits (McPherson et al., 2013). Caesarean section is a high-volume and high-cost procedure, more expensive than normal delivery (Koechlin et al., 2010).

Standardised caesarean section rates are as much as 50% higher in Italy, Portugal, Australia, Switzerland and Germany (above 300 per 1 000 live births) than in Finland (below 190) (Figure 1.7). Despite high rates in many countries, this procedure generally displays low variations within countries, except in Italy, where a six-fold variation is partly explained by very high rates in the south of the country. In England, while the caesarean section rate has increased, the variation is small, which may be due to adherence to NICE guidance (NICE, 2011).

In most countries that reported trend data, caesarean section rates increased over time. Variations across geographic units, however, either did not change considerably (e.g. Canada, Czech Republic, Italy and Spain), or decreased (e.g. France, Portugal and Switzerland). Israel and Finland (to a lesser degree) observed an increase in variation across geographic areas. Only Italy and Portugal observed a reduction in the caesarean section rate over time.

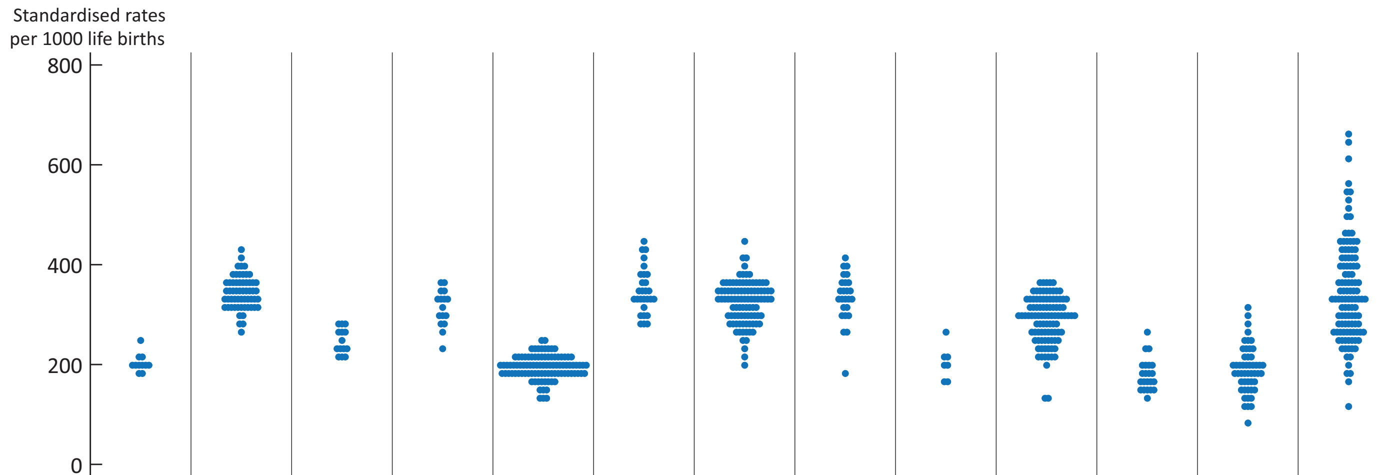
This study does not distinguish emergency and elective caesarean sections, whose respective contributions to overall variations seem to vary across countries. In Germany, variations in caesarean section rates are mainly due to variations in planned caesareans sections (Kolip et al., 2012) while in England, rates of emergency caesarean section varied between trusts more than rates of elective caesarean section (Bragg, 2010).

Physicians practice styles and delivery in private settings explain a large share of variations in caesarean section rates

Several studies showed that private hospitals tend to perform more caesarean sections than public hospitals. In France, private-for-profit hospitals authorised to provide maternity care for pregnancies without complications have caesarean section rates as high as public hospitals authorised to provide care for the most complex cases (FHF, 2008). Milcent and Rochut (2009) working on individual data in 2003 confirmed that private-for-profit hospitals are more likely to perform caesarean sections than other hospitals, even after adjustment of risk factors. In Switzerland, the Office Fédéral de la Santé Publique (OFSP, 2013), working on individual data allowing for adjustment for clinical need reached the same conclusion. The rate of caesarean sections is also higher in private hospitals in Italy and in Spain (Barbadoro et al., 2012; Márquez-Calderón et al., 2011).

Other supply factors seem to play a role. For instance, in France, in 2003, the number of obstetricians per bed in one hospital increased the probability of caesarean section (Milcent and Rochut, 2009). In the United States, the percentage of births assisted by midwives has a small negative impact on the probability of caesarean section at the state level (Yang et al., 2011). Epstein and Nicholson (2005), working on deliveries in Florida found that 30% of variations between physician-specific caesarean section rates were explained by physicians' practice styles and that practice styles of other physicians in the same hospital and of physicians in the same region were also influential.

Figure 1.7. Caesarean section rate across and within selected OECD countries, 2011 or latest year



	Belgium	Australia	Czech Rep	Germany1	France	Portugal	Germany2	Switzerland	Israel	Canada	Finland	Spain	Italy
Crude rate	194	323	237	314	196	328	314	332	185	270	161	170	369
Std rate	206	343	243	311	194	349	324	332	207	292	181	189	346
Coeff. of variation	0.09	0.10	0.11	0.11	0.12	0.13	0.13	0.15	0.16	0.16	0.18	0.25	0.29

Note: Each dot represents a territorial unit. Rates are standardised using Italy's population structure of live births according to the mother's age. Countries are ordered from the lowest to highest coefficient of variation within countries. Rates include emergency and non-emergency caesarean sections. Data for Portugal only include public hospitals. Spanish data only include public hospital leading to a 30% underestimation of caesarean sections. For Spain, the rates are reported based on the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

Two countries participating in this study reported the influence of the supply of resources on variations in caesarean sections rates. In Finland, caesarean section rates were generally higher in rural areas. This may in part be due to some small hospitals with insufficient resources for emergency services which tend to manage low-risk deliveries by planned caesarean sections. In the Czech Republic, the rate of caesarean sections was high in rural areas with low income levels and low hospital density but also in high concentrated urban areas (e.g. Prague) with a large number of hospital facilities, equipment and physicians.

On the demand side, women with higher socio-economic status tend to be more likely to give birth by caesarean section (Cáceres et al., 2013; Grant, 2009). In the Spanish Autonomous Community of Andalucía, women with a tertiary degree of education are 34% more likely to have a caesarean section than women who did not study and part of the variation might be explained by a more frequent use of private hospitals (Márquez-Calderón et al., 2011). In Florida, non-insured women or with Medicaid coverage are less likely to give birth by caesarean section (Epstein and Nicholson, 2005). By contrast, in Germany, a recent study of regional variations in caesarean section rates found that socio-demographic factors played a small or negligible role (Kolip et al., 2012).

Policies seeking to reduce caesarean section rates often target providers

The rapid increase in caesarean sections observed in many countries has raised questions on appropriateness. Public reporting, provider feedback, monitoring and clinical guidelines are used to reduce unwarranted variations in caesarean section rates. In the mid-2000s in Spain, caesarean section became an important part of the health strategy. An observatory on women's health to monitor caesarean section rates was established and more recently, the appropriateness of caesarean section was assessed against a set of indications. Hospitals who volunteered to use the inclusion protocol based on these criteria experienced a lower increase of caesarean section rates than those that did not. A second phase is planned in 2013-14.

In Belgium, the publication of a report documenting variations in caesarean section rates led to providing feedback to hospitals (Jacques et al., 2006). An analysis of hospital rates of caesarean section between 2008 and 2011 showed a convergence to the mean, where high-rate hospitals show a decrease towards a slightly lower rate, and low-rate hospitals increased their rate.

France introduced a financial disincentive in hospital payment rates to discourage inappropriate caesarean section: while the difference between payment rates of caesarean section and normal deliveries was expected to increase (to reflect changes in costs), the difference was kept constant in 2010 (Ministère de la Santé et des Sports, 2010). At the regional level, the ARS (*Agences Régionales de Santé*) directly monitor hospital activity in order to identify hospitals that have significantly high/low levels of activity/growth within the region. They can sign contracts with hospitals to encourage good practice. For example, in Alsace, hospitals are asked to limit the number of caesarean sections to 20% of total deliveries. Monitoring of changes in the caesarean section rates is encouraged.

In Australia, where caesarean section rates are high relative to many OECD countries, rates have continued to increase over the past 20 years, and a number of jurisdictions have taken an active role, developing guidelines covering perinatal practice, requiring reporting of hospital caesarean section rates, and investigation of performance against guidelines (Chapter 2 in this volume). The measures taken to monitor and review caesarean section rates may have discouraged variation in practice, and contributed to slowing down the rise in caesarean sections.

Within-country variations in hysterectomy are very large in a few countries

A hysterectomy is the surgical removal of the entire uterus (complete hysterectomy) or a part of it (removal of the uterine body while leaving the cervix intact). Hysterectomies are performed for a large number of benign and malignant conditions whose incidence varies by age as well as for symptoms caused by genital tract prolapse. The most common are menstrual irregularities, mostly fibroids and dysfunctional uterine bleeding, and symptoms associated with endometriosis. Alternatives exist as several new treatments have been introduced over the past decade to treat benign conditions that are less invasive than hysterectomy (NICE, 2007; McPherson et al., 2013).

The prevalence of hysterectomy is decreasing in most geographic areas thanks to the introduction of less invasive treatment alternatives. McPherson and colleagues (2013) found that cross-country variations in hysterectomy rates have been decreasing in the last decades. While countries with high rates 20 years ago, such as Australia, experienced a decline, countries with lower rates (e.g. United Kingdom/England) saw some increase.

However, standardised rates of hysterectomy are still 75% higher in Canada and Germany (above 350 per 100 000 females) than in Israel, Spain, Portugal and the Czech Republic (less than 200 per 100 000 females) (Figure 1.8).

Most countries have two- to three-fold variation across geographic units. Canada and the Czech Republic stand out with higher levels of variation (close to four-fold), due to some extreme values in certain areas: nearly 400 in Karlovarsky kraj, in the Czech Republic and above 600 per 100 000 females in certain regions in the provinces of Saskatchewan, British Columbia and Nova Scotia in Canada (Figure 1.8).

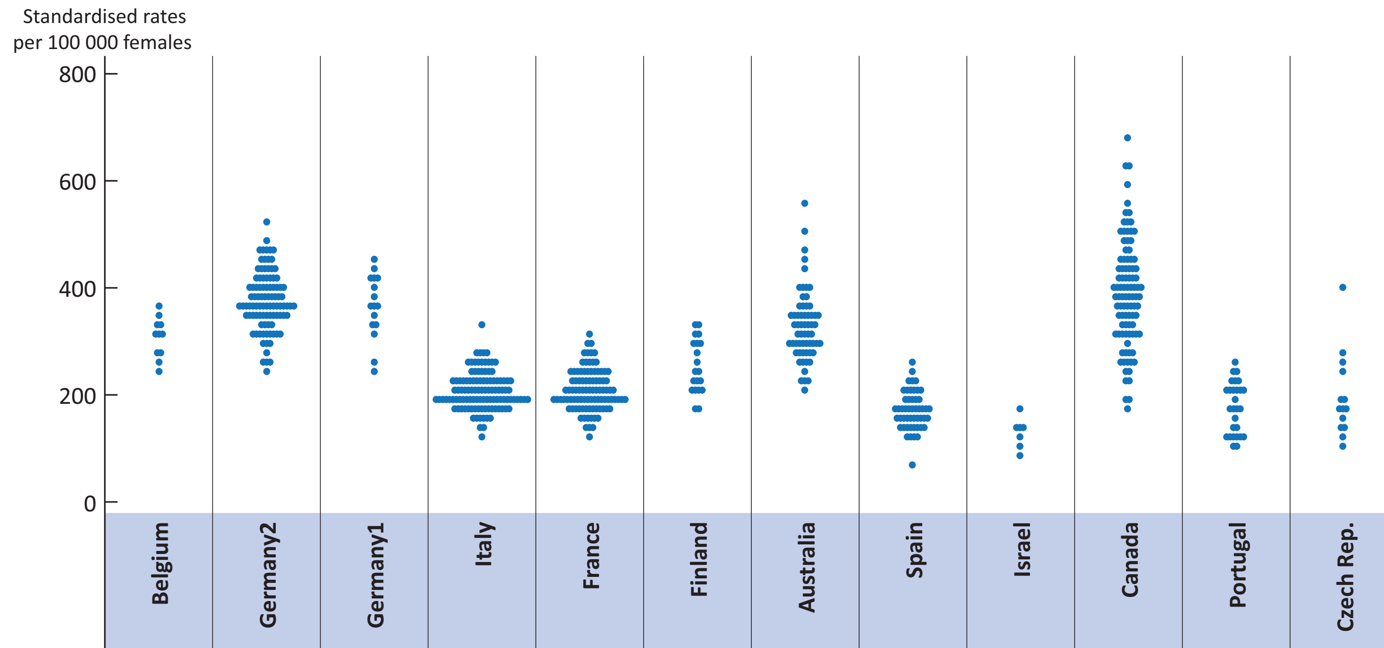
Over time, the average hysterectomy rate decreased in all countries participating in this project (e.g. by 11% in France between 2005 and 2011, a 40% drop in Finland between 2001 and 2011) but this was not uniform across geographic units. Within-country variations did not typically decrease (e.g. Spain) but rather were stable or increased (e.g. Canada, Italy, France, Finland and Portugal).

Hysterectomies are more frequent in women with low economic status, especially when physicians have greater discretion

Women with low education and low income tend to have higher rates of hysterectomies in some but not all countries. This is the case in Australia and England (Spilsbury et al., 2006; Marshall et al., 2000; and Cooper et al., 2008). In Australia, Reid et al. (1999) found that non-cancer-related hysterectomies were more frequent in local areas with lower socio-economic status. By contrast, in Belgium, Jacques et al. (2006) did not find any significant association between income level and municipal rates of hysterectomy. In Canada, hysterectomy rates were lower in the least affluent and most affluent neighbourhoods compared with women belonging to middle-income groups (CIHI, 2010). In Italy, higher industrialisation and socioeconomic status seem to be associated with higher hysterectomy rates; but the result deserves further analysis, as it contrasts with the conclusion of relevant literature.

Hysterectomies seem to be more frequent in rural areas. In Australia, rural areas had higher rates of hysterectomies performed for other causes than cancer (Reid et al., 1999). The national report produced for this project confirms higher rates in non-metropolitan areas (Chapter 2 in this volume). In Canada, the hysterectomy rate was significantly higher for women living in rural areas compared with women living in urban areas and this may be due to greater access to other treatment options for women living in urban areas (CIHI, 2010).

Figure 1.8. Hysterectomy rate across and within selected OECD countries, 2011 or latest year



	Belgium	Germany2	Germany1	Italy	France	Finland	Australia	Spain	Israel	Canada	Portugal	Czech Rep.
Crude rate	324	330	330	228	170	227	310	162	106	341	162	177
Std rate	308	376	365	207	209	254	330	172	128	394	175	197
Coeff. of variation	0.13	0.14	0.16	0.17	0.18	0.20	0.20	0.21	0.23	0.27	0.27	0.39

Note: Each dot represents a territorial unit. Rates are standardised using OECD female population over 15 years. Countries are ordered from the lowest to highest coefficient of variation within countries. Data for Portugal and Spain only include public hospitals. For Spain, the rates are reported based for the province where the hospital is located. Germany 1 and 2 refers respectively to Länder and Spatial Planning Regions.

Source: Authors' estimates based on data submitted by countries for the OECD project.

However, there is no clear relationship between hysterectomy rates and the density of health care supply. The prevalence of hysterectomy is not linked to the density of gynaecologists in Finland (Chapter 6) neither with the density of gynaecological beds in Germany (Geraedts and Malik, 2012).

Medical practice styles seem to play an important role. Hall and Cohen (1994) revealed that variations across regions in Ontarian were higher for indications that are more discretionary than others (i.e., menstrual haemorrhage, uterine prolapse and endometriosis).

Public reporting and clinical guidelines for hysterectomy

The publication of clinical guidelines has played some role in the observed reduction in hysterectomy rates. In Finland, for instance, the decline in overall hysterectomy rates coincided with the publication of results from a Finnish RCT study comparing hysterectomy and levonorgestrel-releasing intrauterine device for treating menorrhagia in the early 2000s (Hurskainen et al., 2001, 2004a, 2004b). The study influenced the national clinical guideline on the treatment of excess menstrual bleeding which underlined pharmaceutical treatments in menorrhagia. However, lower surgery rates have not led to any smaller relative regional variation in hysterectomy rates between hospital districts (Chapter 6).

In Canada, such guidelines might have contributed to the continuous reduction in hysterectomy rates overall, but they do not seem to have been sufficient to reduce the variations across provinces and health regions (Chapter 4).

In Germany, the rate of hysterectomies is monitored through the mandatory external quality assurance in German hospitals (Nolting et al., 2012). This hospital quality reporting scheme collects quality indicators on hysterectomy (AQUA Institute, 2012). While discussions are held at the Länder level, no particular action has occurred in response to the quality indicators on hysterectomy procedures (Chapter 8).

Geographic variations in imaging tests are high

The use of diagnostic imaging tests such as MRI and CT exams has increased greatly over the past decade in most OECD countries. MRI and CT exams are prescribed in a wide range of indications. Unlike conventional radiography and CT scanning, MRI exams do not expose patients to ionising radiation.

Only a few countries reported data on geographic variations in MRI and CT exams (Belgium, Canada and the United Kingdom/England). Among this small group of countries, the overall use of MRI and CT exams was greatest in Belgium, followed by Canada and the United Kingdom (based on crude rates or age-standardised rates). In Belgium and Canada, there was almost a two-fold variation in the use of MRI and CT exams between provinces with the highest and lowest rates in 2010, while in England the variation was even greater – around a four-fold difference between Primary Care Trusts (PCTs) with the highest rates and lowest rates in 2010/11.

In Belgium, there is strong evidence of a "substitution" in the use of MRI and CT exams across provinces: provinces that have high rates of utilisation of CT exams tend to have low rates of MRI exams, and vice versa. These differences in utilisation rates are due partly to a lower number of MRI units in some provinces. A s about high level of exposure to ionising radiation in Belgium compared to neighbouring countries led Belgian health authorities to develop, in co-operation with medical professional associations, a strategy to reduce radiation exposure. This strategy, which was launched in 2010, aims to reduce radiation exposure by 25%, with provincial targets set to reduce a certain number of CT exams and X-rays. However, the strategy has not been fully implemented yet, and progress in achieving the target reduction so far has generally been modest but in the right direction (Chapter 3).

In Canada, there has been a strong rise in the use of both MRI and CT exams in all parts of the country over the past decade, which has been accompanied by some reduction in the variation in MRI exams across provinces (not for CT exams), although substantial variation remains. In order to promote a more appropriate use of these diagnostic procedures, the Canadian Association of Radiologists developed a few years ago some guidelines to assist doctors in their referral practices, but leaving a lot of autonomy and freedom to doctors in the application of these guidelines. More recently, in 2013, the Canadian Medical Association, in co-operation with some universities and patient groups, began to adapt the Choosing Wisely campaign initially developed in the United States to promote more informed discussions between doctors and patients and reduce unnecessary diagnostic tests (Chapter 4).

In the United Kingdom (England), the 2011 NHS Atlas of Variation in Health Care suggested that variations in MRI and CT exams may be due not only to the availability of the equipment and trained personnel, but also to local clinical practices, possibly reflecting an under-use of these diagnostic tests in some regions and an over-use in others (NHS, 2011). The development and application of clearer clinical guidelines might help reduce the degree of geographic variations.

1.5. Policy options to reduce unwarranted variations in health care use target demand and supply factors

A certain degree of geographic variations in health care use can be explained by differences in population needs and differences in patient preferences. The main challenge for health systems is to reduce as much as possible *unwarranted variations,* i.e. those variations that are due to other factors.

Based on a review of experience of countries thus far, a number of possible policy levers might be used to reduce unwarranted variations in health care use across geographic areas. While only few policy options aim to reduce geographic variations in health care use, several policy levers try to encourage appropriate care, with expected spill-over effects on local variations.

Eight types of policies might be envisaged:

- Public reporting on geographical variations, in order to raise questions among stakeholders and prompt actions, particularly in “outlier” regions.
- Setting targets at the regional level can support public reporting and help promoting appropriate use.
- The re-allocation of resources to increase (or reduce) supply of resources (e.g., beds, doctors) in regions with low (or high) utilisation rates.
- Establishment and implementation of clinical guidelines in order to promote greater consistency in clinical practice.
- Provider-level reporting and feedback to improve clinical practice and discourage unnecessary provision of health services.

- Changes in payment systems to promote higher (or lower) use when there is high suspicion of underuse (or overuse).
- The measurement of health outcomes, to promote greater consistency in clinical practice that ensures improved patient outcomes.
- The utilisation of decision aids for patients, to promote more informed decisions about benefits and risks of various interventions, and to better respond to patient preferences.

Many countries report public information relating to the procedures and activities in this study as shown in Table 1.4. Particular procedures may be the subject of more policy interventions than others in the same country (e.g. cardiac procedures have more types of policies than hysterectomy). For example, in England, public reporting, decision aids and health outcome measures are in place for knee interventions.

Table 1.4. Mapping national policies to health care activities and procedures

Country	Hospital medical admission	Cardiac procedures	Surgery after hip fracture	Knee replacement	Caesarean section	Hysterectomy	MRI & CT exams
Australia		Clinical guidelines, health outcomes, payment systems	Health outcomes, resource allocation	Health outcomes, resource allocation	Public reporting, clinical guidelines		
Belgium					Public reporting, clinical guidelines, provider feedback		Clinical guidelines, resource allocation, Setting targets
Canada		Public reporting, clinical guidelines	Public reporting, Health outcomes	Public reporting, clinical guidelines, health outcomes	Public reporting, clinical guidelines	Public reporting	Public reporting, clinical guidelines
Czech Republic			Health outcomes	Health outcomes			
Finland		Clinical guidelines	Clinical guidelines	Clinical guidelines, health outcomes		Public reporting, clinical guidelines	
France					Clinical guidelines		
Germany		Public reporting, clinical guidelines, decision aids	Public reporting, clinical guidelines	Public reporting, clinical guidelines	Public reporting, decision aids	Public reporting, clinical guidelines, decision aids	
Israel	Public reporting	Resource allocation	Clinical guidelines				Resource allocation
Italy	Public reporting, decision aids, health outcomes, payment systems, resource allocation	Decision-aids, Health outcomes	Public reporting, decision aids, health outcomes, payment systems, resource allocation		Public reporting, decision aids, health outcomes, payment systems, resource allocation		
Portugal					Public reporting, clinical guidelines, payment systems, resource allocation		
Spain		Clinical guidelines	Public reporting, clinical guidelines	Public reporting, clinical guidelines	Clinical guidelines		
Switzerland	Public reporting	Public reporting	Public reporting	Public reporting	Public reporting	Public reporting	
United Kingdom (England)	Clinical guidelines, payment systems, resource allocation	Public reporting, clinical guidelines		Public reporting, decision aids, health outcomes	Public reporting, clinical guidelines, payment systems	Public reporting	Public reporting

Source: National reports included in this volume.

Soft touch policies such as public reporting and target setting can be important catalysts for change

Public reporting of geographic variations in health care activities aims to raise questions among stakeholders and to prompt actions, particularly in "outlier" regions. Atlases of variations in health care now exist in a number of countries, produced by authorities in charge of health care or other independent stakeholders (Table 1.5).

Table 1.5. A generation of atlases of health care variations

Country / producers	Description
United States (from 1996) Dartmouth Institute for Health Policy and Clinical Practice	Atlases cover common procedures and treatments and report activities by hospital referral regions (HRRs) for the Medicare population (people aged 65 and over). Utilisation rates can be matched with data on population characteristics or health care resources (www.dartmouthatlas.org/publications/reports.aspx).
Canada (from mid-1990s) Institute for Clinical Evaluative Sciences (ICES), Centre for Health Services & Policy Research Atlas (CHSPR), Canadian Institute for Health Information (CIHI)	ICES Atlases cover procedures and conditions for the population of Ontario (most populous Canadian province) (www.ices.on.ca) CHSPR Atlases cover on pharmaceutical prescriptions across Canada and British Columbia (third largest province) (www.chspr.ubc.ca/research-area/pharmaceutical-policy). CIHI reports on variations in selected surgical procedures, hospitalisations and diagnostic procedures, wait times, health status and health outcomes (www.cihi.ca).
Netherlands (from 1999) National Institute of Public Health and the Environment (RIVM), Scientific Institute for Quality of Healthcare and other partners	RIVM Atlas covers public health indicators (www.zorgatlas.nl/). The Dutch Atlas of Healthcare Variation report data on variations in medical practice at the provincial and municipal level for a range of procedures (http://emc3dev.com/depraktijkindex).
Spain (from early 2000) Atlas of Variations in Medical Practice in the Spanish National Health System	Atlases cover many procedures (e.g. acute myocardial infarction admissions, surgery in breast cancer, knee replacement), categorised based on the value they bring to the patient: effective care, lower-value care, uncertain benefit. This initiative was concurrent with changes in the devolution of health care organisation and delivery to the regional governments and allowed for comparative analysis of variations across the country (www.atlasvpm.org/).
Belgium (from 2006) Belgian Healthcare Knowledge Centre, Ministry of Health	The Belgian Healthcare Knowledge Centre published a one-off atlas on a selected set of procedures in 2006, with analyses of determinants of variations (www.kce.fgov.be). The Ministry of Health annual Atlas of pathologies is published by district in hospital admissions for a large number of conditions (www.health.belgium.be)
United Kingdom (from 2010) NHS Right Care	The first NHS Atlas covered more than 30 procedures covering 17 service areas (e.g. cancer, organ donation, diagnostic services) and a number of thematic atlases have been published (e.g. children and young people, kidney disease, diabetes) www.rightcare.nhs.uk/index.php/nhs-atlas/
Australia (from 2010) New South Wales Health Care Atlas	The first New South Wales Health Care Atlas published information on medical practice variation across Area Health Service (AHS), based on public and private hospital data, for the period 1 July 2005 to 30 June 2008, www.atlas.nsw.gov.au/. Although other jurisdictions have not undertaken similar analysis, some have examined variation in hospitalisation rates for various conditions according to geographical area, often with a focus on ambulatory care sensitive conditions.
Germany (from 2011) Bertelsmann Foundation, Institute of Statutory Health Insurance Physicians	The Bertelsmann Foundation produces atlases which include age- and sex-standardised rates for a number of inpatient procedures and activities at the county level (412 counties /districts) such as caesarean sections, prostatectomies, CABG, inpatient treatment for depression and diabetes. It also includes information on health outcomes and explores possible reasons for over- or underuse of some procedures. The Bertelsmann Foundation's publication of Atlas of medical practice variations is part of its Initiative for High-Quality Healthcare (https://faktencheck-gesundheit.de/english-summary/). The Institute of Statutory Health Insurance physicians has undertaken analyses on different regional levels mainly on outpatient care-related activities (e.g. antibiotic drug prescriptions, prevalence of depression, utilisation of screening and office visits). The data are drawn from office-based physician billing codes and diagnosis as well as on outpatient prescriptions. Other data (regional) and different methods are used in some cases to explain potential determinants of variation. "Versorgungsatlas" (healthcare atlas) (www.versorgungsatlas.de).

The NHS Atlas in England has spurred further diagnostic tools. In conjunction with the NHS Atlas of Variation in Healthcare series, Rightcare produced a "Health Investment Pack" (HIP) for each PCT. HIPs used outputs from analytic tools already available to PCTs to analyse variation in spending, outcome and activity for a given budget category along the entire patient pathway for that PCT.

The NHS Commissioning Board (now named NHS England) produced "Outcomes benchmarking support packs" (NHS Commissioning Board, 2012) for Clinical Commissioning Groups (CCGs) and Local Authorities (LAs). These short documents provide CCGs and LAs with a quick and easy-to-use summary of their current position and enable comparison with the rest of England on various health outcomes and other indicators. The packs provide health information in a user-friendly format for use by local commissioners, local governments, health care services and the general public.

Following the transition in 2013, NHS England working with Public Health England and NHS Right Care provided all 211 CCGs with a comprehensive Commissioning for Value (CfV) data pack and two online tools in October 2013. The CfV packs included spending, drivers of spending and outcome measures for major diseases and identified where CCGs were outliers compared to similar CCGs. These showed CCGs their potential priority diseases for action and where to look to identify opportunities to improve outcomes and increase value for local populations. This work is supported by the two online CfV tools and help from the three organisations to enable CCGs to examine the data in greater detail including interactive maps (NHS England, 2014a, 2014b; Health Investment, 2014).

A study on the impact of the English NHS Atlas on local decision-making processes found half of the PCTs who responded to the survey reported using the Atlas (Schang et al., 2013).

Setting targets at the regional level can support public reporting and help meet public health objectives. In Italy, since 2005, the National Outcome Programme (*Programma Nazionale Esiti*), developed by the Italian National Agency for Regional Health Services (AGENAS) and the Ministry of Health, collects a wide range of indicators by hospital, local health unit (ASL), province and region, directly available to policy makers and health professionals on a dedicated website accessible through user credentials (Fusco et al., 2012; Amato et al., 2013). This programme is an audit instrument aimed at promoting quality, effectiveness and equity of the health system. In 2013, the programme collected 114 indicators on outcomes, processes and volumes in different clinical areas (e.g. cardiology, obstetrics and neurology).

In addition, the Italian Ministry of Health conducted additional studies to monitor the actual provision of the services included in the Essential Levels of Care (LEA) across the country and to assess health care systems across regions. An essential set of 21 indicators divided in three areas (collective health care; district health care and hospital care) and with different weights for each level of care is used to measure the effectiveness of LEA provision in Italian regions (Ministero della Salute, 2013). "Target" diagrams are used to show the performance of each region in the fulfilment of each indicator.

In Belgium, a study on substantial variations in diagnostic imaging by the National Institute for Health and Disability Insurance in Belgium prompted a strategy to reduce exposure to ionising radiation from X-ray and CT scans across the country (see Chapter 3 on Belgium on this volume). The policy aimed to reduce rates by 25%, with provincial targets set for a selected number of CT and X-ray procedures. An education campaign also targeted providers and patients about excessive exposure to ionising radiation. Some progress has been made but the full strategy has not been implemented yet.

Targeting providers could reduce unwarranted variations

The development and monitoring of clinical guidelines is one of the main policy levers to harmonise clinical practices and reduce unwarranted variations. Health technology assessment (HTA) agencies in England and Finland were set up in response to unwarranted variations in health care. Even though guidance exists, take-up in these two countries is voluntary, making it difficult to determine the impact of HTA bodies on local area variations (HSCIC, 2014). In almost all countries, physician societies and/or health authorities have produced clinical guidelines for many of the procedures examined in this report, with the aim to improve and harmonise clinical practices across regions.

However, compliance with guidelines is not always guaranteed (OECD, 2010) and their impact on variations is not straightforward (De Jong, 2008). To increase compliance with guidelines, which is always a challenge, Spain proposed an "inclusion protocol" for caesarean section in a sample of voluntary hospitals (Chapter 12). The check-list allowed practitioners to assess the appropriateness of caesarean section for each patient against a set of well-defined criteria. Hospitals which used this protocol experienced a lower increase in caesarean section rates than those that did not.

Provider level reporting and feedback, while not necessarily public, shows promising results. In Canada, for instance, a recent report by the Cardiac Care Network on variations in the ratio of PTCA to CABG across different hospitals in the province of Ontario (the largest province) identified opportunities to improve transparency and consistency in decision making for coronary revascularisation. A network of researchers was established across the country to study variations in cardiac care in provinces and produced a series of studies and atlases to better identify clinical guidance; adopted an urgency rating score (URS) to triage patients into three categories (elective, emergent, urgent); and adopted uniform eligibility criteria. These measures led to a reduction in variation of coronary revascularisation in Canada (CCORT, 2014).

In Belgium, monitoring and provider level feedback was found to have an impact on caesarean section rates. The Medical College of Mothers and Newborns monitored and gave feedback to hospitals on variations in caesarean section rates. An analysis of hospital rates of caesarean section between 2008 and 2011 showed a convergence to the mean, where high-rate hospitals showed a decrease towards a slightly lower rate, and low-rate hospitals increased their rate (Chapter 3 in this volume).

Financial incentives can be used to encourage appropriate care. Two countries (England, France) have recently reduced the gap between payments for caesarean section and for normal delivery, to remove incentives to perform unnecessary caesarean sections (Ministère de la Santé et des Sports, 2010; Department of Health, 2012). Korea introduced a pay-for-performance (P4P) scheme for hospitals, linked to a reduction in caesarean section rates. In Korea, this change coincided with a modest drop in the national caesarean section rate, but it is difficult to judge whether this scheme improved performance or simply captured a trajectory of improving performance that may have occurred irrespective of the scheme (OECD, 2012).

The re-allocation of resources (e.g. spending, equipment) could be envisaged as a means to reduce unwarranted variations. In Canada, some variation studies have highlighted/supported evidence of under-provision of health care services in remote areas, fostering policies to increase access to primary care.

Patient-centered policies are taking centre stage

The collection of information on patient clinical need before an intervention and health outcomes after this intervention can also help to assess the appropriateness and benefits of different health care interventions. Countries such as Sweden and the United Kingdom have led the way in systematic collection of patient-related outcomes following surgical procedures such as knee and hip replacement. Since 2006, the Swedish annual health care report documents the quality and outcomes of many conditions on a regional basis such as patient reported complications after hysterectomy (Socialstyrelsen, 2010). Regions are able to compare their health care outcomes to each other. Since 2010, an online cardiac registry reports the outcome for every patient hospitalised (Taylor, 2009).

In England, there are now numerous efforts to collect and examine data on patient outcomes to better monitor the health benefits of some interventions. Since April 2009, providers of NHS-funded care are obliged to collect information on patient quality of life before and after some surgical interventions and some PROMs are reported in the NHS Atlases of Variation in Healthcare as well as in the Commissioning for Value data packs for Clinical Commissioning Groups (NHS, 2010; HSCIC, 2013; NHS England, 2014b). NHS England has compared these health outcomes with spending and activity data to identify not just variation, but unwarranted variation, to help inform the CCGs (the decision-making units) on actions to take. This information is interesting to determine whether rising utilisation rates of certain procedures are reaching "diminishing returns" in terms of benefit/cost ratios.

Decision aids for patients may allow health systems to better respond to patient preferences that may have spill-over effects in addressing unwarranted variation at the local level. Decision aids are tools for patients that can be used as a complement to physician opinions, in order to facilitate informed, shared decision making between physicians and patients (McCulloch et al., 2013). Decision aids increase patient knowledge and involvement, improve perception of risk and benefits, positively affect patient-practitioner communication, and lower levels of decisional conflict and indecision (Stacey et al., 2012). They are particularly useful when alternative treatments exist with different risks and benefits that patients can value differently (e.g. cardiac procedures, hysterectomy, hip replacements). In a few countries, such as the United Kingdom and the United States, decision aids are available for a wide range of health care interventions.

Decision aids may be presented as a booklet or information leaflet, an audio programme, CD, DVD or via an interactive online platform. Currently, there are 455 decision aids listed in the Cochrane Inventory of Decision Aids (OHRI, 2013). A recent Cochrane Review of the literature showed that well-informed patients are less likely to choose to undergo surgery, in favour of less invasive procedures, though this is not always the case (Mulley at al., 2012; McCulloch et al., 2013; Katz, 2014).

Related policies have been developed which engage providers and patient groups. The Canadian Medical Association has also recently begun to adapt the Choosing Wisely initiative from the United States in a Canadian context. In conjunction with the University of Toronto, the Government of Ontario, Canadian medical speciality groups and patient groups, Choosing Wisely Canada aims to reduce unnecessary tests (and other procedures) that may be overused (Levinson and Huynh, 2014). The Choosing Wisely campaign is designed to engage physicians and patients in making the best choices in diagnostic and treatment options for people with different conditions. It will be important to monitor the impact of this new initiative.

1.6. Conclusions

The analysis carried out in this report has enabled to highlight that wide variations persist across and within countries for high-cost and high-volume procedures, for which there is still limited understanding of underlying reasons. There is broad consistency, however, across countries in the ranking of procedures according to the degree of within-country variation. Some procedures were consistently ranked as "high" variation across geographic units (cardiac procedures, knee arthroscopy, MRI and CT exams). Others were generally in the middle range (hospital medical admissions, knee replacement and hysterectomy). Surgery/admissions after hip fracture and caesarean section were generally ranked as having low variation. These results are consistent with existing research and generally confirm findings in the literature.

The evidence on the determinants of geographic variations is sparse, except for the United States, and information on clinical needs most often unavailable or incomplete. This study cannot determine the extent to which these variations are unwarranted, i.e. not explained by variations in clinical need and patient preferences. However, can variations in morbidity patterns be as large as variations observed for some procedures and some countries? Most likely, not.

Health systems must make sure that clinical needs are appropriately met and patient preferences taken into account. The analysis presented suggests that policy makers have several options to "steer" health care use at the local level in desired directions:

- For a handful of interventions whose effectiveness is based on strong evidence for targeting large populations (e.g. vaccinations or screening rates), public reporting of local variations can help identifying gaps in the coverage of the relevant population.
- For other interventions, where the appropriate level is difficult to define, analysis at the geographic level could be used as a starting point to detect outliers for further investigation.
- While only few policy options aim to reduce geographic variations in health care use, several policy levers try to encourage appropriate care, with expected spill-over effects on local variations. Public/provider reporting at the local level is likely to better support existing governance structures and could be a catalyst for greater dialogue and discussion with stakeholders. It is too early to assess the other policies reviewed but there is considerable scope for better supporting patient preferences (e.g. decision-aids) and improving clinical practice (e.g. inclusion protocols).
- Governments are encouraged to consider systematic monitoring and public/provider reporting for at least a core set of high-cost diagnostic and surgical procedures. Such variations analysis could be an extremely important factor to spark debate, dialogue and inform policy development to improve health system performance.

Finally, this study has shown that taking forward analysis of health care use at the local level needs to take into account the following:

- Establishing causal relationships and assessing the appropriateness of care requires quantitative analysis of patient-level data moving beyond local area analysis. Studies have shown that inappropriate use of health care services can equally exist in areas with high and low utilisation.

- Variation analysis at the geographic level is superior to patient level data analysis to identify possible unmet needs. Patient level data help to contextualise patients who underwent treatment but do not help to identify patients who required a treatment but did not receive it.
- Observing variation across geographic areas seems to be more useful when these areas coincide with decision-making units, which have the power to act on health care supply and organisation.
- Decision makers are encouraged to consider how to make such data more readily accessible to encourage local level analysis.

Notes

1. PCTs were abolished in March 2014 and part of their competencies transferred to the newly created Clinical Care Commissioning Groups.
2. OECD population structure was estimated using population estimates published by the United Nations (2011).
3. All types of hospitals, general or specialised, are considered, except mental health hospitals. Hospital stays for normal deliveries are excluded.
4. Data for Spain only include admissions in public hospitals, which account for the 75% of all hospital activities (Chapter 12). However, the share of private beds differs across regions and provinces. This influences both the average rate and the range of variations across Autonomous Communities and provinces. For Spain, hospital admissions are reported at the location of provider.
5. Data for Portugal only include admissions in public hospitals, which account for three-quarter of hospital beds.
6. Data for Canada exclude all discharges for mental health, while other countries kept admissions/discharges for mental health in general hospitals. However, this only explains a small share of Canada's low admission rates since the crude admission rate for mental health problems in general hospitals is below 500 per 100 000 population (OECD, 2013).
7. Australia, France and Switzerland reported on admissions for hip fracture while other countries reported on surgery after hip fracture. The Czech Republic reported on all hip replacements (not only following hip fractures) and is not included in these international comparisons.
8. FRAX or Fracture Risk Assessment Tool (see www.shef.ac.uk/FRAX/).
9. Data collected for this project include all types of caesarean sections (elective and emergency, primary and others).

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ANNEX 1.A1

OECD project guidelines on procedure codes

This annex includes guidance on the list of procedures/activities that was provided to country experts. When possible, procedure codes and the sources used in their identification are provided using the Classification of Procedures of the ICD-9-CM.[1] For each procedure, rules for exclusion and inclusion are provided to standardise as much as possible the procedures/activities. The unit of analysis used to calculate the rates is included along with the suggested age group.

Hospital medical admissions

Countries should consider for inclusion any hospital inpatient stay (i.e., with at least one night) with a medical (non-surgical) purpose in a "hospital", as defined by the category HP.1.1 (general hospitals) and HP.1.3 (specialised hospitals) in the revised System of Health Accounts[2]. This category does not include mental hospitals or long-term care facilities. Where DRG-like classifications are used, medical admissions can be identified by medical (i.e. non-surgical) DRGs, with an overnight stay.

Description	Hospital admission for a minimum one night inpatient stay. Hospitals are defined to be general or specialised hospitals (HP.1.1. and HP.1.3 in the System of Health Accounts)
Rules	All medical discharges
Exclusion	Day care is not included. Exclude surgical discharges.
Unit to be used for rates	Per 100 000 population
Age group (suggested) for women and men	15-34, 35-44, 45-54,55-64,65-74,75+ OR five-year age groups
Resource use (optional)	Density of hospital beds by territorial unit

Revascularisation

The three revascularisation procedures selected are CABG, PTCA and catheterisation. The ICD-9-CM codes are provided below.

To avoid double counting procedures for which more than one code may be used depending on each national classification system, only one code should be reported per procedure category for each patient. For example, if a percutaneous coronary intervention including a coronary stenting is recorded as two separate codes, only one code/procedure should be reported. Crude and standardised rates are suggested to be reported per 100 000 of the population in the territorial unit across age groups/gender. Data should be reported separately for each procedure.

ICD-9-CM code Coronary bypass	36.1, 36.11-36.19 Aortocoronary bypass for heart revascularisation
ICD-9-CM code Percutaneous coronary interventions (PTCA and stenting)	36.0 Removal of coronary artery obstruction and insertion of stent(s)
ICD-9-CM code Cardiac catheterisation (optional)	37.21 Right heart cardiac catheterisation 37.22 Left heart cardiac catheterisation 37.23 Combined right and left heart cardiac catheterisation
Rules	Any principal diagnosis code. To avoid double counting procedures only one code should be reported per procedure category for each patient.
Unit to be used for rates	Per 100 000 population in the territorial unit
Age group (suggested) for women and men	20-49,50-64,65-74, 75+, OR five-year groups

Joint procedures

Admission/Surgery after hip fracture

A number of procedures exist for the treatment (e.g. total hip replacement, partial replacement, the use of nails/screws). All hip fracture emergency admissions are included regardless of the way in which the hip was repaired. This measure is a proxy for the burden of disease for hip fracture because treatment is typically provided for this condition. External causes are excluded (e.g. accidents).

Crude and standardised rates are suggested to be reported per 100 000 of the population in the territorial unit across age groups/gender.

ICD-9-CM code	820.0-820.3, 820.8,820.9 Only emergency admissions of fracture of neck of femur Plus 733.14 Pathologic fractures
Rules	Principal diagnosis code (Emergency admission) can be reported with or without the pathologic fractures.
Exclusion	E800-E849.9 (Accidents: railway, motor vehicle, road, water, air and space)
Unit to be used for rates	Per 100 000 population in the territorial unit
Age group (suggested)	15-34,35-44,45-54,55-64,65-74,75+ OR five-year age groups

Source: ECHO project.

Knee interventions

Two knee interventions were agreed upon: knee replacement and knee arthroscopy (diagnostic procedure). It is optional for countries to include knee arthroscopy in this analysis.

Crude and standardised rates are suggested to be reported per 100 000 of the population in the territorial unit across age groups/gender. Data should be reported separately for each procedure.

ICD-9-CM code Knee replacement	81.54 Total knee replacement 81.55 Revision of knee replacement, not otherwise specified OR 00.80-00.84 Revision of knee replacement if specified
Rules knee replacement	Any principal code
Inclusion knee revision	Revision of knee replacement
Knee arthroscopy (optional)	80.26 Arthroscopy knee and 80.6 Excision of semilunar cartilage of knee
Rules knee arthroscopy	Only one code should be reported per event/patient.
Unit to be used for rates	Per 100 000 population
Age group (suggested)	15-34,35-44,45-54,55-64,65-74,75+ OR five-year age groups

Gynaecological procedures

Caesarean sections

Countries should consider all procedures where a baby is delivered by caesarean. These procedures can either be planned where the procedure becomes apparent during pregnancy, unplanned or an elective procedure on the basis of personal choice. The ICD-9-CM codes are provided below. Crude and standardised rates are commonly reported per 1 000 live births and will be the relevant unit for this procedure across a range of suggested age groups.

ICD-9-CM code	74.0-74.2 Classical, low cervical or extraperitoneal caesarean 74.4 Caesarean section of other specified type 74.99 Other caesarean section of unspecified type
Rules	Any procedure code
Unit to be used for rates	Per 1 000 live births
Age group (suggested) for women	<19, 20-24,25-29,30-34,35-39,40+ OR five-year age groupings

Hysterectomy

The OECD Secretariat proposes to consider all types of hysterectomies, be they partial or complete, abdominal or vaginal. The table below shows procedures codes in ICD-9-CM. All diagnoses should be included. The unit of analysis for rates is the number of procedures for 100 000 of the female population.

ICD-9-CM code	68.3-68.9 Abdominal or vaginal hysterectomy
Rules	Any principal diagnosis code
Unit	Per 100 000 female population in the territorial unit
Age group (suggested)	15-34,35-44,45-54,55-64,75+ OR five-year age groups

Imaging tests

MRI exams

The variable of interest is the number of patients receiving the exam. Crude and standardised rates are suggested to be reported per 100 000 of the population in the territorial unit across age groups/gender.

Unit to be used for rates	Number of patients receiving MRI exams per 100 000 population in the territorial unit
Age group (suggested)	15-34,35-44,45-54,55-64,65-74,75+ OR five-year age groups

CT exam

The variable of interest is the number of patients receiving the CT exam. Crude and standardised rates are suggested to be reported per 100 000 of the population in the territorial unit across age groups/gender.

Unit to be used for rates	Number of a patients receiving the CT scan per 100 000 population in the territorial unit
Age group (suggested)	15-34,35-44,45-54,55-64,65-74,75+ OR five-year age groups

ANNEX 1.A2

Measurement of variations

Table 1.A2.1. How is variation in health care use measured

Measures	Description
Average rate (mean) μ	Definition: The arithmetic unweighted average of the standardised rates of a procedure across a number of given territorial units. Rates in this synthesis chapter are age- and sex-standardised using the OECD population, while rates in national reports are standardised based on national population structures. Advantages: The unweighted average of standardised rates for a given country reflects what would be the average procedure rate if all territorial units had the same population structure. Disadvantages: It does not convey any information relating to distribution of the data, nor variation. It gives equal weight to all regions, regardless of population and size.
Ratio Max/Min	Definition: The ratio of the highest territorial unit rate to lowest territorial unit rates of a procedure. Advantages: Intuitive, easy to understand. Disadvantages: Can be highly influenced by extreme values of outliers.
Ratio 90/10	Definition: The ratio of the 90th percentile to the 10th percentile of the distribution of standardised rates. Advantage: Removes the effect of any extreme values of outliers.
Coefficient of variation (CV)	Definition: The ratio of the standard deviation to the mean of a procedure across a number of given territorial units. The higher the coefficient of variation, the greater the dispersion around the mean. $$CV = \frac{\sigma}{\mu}$$ Advantages: Can be used to compare variation between data of different units, since the coefficient is itself without units. Relatively insensitive to population sizes. Disadvantages: Does not adjust for random variation or systematic variation, may be sensitive to over dispersion in the data, and is less intuitive than simpler measures. May not be an appropriate method to compare surgeries that are performed at different rates.
Systematic component of variation (SCV)	Definition: Considers the number of observed episodes relative to the number which are expected for that population structure, given the age and sex distribution of the population $$\mathrm{SCV} = \frac{\left[\left(\sum_{t=1}^{n} \frac{(\mathrm{O_t} - \mathrm{E_t})^2}{\mathrm{E_t^2}}\right) - \left(\sum_{t=1}^{n} \frac{1}{\mathrm{E_t}}\right)\right]}{\mathrm{n} - 1}$$ Where: SCV = systematic component of variation $\mathrm{O_t}$= observed cases in region t $\mathrm{E_t}$= expected cases in region t n = number of observations Advantages: Incorporates demographic structure of the population, and provides an indication whether variation is greater than would be expected by chance. It is not sensitive to extreme value and therefore can be used to compare different procedures that have different mean rates. Not influenced by small sample sizes. Disadvantages: Not an intuitive measure.

Source: Diehr, P. (1984). "Small Area Statistics : Large Statistical Problems", A*merican Journal of Public Health*, Vol. 74, No. 4, pp. 313-314; Appleby, J. et al. (2011), *Variations in Health Care: The Good, the Bad and the Inexplicable*, The King's Fund, London; OECD project on Medical Practice Variations.

Box 1.A2.1.Technical note on OECD standardisation for cross-country comparisons

The age/sex standardised rate was calculated to eliminate the effect of differences in population age/sex structures when comparing procedure rates for different geographic areas across countries. The standard population used in this chapter for the international comparisons is the 2010 OECD population which includes all 34 countries (United Nations, 2011). Caesarean section is the only procedure for which a different population structure has been used, that is, the 2011 Italian population structure according to the mother's age (Chapter 10).

Calculation of age/sex standardised rates

The age/sex standardised rate for each territorial unit (SR_t) is a weighted average of age and sex specific rates:

$$SR_t = \sum ij(ASRijt) * [POPij/POP_{tot}]$$

Where the ASR_{ijt} is the age-and-sex-specific rate (per 1 000 or 100 000 population depending on the procedure) for age group i; sex j and the territorial unit t. POP_{ij} is the OECD standard population size in age group i, sex j, and POP_{tot} is the OECD total standard population defined as $\sum_{ij} POP_{ij}$.

Warning! The standardised rates reported in this chapter are different from the ones presented in national reports, where standardisation was operated with *national* population structures. While the standardisation using a unique population structure is needed to make international comparisons, the use of national population structures is more meaningful in a national context.

Notes

1. The International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM), Sixth Edition, issued for use beginning October 1, 2008 for federal fiscal year 2009 (FY09). The ICD-9-CM is maintained jointly by the National Center for Health Statistics (NCHS) and the Centers for Medicare & Medicaid Services (CMS).
2. See www.oecd-ilibrary.org/social-issues-migration-health/a-system-of-health-accounts_9789264116016-en, pp. 130-133.

Chapter 2

Australia: Geographic variations in health care

Australian Commission on Safety and Quality in Health Care
and Australian Institute of Health and Welfare

This chapter summarises data and utilisation rates of a select number of health care procedures and activities within Australia, analysed by Medicare Local.

In 2010-11, the amount of variation across Medicare Locals was smallest for caesarean sections (a 1.6-fold variation) and largest for cardiac catheterisation (a 7.4-fold variation). Variations were somewhat lower when based on the 10th and 90th percentile values of the distribution of procedure rates, ranging from 1.3-fold for caesarean section to two-fold for cardiac catheterisation and knee arthroscopy. Cardiac revascularisation procedures, hysterectomy and knee replacement showed relatively middle range variation across Medicare Locals.

The chapter also describes policies that have been used to address variations, such as the establishment and promotion of national clinical guidelines for cardiac care; the development of criteria to define priorities for hip and knee replacements; and the introduction of payment incentives to encourage the provision of evidence-based health care.

2.1. Introduction

This chapter summarises data on rates of hospital admission for selected medical practices and the geographic variation in these rates within Australia. This information needs to be interpreted within the context of Australia's geography and the financing and organisation of health services.

Australia is the sixth largest country in the world in terms of land mass, but is highly urbanised, with most of the 22.3 million population concentrated in two widely separated coastal regions, mostly on the east to south east coast, with a smaller cluster in the state of Western Australia on the south west coast. Seventy-seven per cent of the population lives in the three most populated states – New South Wales, Victoria and Queensland. Areas across Australia can be classified into five categories based on the distance from different services: major cities, inner regional, outer regional, remote and very remote (GeoScience Australia, 2013, Australian Bureau of Statistics, 2013a).

This chapter first provides an overview of the Australian health care system, followed by current research activities to date on health care variations. Section 2.3 turns to the methods used and data sources. The results are then provided for the 11 health care activities and procedures being considered. Australia has only recently begun to nationally document variation in health care use, and this is further discussed in the final section on policy implications.

2.2. Overview of Australia's health care system

Political and organisational structure

The Australian health care system has multiple funders and providers, both public and private. Responsibilities for health care are split between different levels of government and between government and non-government sectors. The Australian Government sets national health policy, whilst governments of the eight states and territories (Australian Capital Territory, New South Wales, Northern Territory, Queensland, South Australia, Tasmania, Victoria, Western Australia) set state- or territory-wide health policy.

Australia has a universal health insurance scheme, Medicare. While the Australian government provides a funding contribution for public hospital services, state and territory governments are the majority funders of public hospitals and are recognised as the system managers. The organisation, management and governance structures differ between states.

Under the previous Labor government (2007-13) Australia underwent a process of national health reform involving changes to the way care was planned, funded and provided. The Coalition government elected in September 2013 has embarked on its health reform agenda with every dollar of saving in health reform being invested into a new Medical Research Future Fund until it reaches AUD 20 billion. Medicare Locals (61 primary health care organisations) were established in July 2012 with responsibility for planning and co-ordinating improvements in primary health care for a designated population within a defined geographic area. From 1 July 2015, Medicare Locals will be replaced by a smaller number of Primary Health Networks (PHNs) that will be tasked with planning and funding local primary health services.

Medicare Locals, and their successors PHNs, are required to work closely with Local Hospital Networks (LHNs) to create more integrated and responsive services across primary health and acute care in their area. There are 124 geographically based Local Hospital Networks and 13 state-wide networks that deliver specialised hospital services (Department of Health and Ageing, 2010). While Australian residents are entitled to access public hospital care in any part of Australia, most hospital care occurs within state of residence. PHNs will be established to better align with LHNs to maximise integration opportunities, with a focus on developing locally relevant care pathways.

There are non-governmental health service providers across Australia, both private for-profit and not-for-profit organisations (Johar et al., 2013). These services exist either independently of public health care provision, for example in private clinics, or alongside public service provision, and are increasingly being awarded government contracts to provide certain services (Johar et al., 2013).

Health care expenditure

Total health spending accounted for 9.28% of Gross Domestic Product in Australia for 2010-11, on par with the OECD average of 9.3% in 2011(OECD, 2013). Australia ranks above the OECD average in terms of total health spending per capita, with spending of USD 3 800 (adjusted for purchasing power parity) in 2010, compared with an OECD average of around USD 3 300. The share of hospital spending accounted for 43% of health spending, which was higher than the OECD average of 36%.

Between 2000 and 2009, health spending per capita in Australia increased, in real terms, on average by 3% per year, but there was no growth in 2010 (OECD, 2013).

Health care financing

The health care system in Australia is characterised by universal coverage and is financed mainly through general taxation and a compulsory tax-based health insurance levy, which pays for Medicare coverage, accounting for 68% of health spending in 2010 (Johar et al., 2013; OECD, 2013). Medicare funds subsidised primary health, private outpatient care and private inpatient care. Public hospital services are generally provided free of charge to eligible patients.

The Australian Government has also been encouraging individuals to take out private health insurance for both hospital care and supplementary coverage (non-hospital services) through a range of initiatives, including incentives, subsidies and penalties (Johar et al., 2013). About 47% of the Australian population has private hospital insurance (Private Health Insurance Administration Council, 2013). In 2010 private health insurance accounted for 8% of health care financing and out-of-pocket payments accounted for about 20% (OECD, 2013).

Medicare reimburses between 75% and 100% for eligible services and offers additional payments for concession card holders and children (Johar et al., 2013).

Health care delivery and provider payments

Physician services and payments

General Practitioners play a gatekeeping role and may also perform minor surgery in their clinics (Commonwealth Fund, 2011). Primary health care payment is predominantly fee-for-service, and patients do not need to register with a single GP (OECD Health Systems Characteristics Survey, 2012). GPs can either charge the Medicare scheduled fee, or they can charge more. If the GP charges more than the Medicare rebate, the patient must pay the difference between the Medicare rebate and the GP fee out-of-pocket (Healy et al., 2006).

Pay-for-performance schemes have been in place since the 1990s: the General Practice Immunisation Incentive scheme to increase vaccination in coverage in children (which ceased in June 2013); and the Practice Incentives Program seeks to improve the quality of primary health care (Cashin and Chi, 2013).

Specialists provide ambulatory care either in private consulting rooms or in outpatient departments of public hospitals. Physicians in public hospitals either are salaried (but may also have private practices and additional fee-for-service income) or are paid on a per-session basis for treating public patients (OECD Health Systems Characteristics Survey, 2012). Specialists treating private patients set their own fees on a fee-for-service basis (OECD Health Systems Characteristics Survey, 2012). The gap between the fee charged and the Medicare scheduled fee is covered either by private insurance and/or by out-of-pocket payments (Johar et al., 2013).

In 2011, Australia had 3.3 practising physicians per 1 000 population, slightly above the OECD average (3.2). The proportion of generalists is higher than the OECD average in 2011 (30%), while the proportion of specialists is lower than the OECD average (62%).

This workforce is not equally distributed across Australia. The full-time equivalent (FTE) rate of all specialists ranges from 148.7 FTE per 100 000 population in major cities to 36.9 FTE in remote/very remote areas. General practitioners range from 107.5 FTE practitioners per 100 000 population in major cities to 130.3 in remote/very remote areas (Australian Institute of Health and Welfare, 2013a). However, medical workforce data for remote and very remote areas should be interpreted with caution due to the relatively small number of employed medical practitioners who stated that their main job was located in these areas.

Hospital services and payments

Elective surgery is provided in both public and private sectors, with more provided privately than publicly (Australian Institute of Health and Welfare, 2012a). Emergency care is provided predominantly in the public hospital system. In 2010-11 about 90% of all emergency admissions were in public hospitals.

In public hospitals, Australian Government funding is provided on the basis of diagnosis related group (DRG)-type payments and prospective budgets. Each state determines its own funding arrangements. In private for-profit and private-not-for-profit hospitals payments, a national tariff rate covers the clinical costs, with the remaining cost covered by private health insurance and out-of-pocket payments (OECD Health Systems Characteristics Survey, 2012).

Patients admitted to public hospitals can elect to be treated as a public or private patient. Public patients are generally treated free of charge in public hospitals. Private patients can choose hospital and treating doctor, while public patients do not have this option. When a patient elects to be treated as a private patient at a public hospital, the federal government covers 75% of the Medicare scheduled fee, while typically private insurance covers 25% of the scheduled fee. Patients are responsible for any additional charges incurred (via out-of-pocket payments). Some states and territories also contract some activity out to private hospitals (Johar et al., 2013).

The number of hospital beds was 3.8 per 1 000 population in 2010, less than the OECD average (5 per 1 000 population). As in most OECD countries, the number of hospital beds per capita in Australia has fallen over time. This decline has coincided with a reduction in lengths of stay in hospitals and an increase in the number of same-day surgical procedures.

Monitoring of health care variations to date in Australia

Nationally, there has been some monitoring of health care variation. For many years data on variations in rates of provision of a range of “selected procedures” have been reported in Australian Hospital Statistics by state and territory, socioeconomic status and remoteness. Data on waiting times for surgery and on some other aspects of care such as potentially preventable hospitalisations have also been reported for several years. An examination of hysterectomy rates for two states by local government area was undertaken in 1999 using 1995-96 data (Reid et al., 1999).

The most detailed reporting on health care variations at state level has been in New South Wales (where just under one-third of Australia’s population reside). A NSW Health Care Atlas produced in 2010 analysed practice pattern variation using public and private hospital data, analysed on a population basis by Area Health Service (AHS) of residence, for the period 1 July 2005 to 30 June 2008. Substantial variations in preference sensitive surgery rates, chronic medical admission rates and readmission rates were found throughout New South Wales. Preference sensitive surgery rates varied by up to 220% by AHS of patient residence, medical admission rates for chronic conditions varied by up to 50%, readmission rates for preference sensitive surgery conditions varied by up to 70%, and readmission for chronic medical conditions by up to 30% (Health Dialog and the Dartmouth Institute for Health Policy and Clinical Practice, 2010).

Historically, other jurisdictions have not undertaken variation analyses of clinical care based on small areas. Some have examined variations in hospitalisation rates and death rates for various conditions according to geographical area but, in the main, analysis of geographical variation has tended to focus on population risk factors, avoidable mortality and ambulatory care sensitive conditions. Some states examine variations in care at the hospital level with a focus on indicators of safety rather than the appropriateness of care – for example, for the past five years the Queensland Department of Health has been monitoring clinical outcome indicators monthly across 75 public hospitals. The 32 indicators include in-hospital mortality and complications in surgery for hip fracture and knee replacement, mortality and readmissions for acute myocardial infarction, along with indicators relating to maternity care including caesarean section. Hospitals with adverse patient outcome rates that are statistically higher than the state average are alerted and required to undertake a structured method of investigating these and report on remedial actions taken to a clinical expert group.

A common jurisdictional and national approach involves statistical exploration of variation for high acuity, low volume procedures (e.g. oesophagectomy) performed to assist in policy decisions regarding service concentration at the state/territory level and at the national level (e.g. Nationally Funded Centres for high-cost, low-volume procedures such as paediatric transplantation). The purpose of these approaches is to reduce unwanted variation in outcomes, particularly patient mortality.

2.3. Data and methods

This section provides a brief outline of the method used for this project, including data sources and presentation; methods used to analyse data by Medicare Local; methods used to calculate data according to the project's specifications, including mapping of diagnosis and procedure codes (based on International Classification of Diseases, ICD-9-CM) to corresponding codes used in Australia (based on ICD-10-AM/ACHI) and statistical calculations; and a summary of limitations. More information is provided in Annex 2.A1.

This project included data from a number of sources (see Box 2.1). However, the core set of data for the project – hospital procedure and activity rates – was sourced from the National Hospital Morbidity Database. Coverage for each hospital procedure or activity indicator was very good, with data representing admissions to essentially all Australian hospitals. Data are based on the person's place of usual residence.

Box 2.1. Data sources

National Hospital Morbidity Database (NHMD)

State and territory health authorities compile information on hospital admissions (separations) and supply it to the Australian Institute of Health and Welfare for collation into the National Hospital Morbidity Database (NHMD). This database is an electronic record for each episode of care (separation) for essentially all hospitals in Australia, including public acute and psychiatric hospitals (public sector), and private free-standing day hospital facilities and other private hospitals (private sector). It includes demographic information on the people admitted to hospital (for example, age, sex, geographic location), the reasons for their hospital admission (for example, diagnoses), and the type of care they received (for example, procedures undertaken).

National Mortality Database

The National Mortality Database (NMD) contains data on all deaths registered in Australia, including information on the cause of death and demographic information on the deceased. These data are sourced from the Registrars of Births, Deaths and Marriages and the National Coronial Information System, and compiled and coded by the Australian Bureau of Statistics.

ABS National Health Survey 2007-08

The 2007-08 National Health Survey was conducted by the Australian Bureau of Statistics (ABS) from August 2007 to June 2008. The survey was designed to obtain national benchmarks on a wide range of health issues, and to enable changes in health to be monitored over time (Australian Bureau of Statistics, 2009). The survey collected information on the health status of the population (for example, the prevalence of heart disease), health-related aspects of lifestyle (for example, smoking), health-related activities (for example, visits to a health professional) and demographics of the population.

Estimated Resident Population (ERP)

Australian Bureau of Statistics (ABS) data on the Estimated Resident Population (ERP) were used as the denominator for the majority of rates provided. The ERP is an official estimate of the Australian population by age and sex, based on census counts by place of usual residence, and updated to take into account births, deaths and overseas migration.

Publically available data quality statements provide information on the overall quality of a data collection or source (see ABS, 2013, for information on Australian cause of death data; see AIHW, 2012, for information on the National Hospital Morbidity Database; see ABS, 2009, for information on the National Health Survey).

Detailed data for each procedure/activity plus data on prevalence of ischaemic heart disease, mortality rates of coronary heart disease and average length of stay were also collected.

Data refer to the 2010-11 year only as analyses found that the variation in rates was similar in both 2008-09 and 2010-11. This reporting period predates the establishment of Medicare Locals, but provides a baseline for monitoring future changes. The Australian population on 30 June 2001 has been used for age and sex standardisation.

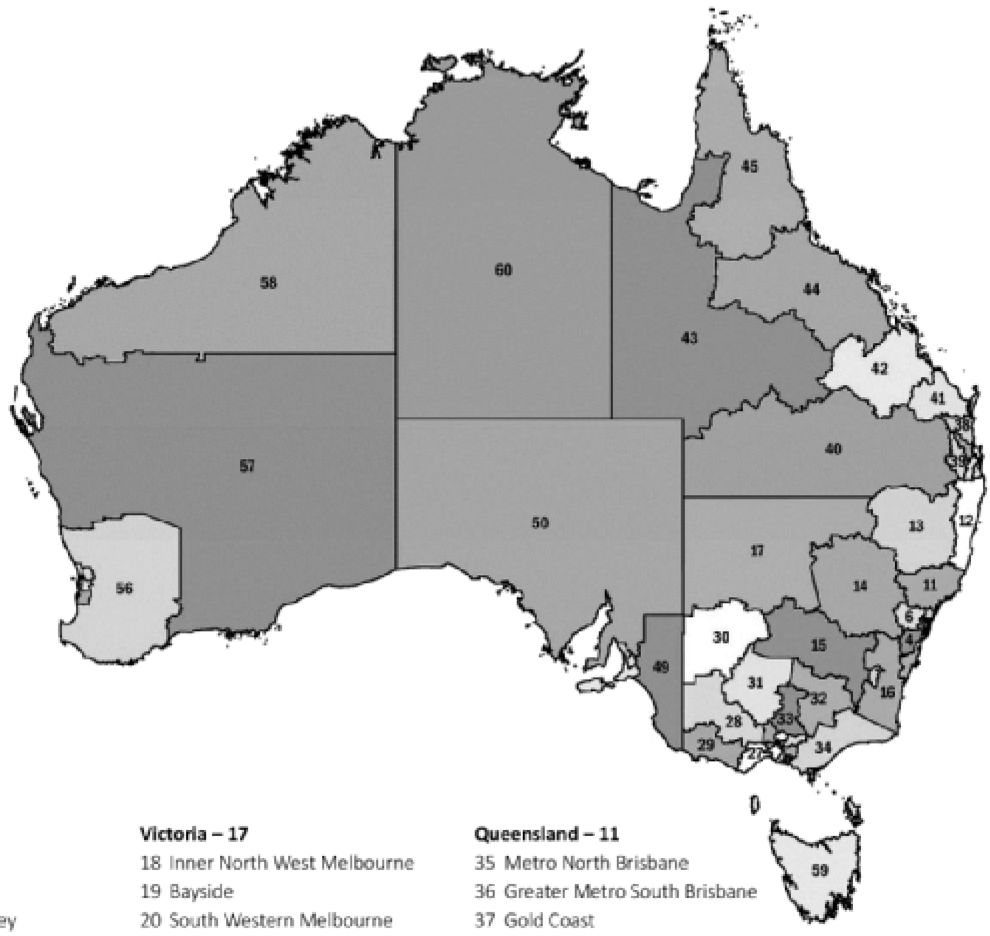
Data are reported according to the patient's place of residence. The geographical unit used for analysis in this chapter was the Medicare Local. The 61 Medicare Locals vary considerably in population size (40 000 to 800 000), demographics, health and socioeconomic status, geographic area, remoteness and proximity to tertiary hospitals. In addition, variance between Medicare Local catchment areas in terms of the affordability, availability and accessibility of general practitioner and acute care have been documented (NHPA, 2013).

Medicare Locals were established in 2012 (see Figure 2.1). This geographical unit does not feature in the data sources used in this chapter, which commonly include the Statistical Local Area (SLA) or postcode. Concordance files were required to assign the SLA or postcode on data to a Medicare Local, and to create Estimated Resident Populations by Medicare Locals for use as a denominator for rates. At the time of analysis, concordance files to Medicare Locals were available only for the year 2010. For analysis of NHMD and NMD data, with geographical information on the Statistical Local Area, the concordance file provided details of the corresponding Medicare Local for each SLA, and the SLA's surface area (in square kilometres) contained in that Medicare Local (see Annex 2.A1 for details). Data covered both public and private hospitals. The PHNs to be established from 1 July 2015 to replace the 61 Medicare Locals will be far fewer in number and better aligned with Local Hospital Network boundaries.

Data were mapped from the ICD-9-CM codes to the: International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification [ICD-10-AM and the Australian Classification of Health Interventions (ACHI) 7th editions].

Data were standardised using the Australian population on 30 June 2001 and followed the OECD project guidelines. Some data have been suppressed to protect confidentiality where the presentation could identify a patient, or where rates are likely to be highly volatile, for example, when the denominator is very small. Summary statistics are presented in the tables and are based on the OECD project guidelines. Box 2.2 provides a summary of the key data and methodological limitations.

Figure 2.1. Map of Australian Medicare Locals



New South Wales – 17
1 Eastern Sydney
2 Inner West Sydney
3 South Eastern Sydney
4 South Western Sydney
5 Western Sydney
6 Nepean – Blue Mountains
7 Northern Sydney
8 Sydney North Shore and beaches
9 Central Coast NSW
10 Illawarra – Shoalhaven
11 Hunter
12 North Coast NSW
13 New England
14 Western NSW
15 Murrumbidgee
16 Southern NSW
17 Far West NSW

Northern Territory – 1
60 Northern Territory

Australian Capital Territory - 1
61 Australian Capital Territory

Victoria – 17
18 Inner North West Melbourne
19 Bayside
20 South Western Melbourne
21 Macedon Ranges and North Western Melbourne
22 Northern Melbourne
23 Inner East Melbourne
24 Eastern Melbourne
25 South Eastern Melbourne
26 Frankston – Mornington Peninsula
27 Barwon
28 Grampians
29 Great South Coast
30 Lower Murray
31 Loddon – Mallee – Murray
32 Hume
33 Goulburn Valley
34 Gippsland

South Australia – 5
46 Northern Adelaide
47 Central Adelaide and Hills
48 Southern Adelaide – Fleurieu – Kangaroo Island
49 Country South
50 Country North

Queensland – 11
35 Metro North Brisbane
36 Greater Metro South Brisbane
37 Gold Coast
38 Sunshine Coast
39 West Moreton – Oxley
40 Darling Downs – South West QLD
41 Wide Bay
42 Central Queensland
43 Central and North West QLD
44 Townsville – Mackay
45 Far North QLD

Western Australia – 8
51 Perth Central East Metro
52 Perth North metro
53 Fremantle
54 Bentley – Armadale
55 Perth South Coastal
56 South West WA
57 Goldfields – Midwest
58 Kimberley – Pilbara

Tasmania – 1
59 Tasmania

Source: Australian Government, Department of Health and Ageing, 2013.

Box 2.2. Summary of limitations

The data presented in this chapter were collected prior to the establishment of Medicare Locals in Australia; however, they provide a useful baseline for the future monitoring of health care variation.

This analysis describes the variation in procedures and activities across Medicare Locals. It does not draw any conclusions about unwarranted variation among Medicare Locals, or the relative performance of one Medicare Local compared to another.

Hospital data presented in this chapter do not include episodes of non-admitted care provided in outpatient clinics. For some procedures, analysis of variation across Medicare Locals should take into account possible differences in admission practice and policies among providers. For example, procedures such as knee arthroscopy or cardiac catheterisation may be provided as either non-admitted or admitted care.

Because of the nature of the mapping used, the Medicare Local data for some individual records may not be accurate; however, the overall distribution of the data by Medicare Local is considered useful for the purposes of these analyses.

Unless otherwise specified, standardised rates in this chapter can be meaningfully compared across time and Medicare Locals. However, comparison with standardised rates calculated using a different standard population (for example, data submitted by other countries) is not valid.

The unweighted average of the age- and sex-standardised rates will be influenced by extreme values in Medicare Locals and should be interpreted with caution.

There is limited ability to explore the contribution of workforce supply to variation because of the available survey data on medical practitioners. Data currently reflect the practitioners' main place of work in the week before they completed the survey (or if this is not available, the main place of practice, or place of residence). Therefore, results do not accurately capture the total workforce activity in a Medicare Local because a number of practitioners, specialists in particular, may work across more than one Medicare Local. In addition, even if more suitable information on workforce supply were available, it would be difficult to interpret the contribution of workforce supply to variation because of the diverse patterns of referrals that can exist between providers. Further, Medicare Local boundaries differ from the boundaries of Local Hospital Networks (the networks that are responsible for the delivery of specialised hospital services are not aligned with either Statistical Local Areas (SLAs), postcodes or other data capture boundaries. As noted earlier in this chapter, Australia has data which provides the numbers of medical practitioners practising in each of the five areas of the Australian Standard Geographical Classification – Remoteness Area (ASGC-RA). To improve the integrity of health workforce data, there is a national approach underway, including a process of continual quality improvement, in workforce data. This has resulted in increasing survey response rates and higher quality capture of the medical workforce data.

The establishment of PHNs will assist in future data analysis due to the closer alignment with LHN boundaries.

2.4. Description of results

Overview of results

This section describes variation in the specified procedure or activity rates between Medicare Local populations. A table of summary statistics is provided for each procedure and activity (Table 2.1).[1]

Data for hospital medical admissions and hip fractures have been calculated with admissions that involved admitted patients transferred from another hospital excluded. This is because patients can be transferred between hospitals to receive appropriate care, and the likelihood of this occurring will vary by geography. This method assumes that the medical admission or hip fracture was recorded in the first admission, and better estimates the overall number of hospitalisations for hip fracture by Medicare Local. For example, if the local hospital does not have specialist orthopaedic services, and a patient with a hip fracture is initially admitted locally, transferred (and re-admitted) to another hospital for operation and then transferred back to the local hospital for post-operative rehabilitation (with a further admission recorded), only the first admission is included in the analyses.

In 2010-11, the amount of variation, expressed by the ratio of the highest to lowest Medicare Local admission rate, was smallest for caesarean sections (a 1.6-fold variation) and largest for cardiac catheterisation (a 7.4-fold variation) (Tables 2.4 and 2.8). When the same calculation was performed on the 10th and 90th percentile values, thus removing the influence of extremely high and low values, variation was reduced. Variation was still smallest for caesarean sections (a 1.3-fold variation) and largest for cardiac catheterisation and knee arthroscopy (both with a two-fold variation) (Table 2.1). Similarly, Figure 2.2 provides a useful graphical presentation of the Medicare Local rates relative to the national average for each of the 11 procedures and activities analysed.

Table 2.1. Summary measures of variation among Medicare Locals, Australia, 2010-11

Procedure or activity	Crude rate (number per 100 000)[1, 2]	Average age and sex standardised rate (number per 100 000)[1, 3]	10th percentile (number per 100 000)[1]	90th percentile (number per 100 000)[1]	Coefficient of variation[4]	Systematic component of variation[5]
Hospital medical admissions[6]	10 986	11 464	9 161	13 945	0.2	6.2
Coronary artery bypass graft	73	70	48	89	0.22	3.7
PTCA and stenting	226	212	162	260	0.22	4.6
Cardiac catheterisation	628	620	400	780	0.33	12.6
Hip fracture[6]	107	105	83	119	0.23	7.5
Knee replacement	238	227	166	280	0.19	3.6
Knee arthroscopy	393	404	262	528	0.3	9.9
Caesarean section	323	314	275	356	0.11	1
Hysterectomy	310	330	250	410	0.21	4.1

1. Data for hysterectomy are per 100 000 female population and data for caesarean sections are per 1 000 live births. The count of live births is based on the total number of hospital (public and private) birth episodes of mothers living in each Medicare Local that included at least one live birth.

2. Crude rate of all Medicare Locals combined.

3. Average age- and sex-standardised rate. The sum of each Medicare Local age- and sex-standardised rate divided by the total number of Medicare Locals. Caesarean section and hysterectomy data are age-standardised only.

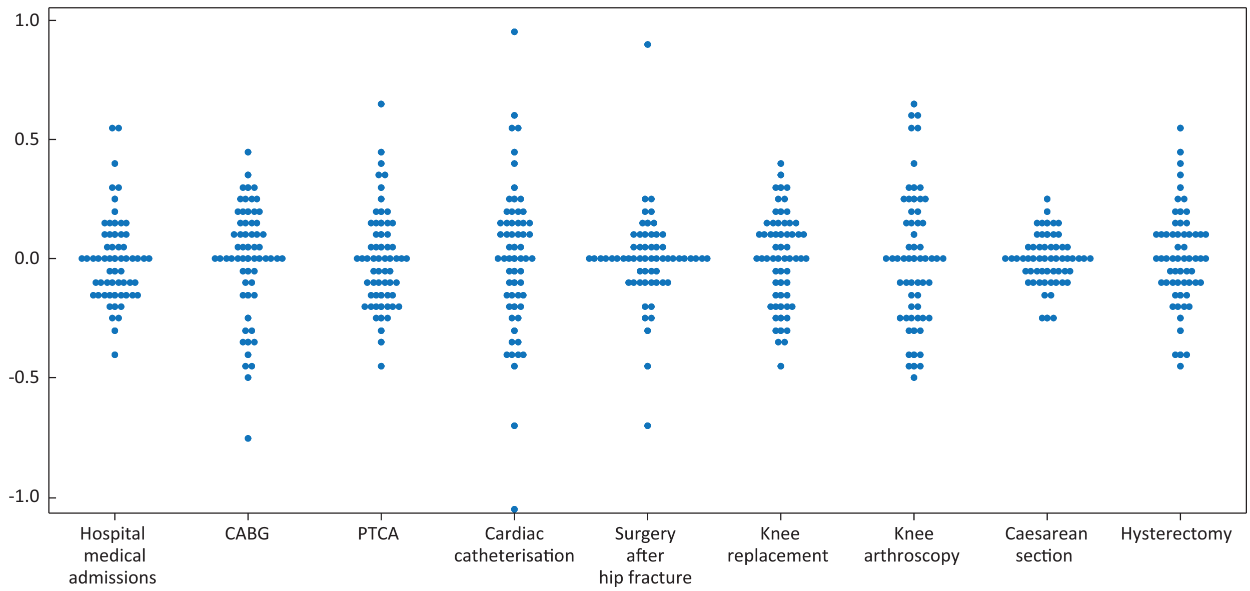
4. The coefficient of variation provides a measure of the spread of Medicare Local age- and sex-standardised rates relative to the average.

5. The systematic component of variation (SCV) uses the difference between the observed and the expected number of admissions in the Medicare Locals to create a measure of inter-Medicare Local variation. The expected number for a Medicare Local is created by taking the age structure of that region into account. A higher component reflects greater variation in the data between Medicare Locals due to factors other than different age and sex structures.

6. Excludes admissions involving an admitted patient transferred from another hospital.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.2. Age- and sex-standardised rates relative to the national average (log transformed) by Medicare Local and procedure or activity, Australia, 2010-11



1. This figure plots the value of the difference between the log of the Medicare Local age- and sex-standardised rates and the mean of these log values for each procedure or activity. Each point on the graph represents one Medicare Local. The shape of the single turnip graph for each procedure or activity here will vary from that produced for each procedure and activity previously in the chapter. See "Limitations of data and method" for further information on interpreting this graph.

2. A log transformation has been used, as the range of rates being compared for procedures and activities is too large to present in a single figure. The resulting display should be interpreted with caution, as the log transformation means that the range and shape of the data for each procedure or activity, relative to the average, differs from that which would be produced by untransformed data. For example, on the graph, a Medicare Local with an above-average rate will be represented closer to the average (0.0) than a Medicare Local with a rate that is equally lower than the average.

3. For caesarean section, data for three Medicare Locals (Far West New South Wales; Lower Murray; Central and North West Queensland) have been suppressed.

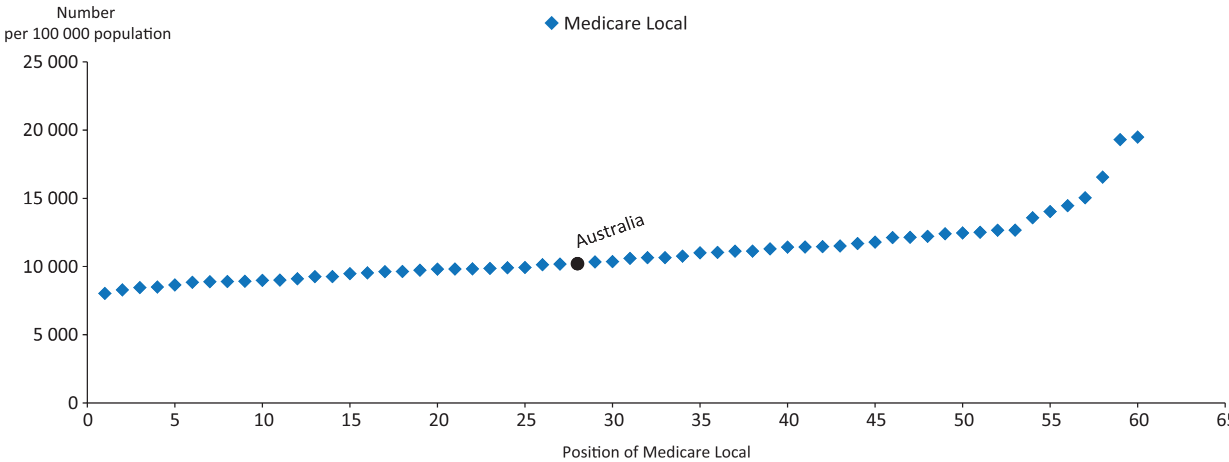
Source: Authors' estimates based on National Hospital Morbidity Database.

Hospital medical admissions

Hospital medical admissions have been calculated with admissions that involved admitted patients transferred from another hospital excluded. This method assumes that the medical admission was recorded in the first admission, and eliminates patients transferred between hospitals being counted twice. Excluding transfers reduces the total number of hospital medical admissions by 10%.

In 2010-11, the national standardised rate for hospital medical admissions was 10 720 per 100 000 population (Figure 2.3). Rates across Medicare Locals ranged from 7 676 admissions per 100 000 population (Northern Sydney) to 19 722 admissions per 100 000 (Central and North West Queensland).

Figure 2.3. Hospital medical admissions per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

Almost 80% of hospital medical admissions occurred in public hospitals (Table 2.2). Generally lower rates of hospital medical admissions were observed in metropolitan Medicare Locals (Figure 2.4).

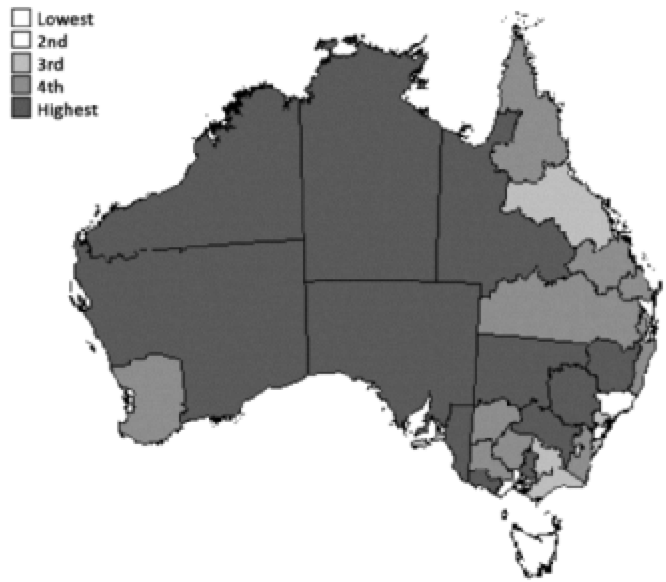
Table 2.2. Summary measures for hospital medical admissions by sector, Australia, 2010-11

Hospital medical admissions	Total admissions	Average standardised rate[1]	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum	Maximum	Ratio Maximum/Minimum	Systematic component of variation
Public hospitals	1 558 199	9 390	6 476	12 520	1.9	4 839	18 774	3.9	13.8
Private hospitals	429 805	2 075	892	3 553	4	624	4 272	6.9	18.9
Total	**1 988 004**	**11 464**	**9 161**	**13 945**	**1.5**	**7 676**	**19 722**	**2.6**	**6.2**

1. Total does not equal sum of components due to rounding. The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.4. Map of hospital medical admissions per 100 000 population by Medicare Local, Australia, 2010-11



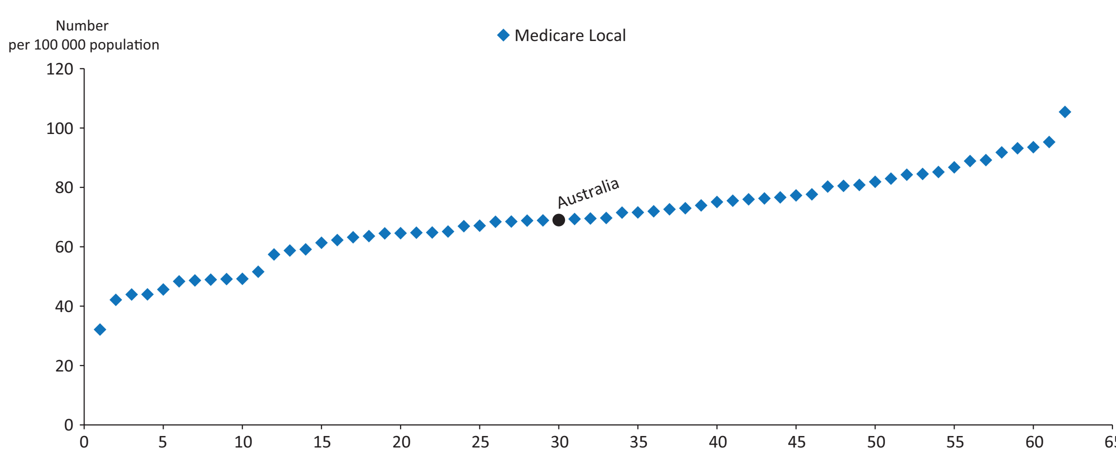
Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (7 676-9 617); 2nd (9 618–10 459); 3rd (10 460–11 589); 4th (11 590–12 722); Highest (12 723–19 722).

Source: Authors' estimates based on National Hospital Morbidity Database.

Revascularisation: hospital admissions involving coronary artery bypass graft

The national standardised rate for admissions involving coronary artery bypass graft (CABG) was 70 per 100 000 population (see Figure 2.5). The highest admission rate for a Medicare Local (105 per 100 000 in Grampians) was 3.3 times as high as the lowest rate (32 per 100 000 in Fremantle).

Figure 2.5. Admissions for coronary artery bypass graft per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

Around 60% of admissions involving coronary artery bypass graft occurred in the public sector (Table 2.3). Compared with most other Medicare Locals, rates of admission for coronary artery bypass graft were lower for Medicare Locals in Western Australia (including the greater Perth metropolitan area) and the Australian Capital Territory (Figure 2.6).

Table 2.3. Summary measures for admissions involving coronary artery bypass graft by hospital sector, Australia, 2010-11

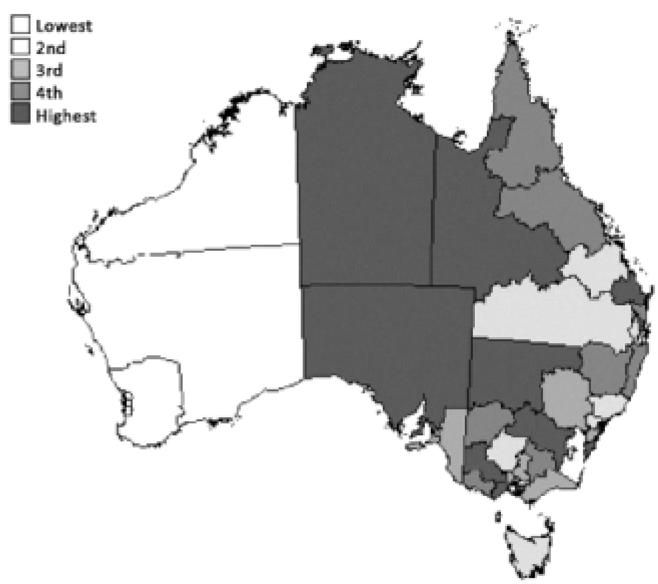
Coronary artery bypass graft	Total admissions	Average standardised rate	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum[1]	Maximum[1]	Ratio Maximum/Minimum	Systematic component of variation
Public hospitals	7 125	43	25	62	2.5	12	85	7.1	10.9
Private hospitals	5 023	27	9	39	4.3	3	51	17	12.6
Total	**12 148**	**70**	**48**	**89**	**1.9**	**32**	**105**	**3.3**	**3.7**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

1. Analysis excludes five Medicare Locals (private hospitals) and one Medicare Local (public hospitals) because of volatility due to small numbers.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.6. Map of admissions for coronary artery bypass graft per 100 000 population by Medicare Local, Australia, 2010-11



Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (32–58); 2nd (59–67); 3rd (68–73); 4th (74–82); Highest (83–105).

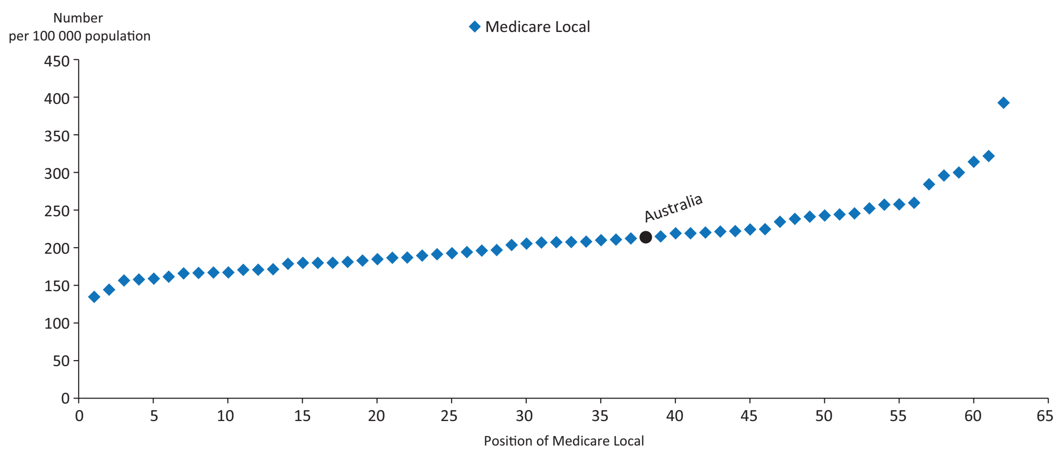
Source: Authors' estimates based on National Hospital Morbidity Database.

A complex mix of factors can influence geographical variation in overall revascularisation procedure rates, as well as the mode of intervention (for example, CABG compared with PTCA or stenting). These factors include the overall burden of cardiovascular disease, the anatomical extent of disease in individuals, co-morbidities, remoteness (e.g. difficulty of access for reassessment), supply and clinical preference. In addition, these factors may often be present in various combinations. Further analysis is required to explain and contextualise these findings. Further analysis examining other measures of need (such as rates of acute myocardial infarction) and determining total revascularisation rates is being undertaken. Information about outcomes from surgery is not routinely available.

Coronary percutaneous angioplasty and stenting (PTCA)

In 2010-11, the national standardised rate for admissions involving coronary percutaneous angioplasty (PTCA) and stenting was 214 per 100 000 population (Figure 2.7). Rates across Medicare Locals ranged from 135 admissions per 100 000 population (Northern Territory) to 393 admissions per 100 000 (Loddon-Mallee–Murray).

Figure 2.7. Admissions for PTCA and stenting per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

Just over half (55%) of the admissions occurred in the public sector (Table 2.4). In contrast to the pattern for coronary artery bypass graft, Medicare Locals in the greater Perth area, and the Australian Capital Territory, were within the two-fifths of Medicare Locals with the highest rates for PTCA and stenting (Figure 2.8).

As noted above, a complex mix of factors can influence variation in revascularisation rates. Further analysis is being undertaken to explain and contextualise these findings.

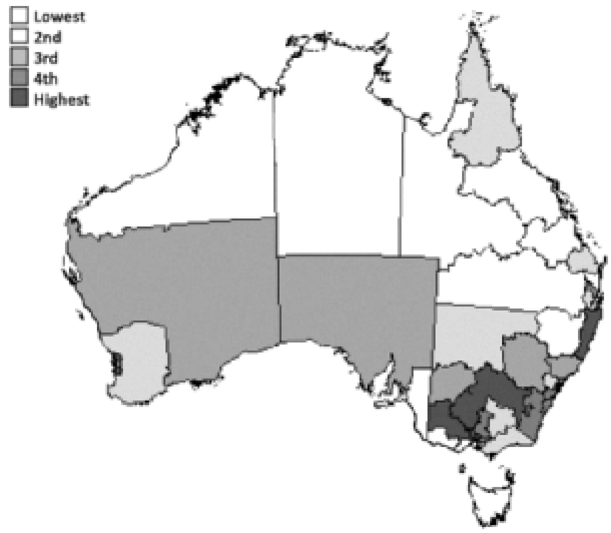
Table 2.4. Summary measures for admissions involving PTCA and stenting by sector, Australia, 2010-11

Coronary angioplasty and stenting	Total admissions	Average standardised rate	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum	Maximum	Ratio Maximum/Minimum	Systematic component of variation
Public hospitals	20 853	121	86	157	1.8	71	190	2.7	5.1
Private hospitals	16 581	91	41	134	3.3	26	219	8.4	18.8
Total	**37 434**	**212**	**162**	**260**	1.6	**135**	**393**	2.9	**4.6**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.8. Map of admissions for PTCA and stenting per 100 000 population by Medicare Local, Australia, 2010-11



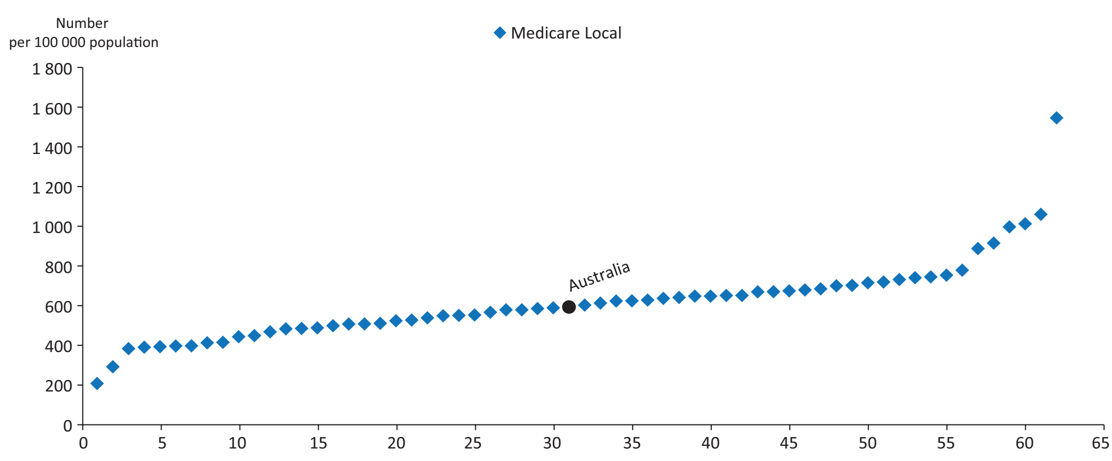
Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (135-171); 2nd (172–193); 3rd (194–213); 4th (214–243); Highest (244–393).

Source: Authors' estimates based on National Hospital Morbidity Database.

Cardiac catheterisation

The national standardised rate for admissions involving cardiac catheterisation was 596 per 100 000 population (Figure 2.9). There was over a seven-fold difference between the highest rate (1 551 admissions per 100 000 in Murrumbidgee) and the lowest rate (210 admissions per 100 000 population in Inner West Sydney) (Table 2.5). The difference between the 90th percentile value (780 admissions per 100 000) and the 10th percentile value (400 admissions per 100 000) was just under two-fold.

Figure 2.9. Admissions for cardiac catheterisation per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

Just over half (55%) of all admissions for cardiac catheterisation occurred in private hospitals (Table 2.5). There was no clear relationship between rates of admission for cardiac catheterisation and the remoteness of the patient's area of usual residence (Figure 2.10).

Cardiac catheterisation may be performed in an outpatient (non-admitted) setting. As the data presented here do not include episodes of non-admitted care, the national rate is likely to be an underestimate, and analysis of variation across Medicare Locals should take into account possible differences in admission practice and policies among providers.

Table 2.5. Summary measures for admissions involving cardiac catheterisation by hospital sector, Australia, 2010-11

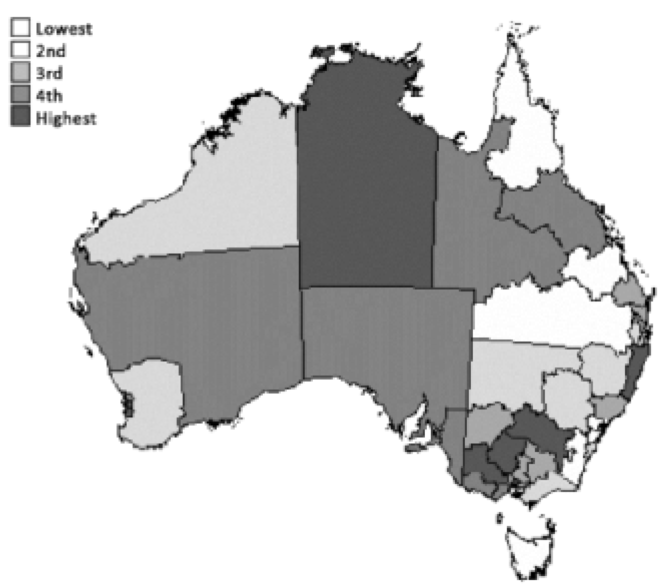
Cardiac catheterisation	Total admissions	Average standardised rate[1]	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum	Maximum	Ratio Maximum/ Minimum	Systematic component of variation
Public hospitals	47 376	294	145	427	2.9	55	527	9.6	17.4
Private hospitals	56 805	325	143	529	3.7	95	1 024	10.8	23.9
Total	**104 181**	**620**	**400**	**780**	**2**	**210**	**1 551**	**7.4**	**12.6**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

1. Total does not equal sum of components due to rounding.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.10. Map of admissions for cardiac catheterisation per 100 000 population by Medicare Local, Australia, 2010-11



Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (210-471); 2nd (472–556); 3rd (557–645); 4th (646–719); Highest (720–1 551).

Source: Authors' estimates based on National Hospital Morbidity Database.

Joint procedures

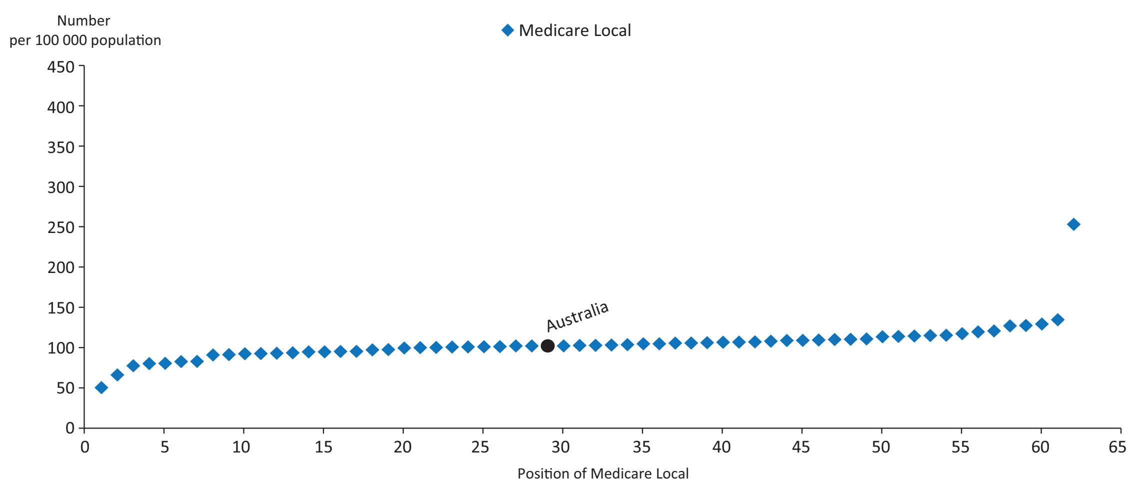
Hip fractures

The calculations below exclude admissions that involved admitted patients transferred from another hospital. This method assumes that the hip fracture was recorded in the first admission, and better estimates the overall number of hospitalisations for hip fracture by Medicare Local.

In 2010-11, the national standardised rate for admissions involving hip fracture was 102 per 100 000 population (Figure 2.11).

The difference between the value of the 90th percentile and the 10th percentile was 1.4-fold (Table 2.6). There was no clear relationship between admission rates and remoteness (Figure 2.12). Kimberley-Pilbara was an outlier with a rate of 253 admissions per 100 000. Analyses of additional years of data are required to see if this result is consistent over time. Analysis of variation across Medicare Locals by hospital sector has not been included due to the small number of admissions that occurred in the private sector (12% of total admissions).

Figure 2.11. Admissions for hip fracture per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

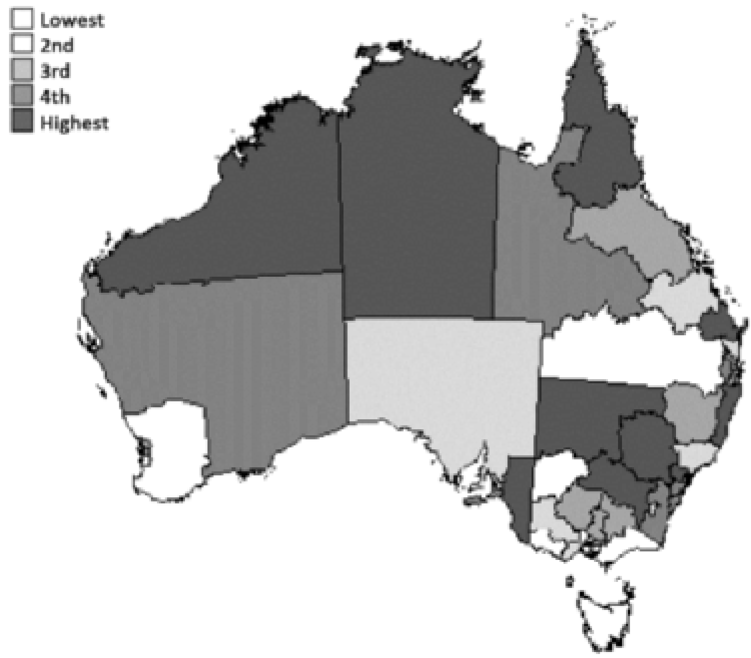
Table 2.6. Summary measures for admissions involving hip fractures, Australia, 2010-11

Hip fracture	Total admissions	Average standardised rate	10th percentile	90th percentile	Minimum	Maximum	Systematic component of variation
Total	**19 343**	**105**	**83**	**119**	**50**	**253**	**7.5**

1. The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.12. Map of admissions for hip fracture per 100 000 population by Medicare Local, Australia, 2010-11



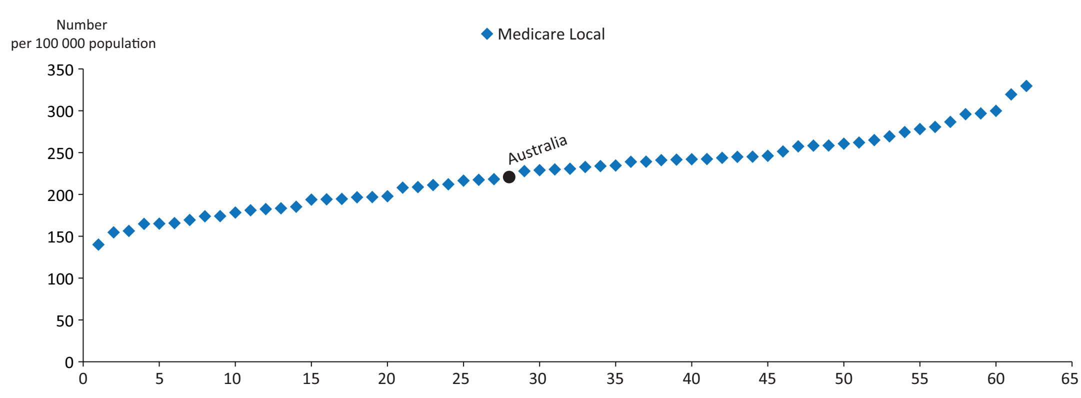
Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (50.0-93.9); 2nd (94.0–101.0); 3rd (101.1–105.9); 4th (106.0–113.5); Highest (113.6–253.0).

Source: Authors' estimates based on National Hospital Morbidity Database.

Knee replacement

In Australia, the standardised rate for admissions involving knee replacements was 221 per 100 000 population. Rates across Medicare Locals ranged from 140 admissions per 100 000 population (Inner North West Melbourne) to 330 admissions per 100 000 (Country North SA) (Figure 2.13).

Figure 2.13. Admissions for knee replacement per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

A large proportion (two-thirds) of total admissions involving knee replacements occurred in private hospitals (Table 2.7). The Medicare Locals with the lowest overall rates (lowest fifth) were predominantly in metropolitan areas (Figure 2.14).

While there is universal access to public hospital care, people who receive elective surgical care in the public system are placed on waiting lists with urgency categories assigned according to their level of assessed need. While there are three broad nationally defined urgency categories, there is apparent variation in how urgency categories are assigned and how waiting times are calculated between jurisdictions (AIHW, 2012b).

It is very difficult to identify the appropriate rate of surgery in the absence of the routine measurement of outcomes from knee surgery compared with other alternatives, such as lifestyle or medical interventions. Waiting times in the public sector will influence private sector rates. While the geographic distance to access health care may explain the lower incidence of knee replacement surgery in some remote and regional centres, this is not universal, as there are high rates of knee replacement in some rural areas (e.g. rural South Australia).

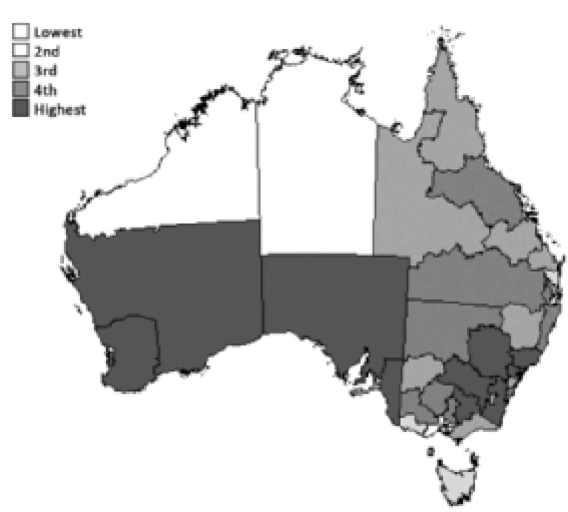
Table 2.7. Summary measures for admissions involving knee replacement by hospital sector, Australia, 2010-11

Knee replacement	Total admissions	Average standardised rate	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum	Maximum	Ratio Maximum/ Minimum	Systematic component of variation
Public hospitals	14 251	79	39	117	3	25	177	7.1	18.4
Private hospitals	28 802	148	98	184	1.9	82	229	2.8	4.3
Total	**43 053**	**227**	**166**	**280**	1.7	**140**	**330**	2.4	**3.6**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.14. Map of admissions for knee replacement per 100 000 population by Medicare Local, Australia, 2010-11



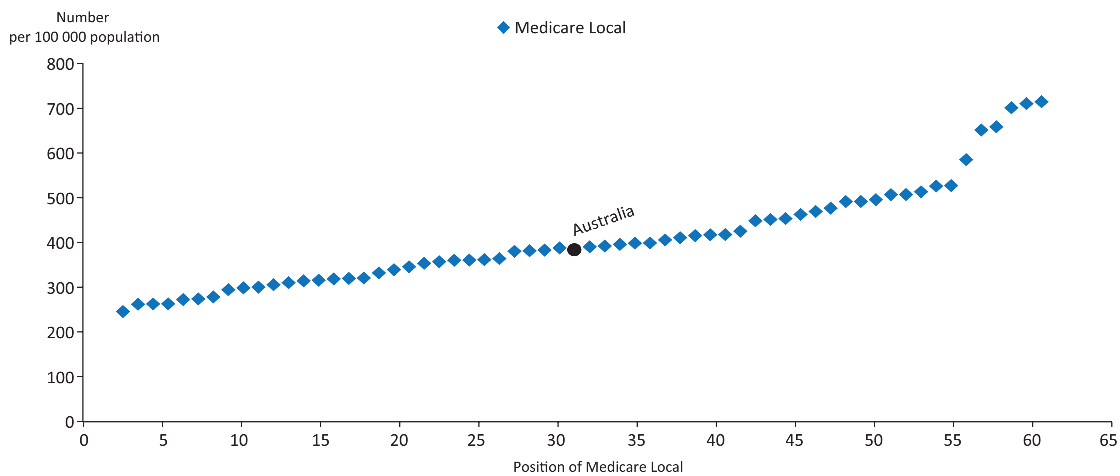
Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (140-182); 2nd (183–217); 3rd (218–241); 4th (242–261); Highest (262–330).

Source: Authors' estimates based on National Hospital Morbidity Database.

Knee arthroscopy

In 2010-11, the national standardised rate for admissions involving knee arthroscopy was 382 per 100 000 population (Figure 2.15). Rates across Medicare Locals ranged from 232 admissions per 100 000 population (Inner West Sydney) to 726 admissions per 100 000 (Country North SA).

Figure 2.15. Admissions for knee arthroscopy per 100 000 population by Medicare Local, Australia, 2010-11



1. Rates are age- and sex-standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

In a pattern similar to knee replacements, four out of five admissions for knee arthroscopy occurred in private hospitals (Table 2.8). There was no clear relationship between rates of knee arthroscopy and remoteness (Figure 2.16).

These results, and those for knee replacement, provide an opportunity to explore at a local level the extent to which variation in rates reflects population factors such as ethnicity, obesity and co-morbidities, local clinician practice patterns or broader system issues such as the availability and distribution of providers and waiting lists in the public sector.

Table 2.8. Summary measures for admissions involving knee arthroscopy by hospital sector, Australia, 2010-11

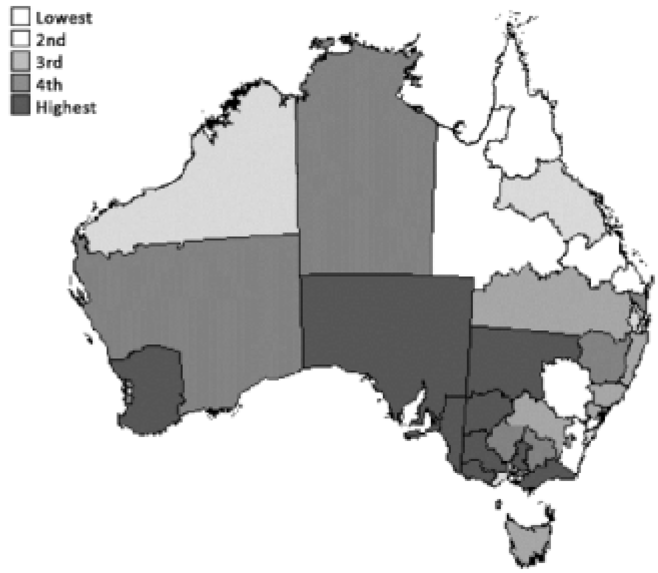
Knee arthroscopy	Total admissions	Average standardised rate[1]	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum	Maximum	Ratio Maximum/ Minimum	Systematic component of variation
Public hospitals	13 773	94	33	213	6.5	26	277	10.7	89.5
Private hospitals	57 314	311	211	439	2.1	183	568	3.1	7.1
Total	**71 087**	**404**	**262**	**528**	**2**	**232**	**726**	**3.1**	**9.9**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

1. Total does not equal sum of components due to rounding.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.16. Map of admissions for knee arthroscopy per 100 000 population by Medicare Local, Australia, 2010-11



Note: The five groups are based on age- and sex-standardised rates. The range within each group is as follows: Lowest (232-300); 2nd (301–354); 3rd (355–406); 4th (407–491); Highest (492–726).

Source: Authors' estimates based on National Hospital Morbidity Database.

Gynaecological procedures

Caesarean section

In 2010-11, the national standardised rate for caesarean section was 313 per 1 000 live births (Figure 2.17). The count of live births used for the denominator is based on the total number of hospital (public and private) birth episodes that included at least one live birth for mothers living in a Medicare Local. Rates across Medicare Locals ranged from 243 caesarean sections per 1 000 live births (Goldfields-Midwest) to 392 caesarean sections per 1 000 (Fremantle), a 1.6-fold national variation (Table 2.9).

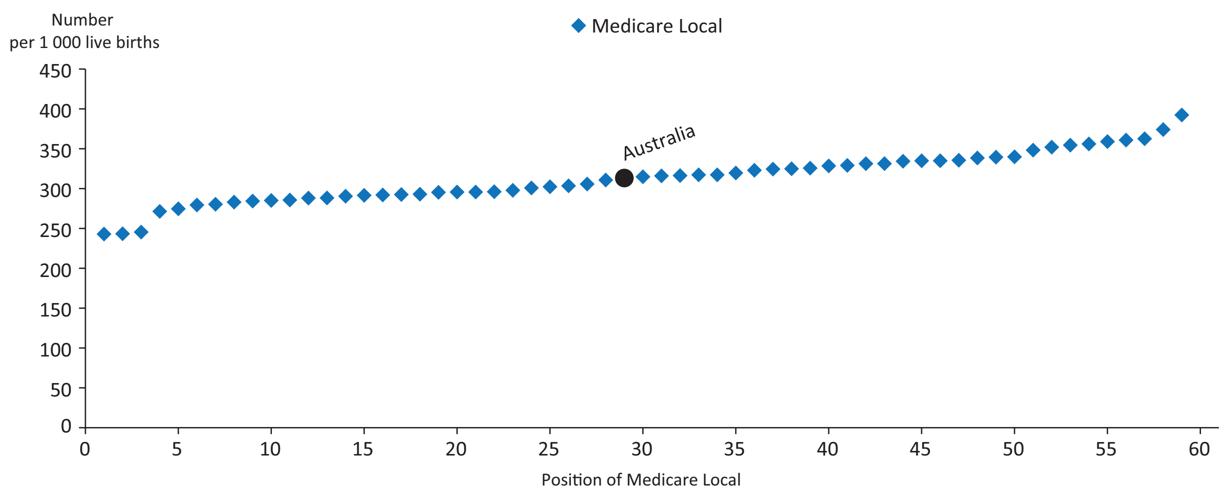
Approximately two-thirds of all caesarean sections occurred in public hospitals (Table 2.9). No clear relationship between rates of caesarean section and geographic location was observed in this analysis (Figure 2.18).

In this chapter, the rates of caesarean section by hospital sector may differ from rates published elsewhere because of the denominator used. When rates by hospital sector are calculated using the number of live births in each hospital sector (as opposed to the total number of live births used here), results have shown that caesarean section rates are higher in private hospitals than public hospitals. For example, the Australian caesarean section rate in 2010 was 43% for women in private hospitals compared with 28% in public hospitals (AIHW, 2012c).

In addition, examining caesarean section rates by hospital (rather than Medicare Local) may reveal a different pattern of variation, as demonstrated in a 2013 study of New South Wales hospitals (Lee et al., 2013). More investigation using different units of analysis that would enable exploration of provider-related factors is recommended.

The main factors known to be associated with variations in rates of caesarean section include the public/private care mix, models of maternity care, socio-economic status (independent of public/private), age,[2] obesity, access to specialist care, and variation in thresholds for performing operative delivery (e.g. breech delivery, rotational instrumental delivery, previous caesarean delivery) by individual practitioners.

Figure 2.17. Admissions for caesarean sections per 1 000 live births by Medicare Local, Australia, 2010-11



1. Rates are age standardised to the 30 June 2001 Australian population.

2. Data for three Medicare Locals (Far West New South Wales; Lower Murray; Central and North West Queensland) have been suppressed because of volatility due to small denominator.

Source: Authors' estimates based on National Hospital Morbidity Database.

Table 2.9. Summary measures for caesarean section by hospital sector, Australia, 2010-11

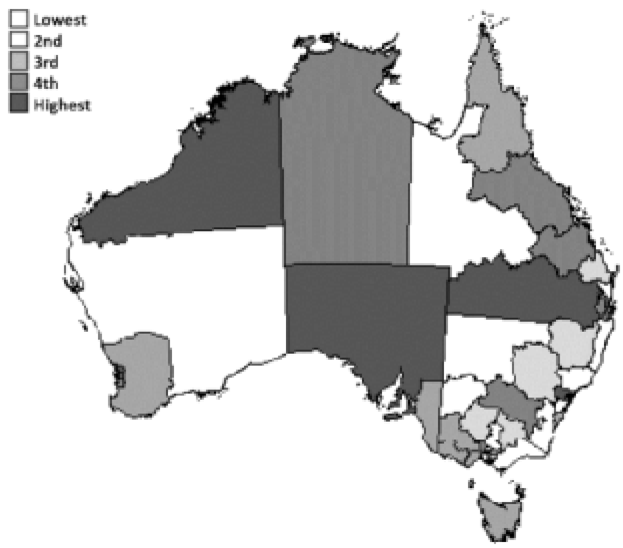
Caesarean section	Total admissions	Average standardised rate	10th percentile	90th percentile	Ratio 90th to 10th percentile	Minimum[1]	Maximum[1]	Ratio Maximum/ Minimum	Systematic component of variation
Public hospitals	59 067	217	159	275	1.7	126	300	2.4	4.9
Private hospitals	34 324	97	29	164	5.6	6	219	36.5	20.7
Total	**93 391**	**314**	**275**	**356**	**1.4**	**243**	**392**	**1.6**	**1**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

1. Analysis excludes threee Medicare Locals because of volatility due to small denominator.

Source: Authors' estimates based on National Hospital Morbidity Database.

Figure 2.18. Map of admissions for caesarean sections per 1 000 live births by Medicare Local, Australia, 2010-11



Note: The five groups are based on age-standardised rates. The range within each group is as follows: Lowest (243–286); 2nd (287–298); 3rd (299–323); 4th (324–336); Highest (337–392).

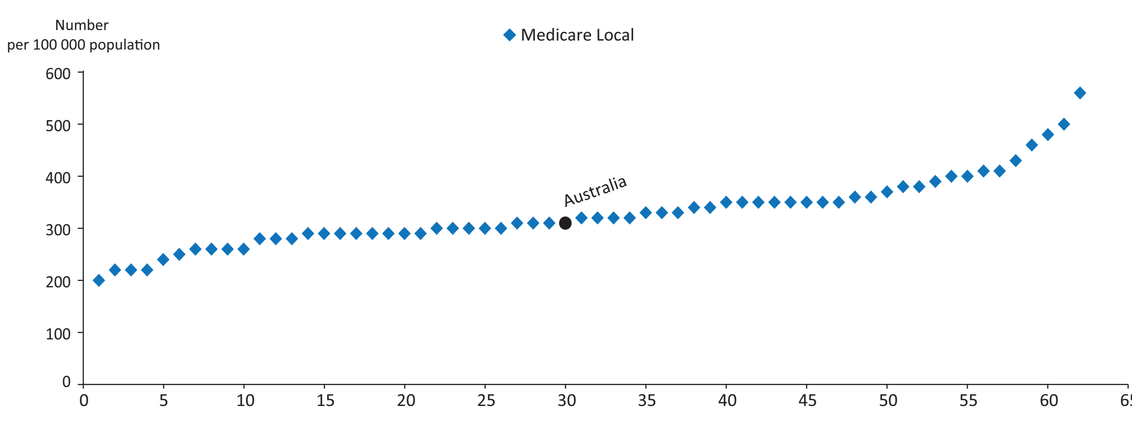
Three Medicare Locals (Far West New South Wales; Lower Murray; Central and North West Queensland) are not shaded. Data for these three Medicare Locals were not published because of volatility due to small denominator.

Source: Authors' estimates based on National Hospital Morbidity Database.

Hysterectomy

Rates across Medicare Locals ranged from 200 admissions for hysterectomy per 100 000 population (Inner West Sydney) to 560 admissions per 100 000 (Grampians) (Figure 2.19). Just over half the admissions for hysterectomy occurred in the private sector (Table 2.10).

Figure 2.19. Admissions for hysterectomy per 100 000 females by Medicare Local, Australia, 2010-11



1. Rates are age standardised to the 30 June 2001 Australian population.

Source: Authors' estimates based on National Hospital Morbidity Database.

The group of Medicare Locals with the lowest overall rates (lowest fifth) are all situated within the greater metropolitan Sydney and Melbourne areas (Figure 2.20). Most Medicare Locals with the highest overall rates (highest fifth) are in non-metropolitan areas of Australia.

Table 2.10. Summary measures for admissions involving hysterectomy by hospital sector, Australia, 2010-11

Hysterectomy	Total admissions	Average standardised rate[1]	10th percentile	90th percentile	Minimum	Maximum	Systematic component of variation
Public hospitals	13 280	165	77	245	52	357	22.3
Private hospitals	15 492	163	92	223	79	317	8.3
Total	**28 772**	**330**	**250**	**410**	**200**	**560**	**4.1**

Note: The average standardised rate is the sum of each Medicare Local age- and sex-standardised rates divided by the total number of Medicare Locals, unweighted. Minimum and maximum values refer to the average age- and sex-standardised rates.

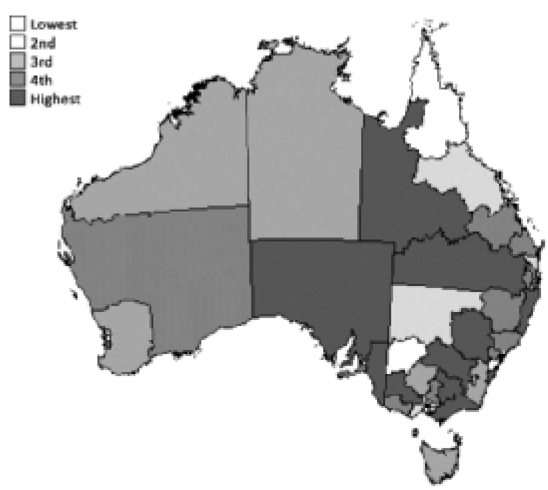
1. Total does not equal sum of components due to rounding.

Source: Authors' estimates based on National Hospital Morbidity Database.

A previous study of utilisation rates in New South Wales, Victoria and the Australian Capital Territory with 1996-97 data excluded hysterectomies performed for cancer, and used the Statistical Local Area of patient residence as the unit of analysis (Reid et al., 1999). This study showed consistently higher rates for rural women compared with urban women and a strong inverse relationship between an area's socio-economic status and the hysterectomy rate.

Australia has higher overall rates of hysterectomy than many other OECD countries, although rates have decreased over the last 20 years, perhaps because of the use of alternative treatments (McPherson et al., 2013). Further analysis of these data excluding hysterectomies performed for cancer will allow the exploration of variations in rates where there are reasonable alternative therapies.

Figure 2.20. Map of admissions for hysterectomy per 100 000 females by Medicare Local, Australia, 2010-11



Note: The five groups are based on sex-standardised rate. The range within each group is as follows: Lowest (200–279); 2nd (280–300); 3rd (301–340); 4th (341–370); Highest (371–558).

Source: Authors' estimates based on National Hospital Morbidity Database.

2.5. Conclusions

While the procedures examined in this chapter reflect activities undertaken by specialists in hospital settings, the chain of events leading to the procedure are initiated by a referral from a general practitioner, and the consultation between the patient and the general practitioner is a key point for discussion of options and alternatives.

The data presented in this chapter show that the variation in medical practices among Australia's 61 different Medical Local areas ranges from 1.6-fold for caesarean sections to 7.4-fold for cardiac catheterisations. Some Medicare Local populations consistently have relatively low admission rates for the majority of procedures (five or more), while some have high admission rates. A recent analysis of the performance of primary care services identifies seven clusters or peer groups of Medicare Locals on the basis of the proximity of each Medicare Local to major metropolitan cities, the proximity to major hospitals and the socioeconomic status of the population (NHPA, 2013). The results presented in this report have been aggregated in this manner in another publication, enabling comparison between and within peers (ACSQHC and Australian Institute of Health and Welfare, 2014).

Initial analysis (not shown) found higher rates of admission for people living in some rural and remote localities, as people were transferred between locations according to the level of service available. As shown in this chapter, when transfers are excluded between hospitals for hip fracture, there is some reduction in variation. However, there was one outlier, and potential reasons for this are being investigated. Caesarean section rates show the least overall variation of the procedures studied. This is one area in which a number of jurisdictions have taken an active role, developing guidelines covering perinatal practice, requiring reporting of hospital caesarean section rates, and investigating performance against the guidelines. However, while the analysis shows little variation in rates across Medicare Locals, the overall rate of caesarean section in Australia is higher than the OECD average, and it has continued to increase over the past 20 years (McPherson et al., 2013).The measures taken to monitor and review caesarean section rates may have discouraged variation in practice and contributed to a reduction in the rate of increase in caesarean sections, but they have not led to a reduction in overall rates. Further analyses will explore differences between emergency and elective caesarean section rates. The analysis by Medicare Local does not allow examination of supply or practitioner-related factors that may be contributing to observed rates of caesarean section. Further examination of these factors depends on the availability of analysis using hospital catchment area populations.

Waiting times for elective surgery in public hospitals for procedures assigned lower urgency tend to be longer. Both knee replacements and coronary artery bypass graft surgery are included in the 15 high-volume indicator procedures where public sector waiting times are monitored. In 2010-11, knee replacement had the highest median waiting time (184 days) of the 15 monitored indicator procedures, while coronary artery bypass graft surgery had the shortest (16 days) (AIHW, 2012a).

The reduction of waiting times for elective surgery in public hospitals has been a longstanding priority of Commonwealth and of state and territory governments. Specific funding for initiatives to reduce waiting lists in the public hospital system has been an intermittent, though consistent, feature of government policies at state and territory level for several years, and specific funding was allocated for this during the period of study.

The high proportion of the Australian population covered by health insurance means that there is substantial use of the private sector for elective surgery, especially since patients are able to choose the timing of admission for most procedures performed in the private sector. In Australia in 2010-11, about two-thirds of elective admissions involving surgery occurred in private hospitals (AIHW, 2012a) This pattern of private activity is reflected in the interventions reported here – for example, 67% of admissions for knee replacement occurred in the private sector, and the percentage is even higher (81%) for knee arthroscopy. In contrast, only 12% of admissions for hip fractures and around 22% of hospital medical admissions were in the private sector. Public/private rates for different procedures vary across Medicare Locals – for example, the variation in public hospital admissions across Medicare Locals for both knee replacement (seven-fold difference in the highest and lowest rates) and knee arthroscopy (nearly 11-fold difference) was much greater than for private sector admissions (three-fold difference for both procedures).

An understanding of the way in which supply factors influence care is complicated by the lack of congruence between Medicare Local boundaries and Local Hospital Network boundaries. Further planned analysis by Local Hospital Network and by place of practice of medical specialists will help explore these factors.

State and territory governments manage the public hospital systems within their jurisdictions. There is no consistent approach between jurisdictions on the use and monitoring of clinical guidelines or pathways, and for most procedures there is no systematic way of monitoring outcomes of care. A number of states have developed clinical care networks that take a collaborative approach to improving care quality and developing evidence-based models of care and care pathways for specific conditions.

In Western Australia, for example, there has been a strong focus on a network approach to developing best practice models of care for use within the public health system. Over 70 models have been developed to date, including for acute coronary syndrome and elective joint replacement. This jurisdiction is also trialling the use of additional payments for providing evidence-based care. From 2012-13, these “Premium payments” have been incorporated into activity-based funding programmes. An Acute Myocardial Infarction Premium Payment was introduced in 2013-14. The premium payments are required to be used by the clinical departments to support patient safety and quality improvement activities.

There are well-developed cardiac clinical networks that promote nationally agreed cardiac care guidelines produced by the National Heart Foundation and the Cardiac Society of Australia and New Zealand. This is also the area with the best data on the appropriateness and effectiveness of care provided across Australia. While there is no routine data collection available in Australia to measure the quality of care or the use of guideline recommendations for cardiac procedures, the National Heart Foundation and the Cardiac Society have collaborated with jurisdictional clinical networks to produce intermittent audits of care in Australian and New Zealand hospitals. One state, Victoria, has established a cardiac outcomes registry, which in December 2012 started monitoring percutaneous coronary interventions in both public health services and a number of the private health services performing this intervention.

A range of patient information brochures on specific procedures is used by health services throughout Australia. In some jurisdictions, standard patient information leaflets and guidelines are produced, while in others this task is undertaken by individual health services or information is produced by various national clinical societies, health insurers or special interest groups. However, there is no system for assessing the information available using the quality standards of the International Patient Decision Aids Standards Collaboration. There has been little focus to date on programmes to improve shared decision making and increase people's understanding of their options, including alternatives to surgery. On occasion this has happened as part of a state-wide programme to implement care pathways or to reduce waiting times. A notable example is a programme initially developed in 2005 to improve waiting list management in hip and knee replacement surgery in the state of Victoria. A multi-attribute quality-of-life questionnaire was developed to help prioritise people with hip or knee joint disease for surgery. The project led to the development of a specialist osteoarthritis hip and knee service. Patients referred for assessment to a hospital clinic by their general practitioner are managed by a multidisciplinary team who provide therapeutic, non-surgical treatment options, as well as assessing the priority for surgery. The health status of patients on the waiting list is regularly monitored using a standard quality-of-life measure, and patients are fast-tracked for surgery if required. However, information on the proportion of patients referred for assessment of knee osteoarthritis that are triaged or on the percentage of those receiving surgery through the specialist service is not monitored at the jurisdictional level.

This initial analysis provides the opportunity for more detailed exploration of these data and for a national approach to identifying areas where the reduction of unwarranted variation is a high priority. There will continue to be differences in approaches to reducing variation across jurisdictions – these data and the ongoing work to explore in detail supply and demand factors will provide baseline information that will allow for monitoring the effects of the approaches taken in different jurisdictions in Australia.

Notes

1. These initial data do not provide any groupings of comparable Medicare Locals. A next step in this analysis could be to group Medicare Locals with similar characteristics.
2. The data presented in this chapter are age-standardised.

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ANNEX 2.A1

Technical appendix

Analysis of data by Medicare Local

For analysis of NHMD and NMD data, with geographical information on the Statistical Local Area, the concordance file provided details of the corresponding Medicare Local for each SLA, and the SLA's surface area (in square kilometres) contained in that Medicare Local. In the majority of cases, the SLA mapped directly to a Medicare Local; however, there were 12 SLAs that crossed over more than one Medicare Local. The AIHW allocated records with these SLAs to a Medical Local based on the proportion of the surface area of the SLA that was contained in each Medicare Local, not the proportion of the SLA population in the Medicare Local. For further information on Medicare Locals, see Australian Government, 2013.

As the boundaries of SLAs can change annually and a Medicare Local concordance file was available only for 2010, additional concordance was required to assign the 2009-10 mortality data (with 2008 and 2009 SLAs) to Medicare Locals. This involved mapping SLAs for previous years to 2010 SLAs before assigning the SLA to a Medicare Local.

Analysis of data by hospital sector

In Australia, hospital services are provided by both public and private hospitals. Analysis in this chapter was undertaken for all hospital admissions and by hospital sector. Public hospital data include care and/or treatment of a patient in a public hospital (including public and private patients), and private data include any care and/or treatment in a private hospital (including public and private patients).

The extent to which the private sector contributes to overall admission rates for populations in different Medicare Locals is likely to be influenced by both patient insurance status and private bed availability.

With the exception of caesarean sections, all rates (for public hospitals, private hospitals and total) by Medicare Local were calculated with the Medicare Local population as the denominator.

For caesarean sections, a count of live births is used as the denominator for all rates (public hospitals, private hospitals and total). This count is based on the total number of hospital (public and private) birth episodes of mothers living in each Medicare Local that included at least one live birth. The number of births is used as the denominator for caesarean sections, as this effectively adjusts for the variation in the number of births per 1 000 population among Medicare Locals. That is, the variation in caesarean section rates shown for Medicare Locals is due to factors other than variation in birth rates.

In tables and graphs, rates for public and private hospitals are calculated using the same denominator (Medicare Local population), because the intent of this analysis is to illustrate the extent to which each sector contributes to the overall variation, rather than to describe the variation within each sector. Therefore, the total age- and sex-standardised rates and total average age- and sex-standardised rates published in tables or graphs represent the sum of the public and private hospital components.[1]

Mapping of ICD-9-CM codes

The OECD specifications provided diagnosis and procedure codes for the selected hospital indicators according to the American ICD-9-CM classification, 6th edition. To allow for extraction of Australian data according to the OECD requirements, ICD-9-CM codes had to be mapped to the:

- International Statistical Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modification (ICD-10-AM) 6th and 7th editions – the classifications used to report Australian hospital diagnosis information analysed in this chapter.
- Australian Classification of Health Interventions (ACHI) 6th and 7th editions – the classifications used to report Australian hospital health interventions and procedure information analysed in this chapter.

As there is no standard mapping file available for this process, ICD-10-AM mapping files located on the National Casemix and Classification Centre (NCCC) website were used to map formerly used Australian ICD-9-CM codes to the ICD-10-AM/ACHI, 1st edition (NCCC, 2012). Additional mapping was undertaken between ICD-10-AM/ACHI 1st edition and subsequent editions in order to identify the relevant codes used for Australian data analysed in this chapter (2010-11).

This mapping may not produce the same result as a process that involved direct mapping from the American ICD-9-CM 6th edition to the ICD-10-AM 7th edition.

Statistical calculations and notes

Crude rates and age and sex directly standardised rates were calculated for all data[2] using the Australian population on 30 June 2001 as the standard population. Unless stated otherwise, hospital data were directly age- and sex-standardised using the age groups stated in the OECD specifications. Mortality data were standardised using five-year age groups up to 85 years and over.

Graphical presentation of data

Turnip graphs

Turnip graphs plot Medicare Locals (represented on the horizontal axis) by their age- and sex-standardised rates (vertical axis). Each point on the graph represents one Medicare Local. Rates were rounded to enable points for MLs with similar but not identical rates to be represented on a horizontal line.

Caterpillar graphs

These graphs show the variation by Medicare Local for each procedure or activity. Medicare Locals are ordered, or "positioned", from lowest to highest age- and sex-standardised rates.

Maps

Age- and sex-standardised rates for each of the 61 Medicare Locals were ranked from lowest to highest and then split into five equal groups, with the Lowest category representing those Medicare Locals with the lowest rates and the Highest category representing those with the highest rates. The display of metropolitan areas has been based on the groupings used by Australia's National Health Performance Authority (NHPA, 2013).

Notes

1. This is not the case for the 10th and 90th percentile values because the Medicare Locals with the lowest or highest rates differ for public hospitals, private hospitals and public and private hospitals combined.
2. Caesarean section and hysterectomy data are age-standardised only.

Chapter 3

Belgium: Geographic variations in health care

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This chapter looks at variations in medical practice across provinces in Belgium, for hospital medical admissions and a number of diagnostic and surgical procedures, drawing on data from 2009. While variations across provinces are relatively small for hospital admissions and some surgical procedures such as caesarean sections, variations are larger in the use of diagnostic procedures such as knee arthroscopy, cardiac catheterisation, MRI exams and CT exams.

In the case of MRI and CT exams, there is strong evidence of a "substitution" effect in the use of these two diagnostic exams. Furthermore, differences in utilisation rates are due at least partly to a greater number of MRI units in the Flemish provinces. A strategy involving co-operation with stakeholders was developed to reduce exposure to ionising radiation from imaging tests by 25%.

Persisting geographic variations in medical practice in Belgium requires a variety of strategies and approaches to engage governments, providers and patients in continuously improving health service delivery.

1. The authors would like to thank Nathalie Terryn (data management FPS Health, Food Chain Safety and Environment) and Johan Peetermans (National Institute for health and disability Insurance) for the data extraction.

3.1. Introduction

Knowledge about medical practice variations in Belgium has been enhanced greatly in recent years through several studies conducted by the Ministry of Health (MOH), the Belgian Health Care Knowledge Center (KCE) and the National Institute for Health and Disability Insurance (INAMI).

Since 2006, the MOH has released an annual *Atlas of Pathologies by District* ("arrondissement"), which shows geographic variations in hospital admissions for a large number of conditions, including both inpatient hospitalisations and same-day admissions (Ministry of Health, 2012). This atlas, however, does not analyse the disparities observed.

The KCE has released a report in 2006 on geographical variations in relation to a number of elective surgery (Jacques et al., 2006), and more recently on certain specific conditions (e.g., on the diagnosis and treatment of thyroid cancer; Francart et al., 2012). The 2006 KCE report is used to provide some trends over time on geographic variations for some of the procedures covered in this chapter (such as caesarean section and hysterectomy, knee arthroscopy and knee replacement). This 2006 KCE study included some in-depth multifactorial analysis of factors that might explain the geographic variations. The main conclusions were that the large geographic variations for several interventions could not be solely explained by epidemiological or socioeconomic factors (on the demand side) nor by supply-side factors such as differences in the density of providers or the supply of equipment. The variations persisted even after controlling for these demand-side and supply-side factors. This research showed that there was an over-utilisation and inappropriate use of certain interventions, and concluded therefore that there was a need to put in place measures to reduce unwarranted variations.

The INAMI produced a report on medical imaging in 2010, which analysed variations in exposure to medical radiation by province, with a specific focus on exams that are outdated, are no longer recommended and should no longer be performed (INAMI, 2010). This report showed that, in 2009, the level of medical radiation in Belgium was 3-4 times higher than in the Netherlands. While the report did not find that one province was generally over-using all the selected exams that are no longer recommended, its main conclusion was that if some efforts were made to reduce the non-recommended exams to the level of the province with the lowest utilisation rate, the level of radiation exposure could rapidly be reduced by 25%. A global strategy was established to reach this goal and is discussed further in this chapter.

This chapter presents findings on medical practice variations for all ten health care procedures and activities covered under this OECD project across the ten provinces and Brussels region in Belgium. Section 3.2 provides an overview of the main characteristics of the Belgian health care system. The next section describes the methodology and data sources used. The results are presented in Section 3.4. There is little variation for some procedures (such as surgery after hip fracture, selected for "calibration" purposes, given there is little discretion for providers to operate patients following hip fracture), but larger variation for other procedures where there is greater discretion, including diagnostic procedures (knee arthroscopy, catheterisation, computed tomography and magnetic resonance imaging). These results confirm previous work and indicate that some of these variations are not solely related to patient need. There is a need to adopt multiple strategies to reduce the inappropriate use of diagnostic and other procedures. This chapter concludes with a policy discussion and proposed policy responses.

3.2. Overview of Belgium's health care system

Political and organisational structure

Belgium is a federal state with three levels of government – the federal government, the federated entities and the local governments (provinces and municipalities). Health policy is a shared responsibility of both the federal authorities and federated entities (regions and communities), which meet on a regular basis to co-ordinate health policy planning. The federal authorities are responsible for the regulation and financing of the compulsory health insurance; the determination of accreditation criteria (i.e. minimum standards for hospital services); the financing of hospital budgets; legislation covering different professional qualifications; and the registration of pharmaceuticals and their price control. The federated entities are responsible for health promotion and prevention; maternity and child health care and social services; different aspects of community care; co-ordination and collaboration in primary health care and palliative care; the implementation of accreditation standards and the determination of additional accreditation criteria; and the financing of hospital investment. To facilitate co-operation between the federal authorities and the federated entities, inter-ministerial conferences are regularly organised (Gerkens and Merkur, 2010).

Health care expenditure

Health spending accounted for 10.5% of GDP in Belgium in 2011, higher than the OECD average of 9.3% (OECD, 2013). Belgium also ranks above the OECD average in terms of health spending per capita, with spending of USD 4 061 in 2011 (adjusted for purchasing power parity), compared with an OECD average of USD 3 300. Hospital spending in Belgium accounted for about 30% of total health spending in 2011, slightly above the OECD average (29%). Health spending per capita in Belgium increased, in real terms, by 3.7% per year on average between 2000 and 2009, but this growth rate slowed down to only 0.6% per year between 2009 and 2011 (OECD, 2013).

The budget for public expenditure on health is fixed by a legal real growth rate. Between 2005 and 2011, the ceiling was allowed to grow by 4.5% per year in real terms, and the share of public expenditure on health rose to 7.0% of GDP, up by 1.5 percentage point in only half a decade. The issue of the rising share of public spending on health was addressed in 2012 by lowering the ceiling to the level of actual spending in 2012 and choosing lower growth rates for the ceiling in 2013 and 2014, of respectively 2% and 3% in real terms.

Health care financing

Belgium's health care system is largely financed from social security contributions (65% in 2011), while government contribution accounted for 11%. Out-of-pocket payments by households accounted for 20% of health financing in 2011, with private health insurance covering the remaining 4% (OECD, 2013).

Social security contributions are set strictly according to income, and the National Institute for Health and Disability Insurance (INAMI) manages the compulsory health insurance. The INAMI is responsible for setting and allocating prospective budgets to the sickness funds. All eligible individuals must be a member of one of the six national associations of sickness funds or a regional service of the public Auxiliary Fund for Sickness and Disability Insurance (Gerkens and Merkur, 2010). General policy matters concerning health insurance, including its budget, are decided by representatives of the government, the sickness funds, and representatives of employers, employees and self-employed workers. The health insurance system is regulated by national conventions and agreements between representatives of health care providers and sickness funds. Private profit-making health insurance companies account for only a small part of the non-compulsory health insurance market. Since 1995, they have been held financially accountable.

Co-payments are in place for ambulatory care, inpatient care and pharmaceuticals. In ambulatory care, typically patients pay for the service and then are reimbursed for part of the cost from their sickness fund, while for inpatient care and pharmaceuticals the sickness fund pays the provider directly and the patient is responsible for co-payments (Gerkens and Merkur, 2010). Some co-payment rates are a set proportion of the service (e.g., 25% for a GP visit, 40% for a specialist consultation). In hospital, co-payments apply to a range of services, including a flat rate for each day of hospitalisation, a room supplement when the patient has requested a single or double room, and a flat rate for pharmaceuticals, laboratory and diagnostic tests (Gerkens and Merkur, 2010).

Physician services and payments

Doctors in Belgium are paid mainly on a fee-for-service basis (for GPs and specialists who are self-employed). GPs do not play a gatekeeping role, and patients can see a specialist directly. In primary care, the majority of GPs work in solo practices (75%), with the remainder working in private group practices which also include other health professionals (e.g. nurses, physiotherapists) (OECD Health Systems Characteristics Survey, 2012). In these group practices, GPs are predominantly remunerated on a fee-for-service basis, but part of their remuneration also includes a capitation payment that is not risk adjusted. A very small proportion of GPs (fewer than 1%) who work mainly in private group practices with other health professionals are paid by salary (Gerkens and Merkur, 2010).

Most specialists who work outside hospitals work in solo practices (80%), while the rest provide services in outpatient departments of public and private non-profit hospitals. Dual practice is allowed for GPs and specialists. For specialists working in hospital, agreements with hospitals allow these hospitals to retain a proportion of specialists' fees to compensate for the use of hospital facilities (Gerkens and Merkur, 2010).

The number of doctors is planned through a quota mechanism ("numerus clausus"), and the number of doctors per capita has remained quite stable since 2000. Some measures have been taken in recent years to increase the attractiveness of general practice and more generally to strengthen primary care and promote the integration of health services.

The number of physicians per capita in Belgium is close to the OECD average. There were 2.9 physicians per 1 000 population in Belgium in 2011, compared to an OECD average of 3.2 (OECD, 2013). About 40% of doctors were generalists, while 60% were specialists (OECD, 2013).

Hospital services and payments

Hospitals in Belgium are private or public not-for-profit organisations (most of them are private).

There are two broad types of hospitals: general and psychiatric. In 2008, out of the 207 hospitals, 139 were general hospitals and 68 psychiatric hospitals. General hospitals include acute care hospitals (112), specialised hospitals (19) and geriatric hospitals (8).

The main feature of Belgian hospital financing is a dual remuneration structure, according to the type of services provided: 1) accommodation, nursing, operating room, and sterilisation costs are financed via a fixed prospective budget system; and 2) medical services, polyclinics and medico-technical services (laboratories, medical imaging and technical procedures) and paramedical activities (physiotherapy) are mainly paid on a fee-for-service basis.

As an alternative to traditional hospitalisation, intermediary structures and services have been developed, including day hospitalisations and long-term care centres.

Belgium had 6.4 hospital beds per 1 000 population in 2011, more than the OECD average of five beds. As in most OECD countries, the number of hospital beds per capita in Belgium has fallen over the past 20 years. The decline has coincided with a reduction in the average length of stay in hospital and an increase in the number of surgical procedures performed on a same-day basis.

3.3. Data and methods

This chapter includes data for all the ten health care activities and procedures covered under this OECD project. Data were drawn mainly from hospital discharge data, based on ICD-9-CM codes. MRI and CT data were drawn from INAMI reimbursement data. The data are reported according to the patient's place of residence.

The province was chosen as the unit for the study of geographic variation (Belgium has ten provinces plus the Brussels region). This geographical unit is a good compromise between policy/planning issues and epidemiological issues: variations would be masked if the data were presented at a broader regional level (there are three regions), while the number of some procedures would be too small to draw any meaningful conclusions if the data was disaggregated at a lower level. Health care utilisation rates have been adjusted by population characteristics (age and gender) to remove the effect of differences in population structure across provinces. However, more specific information on the incidence/prevalence of relevant health conditions was not available to assess more precisely patient needs. Data for the latest available calendar year have been used (i.e., 2009).

3.4. Description of results

Overview of results

Table 3.1 provides a summary of the results for all the procedures. The measures include the unweighted average rate across all provinces, the lowest and highest rates, and the coefficient of variation across all provinces.

There is little variation across provinces for hospital medical admissions, caesarean sections and hysterectomy, and surgery after hip fracture. The highest variation is for diagnostic procedures, including knee arthroscopy and catheterisation, and to a lesser extent MRI and CT exams. The utilisation rate of medical imaging (CT and MRI exams) appears to be directly linked with the availability of these equipment in different regions.

Table 3.1. Summary of results on geographic variations for selected health care procedures by province, Belgium, 2009

	Hospital medical admission	CABG	PTCA	Catheterisation	Surgery after hip fracture	Knee replacement	Knee arthroscopy	Caesarean section (per 1 000 deliveries)	Hysterectomy (per 100 000 female pop.)	MRI exams	CT exams
Unweighted average rate across provinces	10 305	93	283	831	93	206	460	194	317	6886	22582
Lowest rate	9 062	71	225	618	71	169	269	171	245	4 896	18 159
Highest rate	11 655	129	400	1 299	119	264	705	235	376	8 764	29 158
Coefficient of variation	0.07	0.17	0.18	0.24	0.16	0.14	0.36	0.09	0.12	0.18	0.18

Note: Unless otherwise specified, all rates are age- and sex-standardised per 100 000 population.

Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data for all procedures, except MRI and CT which are based on INAMI reimbursement data.

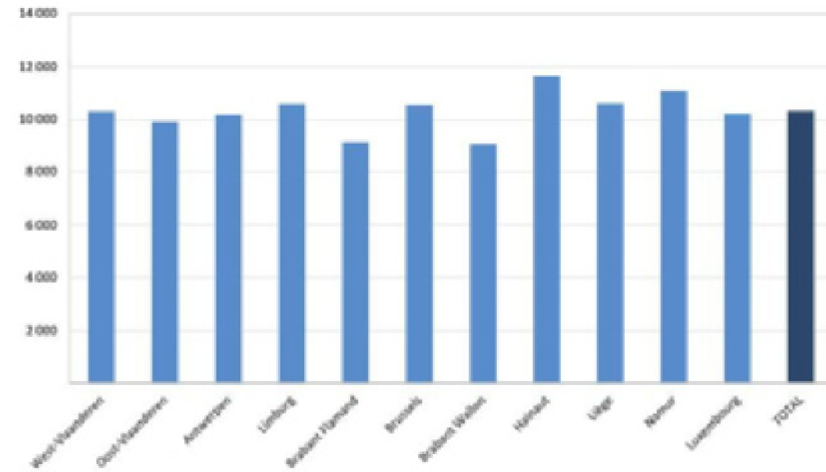
While not directly visible from Table 3.1, no province has systematically high rates for all procedures. The province of Namur stands out as having particularly high rates for revascularisation procedures (PTCA and CABG), while other provinces (West-Vlaanderen and Oost-Vlaanderen) have high rates for knee arthroscopy and knee replacement. Brussels has a high density of professionals and beds, but the utilisation rate generally appears to be relatively low. Some studies suggest that there may be an under-use of certain health services for some of the population in the Brussels region (Decock 2012).

Hospital medical admissions

Figure 3.1 presents variations in hospital medical admission (or discharge) rate in Belgium. The rate of hospital admissions per capita has remained relatively stable in Belgium over the past decade while it has come down in several other countries, so the admission rate in Belgium is now slightly higher than the average across OECD countries (OECD, 2013).

The variation in hospital medical admissions across provinces in Belgium is generally very low, with a coefficient of variation of only 0.07. The difference between the provinces with the lowest rate (Brabant Flamand and Brabant Wallon) and the highest rate (Hainault) was around 25% to 30%, much less than for many other procedures. This low variation has to be interpreted bearing in mind two considerations. Belgium has an equal distribution of hospital facilities across the country, and people are not facing any financial barriers to hospitalisation, since 100% of the population is covered by health insurance, and co-payments for hospitalisation are very low.

Figure 3.1. Hospital medical admissions standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

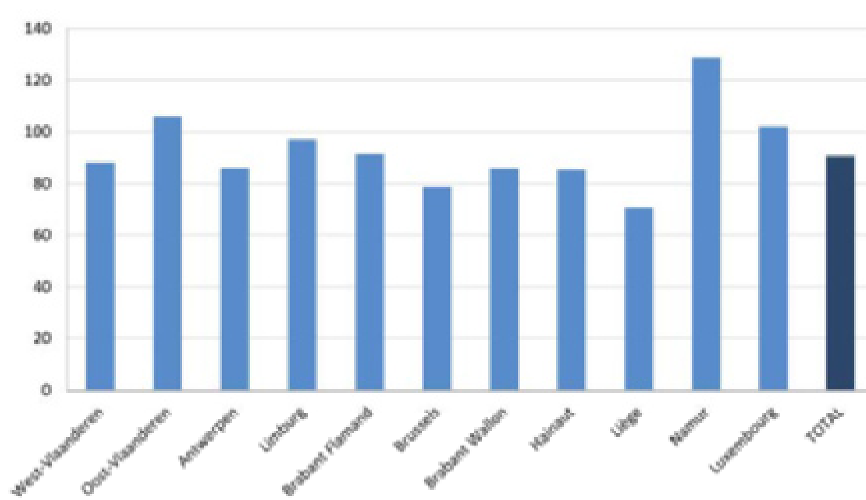
Revascularisation procedures

Coronary artery bypass graft (CABG)

The rate of revascularisation procedures (including both coronary artery bypass graft, or CABG, and coronary angioplasty, or PTCA) in Belgium is among the highest across OECD countries, after Germany (OECD, 2013).

While CABG rate has declined in recent years in Belgium as in other OECD countries, it remains higher than in most other OECD countries. There are also significant variations in CABG rate across provinces in Belgium (Figure 3.2). In 2009, the rate in Namur (129 per 100 000 population) was nearly two times higher than in Liege (71 per 100 000). Luxembourg had higher than average rates despite the fact that it did not have any cardiac centres. This is related to the fact that people in Luxembourg are receiving CABG treatment in another province.

Figure 3.2. CABG standardised rate per 100 000 population, by province, Belgium, 2009

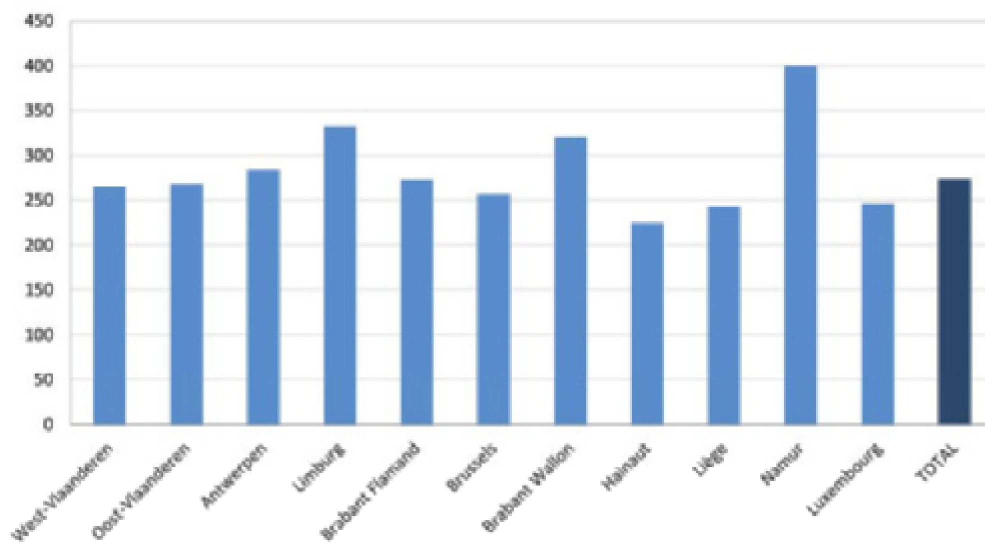


Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Coronary angioplasty (PTCA)

Similarly, there were also large differences in PTCA rate across provinces in 2009 (Figure 3.3). The highest rate, also in Namur (400 per 100 000 population), was nearly two times higher than in Hainaut (225 per 100 000). The rates in the Flemish provinces were generally slightly higher than in the Walloon provinces.

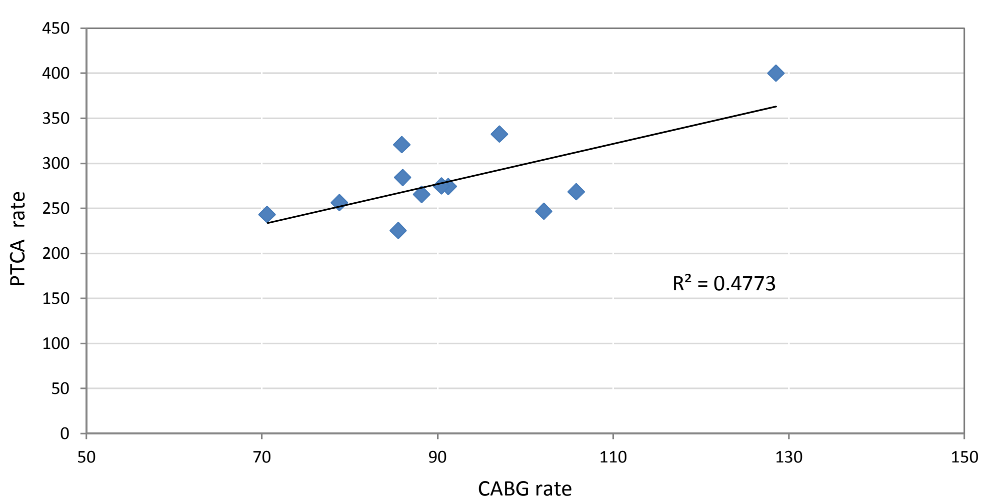
Figure 3.3. PTCA standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

There is no evidence of a possible substitution between these two revascularisation procedures across provinces. Rather, those provinces that have a high rate of one revascularisation procedure also tend to have a high rate for the other (with Namur being the most striking example), and vice versa (Figure 3.4).

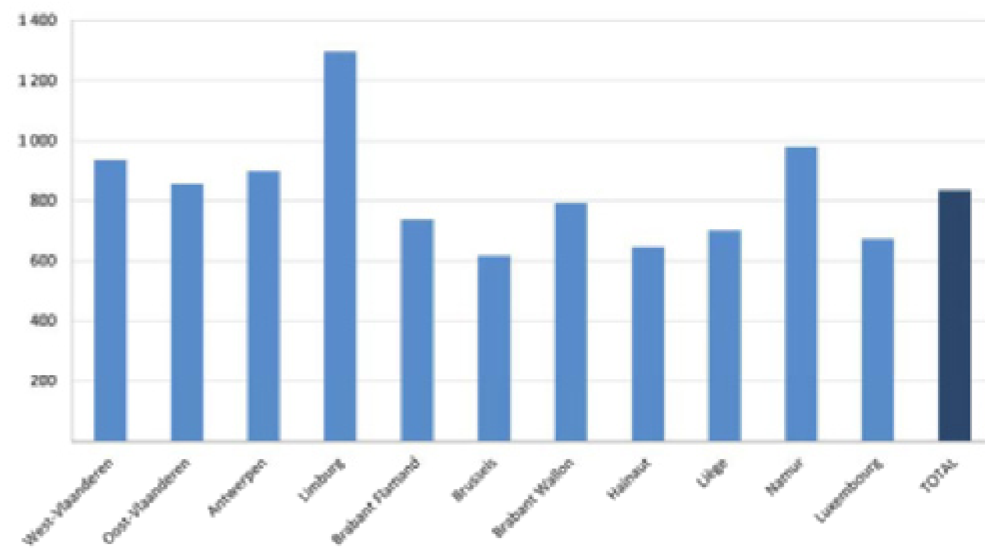
Figure 3.4. PTCA and CABG standardised rates per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

There are also large differences in cardiac catheterisation rate, a procedure used to diagnose ischaemic heart disease and the need for some revascularisation procedure (Figure 3.5). In 2009, the highest rate was in Limburg (1 298 per 100 000 population), followed by Namur. The high rate in Limburg is associated with a high density of catheterisation labs. However, Hainaut also has a high density of catheterisation labs, but much lower rates of utilisation. The lowest rate of catheterisation was in the Brussels region. As for revascularisation procedures, the rates in the Flemish provinces were in general slightly higher than in the Walloon provinces.

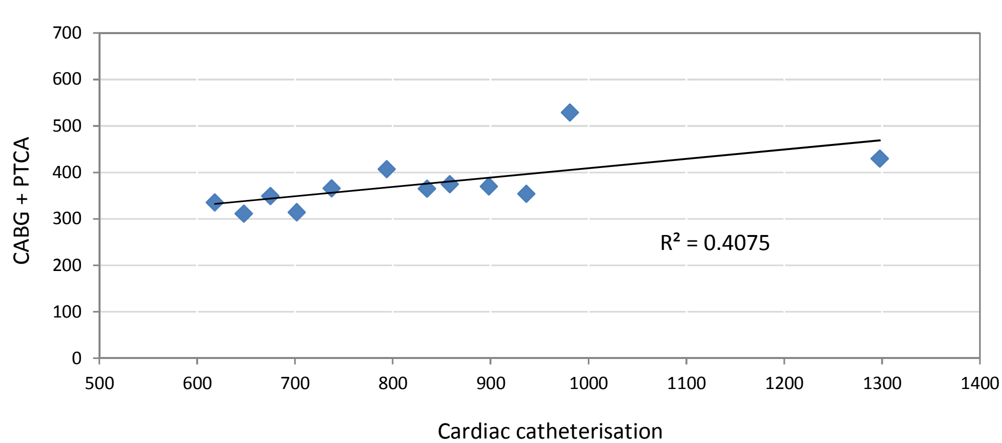
Figure 3.5. Cardiac catheterisation standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

As expected, there is a positive relationship between cardiac catheterisation (a diagnostic procedure) and the two revascularisation procedures (CABG and PTCA) across provinces, although Namur has a much higher rate of revascularisation procedures than what may be expected based on its catheterisation rate (Figure 3.6).

Figure 3.6. Cardiac catheterisation rate and revascularisation procedures (CABG + PTCA) rate, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Namur had, by far, the highest rate of revascularisation procedures in 2009, and the second rate of cardiac catheterisation. It is also the province with the highest density of cardiac centres, which require a minimum level of activities to remain licensed. At the same time, Brussels also has a high density of cardiac centres, but the revascularisation rates are relatively low in comparison with the national average. Further analysis is therefore required to examine the links between the density of cardiac centres and the volume of revascularisation procedures.

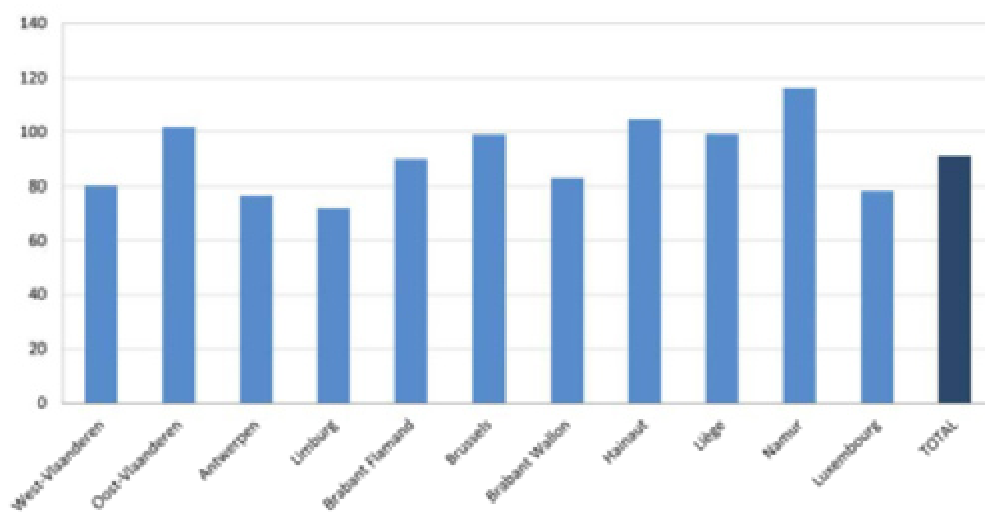
The 2006 KCE report suggested that there may be too many independent catheterisation labs. In 2010, the Ministry of Health introduced policies to reform the delivery of cardiac care, both in terms of diagnosis and treatment. The College of Cardiac Physicians is responsible for monitoring and providing feedback on quality indicators to each hospital for the purpose of benchmarking and achieving continuous improvements.

Joint procedures

Surgery after hip fracture

Surgery after hip fracture is used in this study as a "calibration" procedure, as it is expected that the rate within countries is not likely to vary much if the incidence of hip fracture is homogeneous, given that there is little choice but to operate patients suffering from a hip fracture. The coefficient of variation in Belgium in 2009 was lower than for more discretionary procedures, but still there were some noticeable variations across provinces. For example, the rate in Namur was 60% higher than in Limburg (Figure 3.7).

Figure 3.7. Surgery after hip fracture standardised rate per 100 000 population aged 35 and over, by province, Belgium, 2009

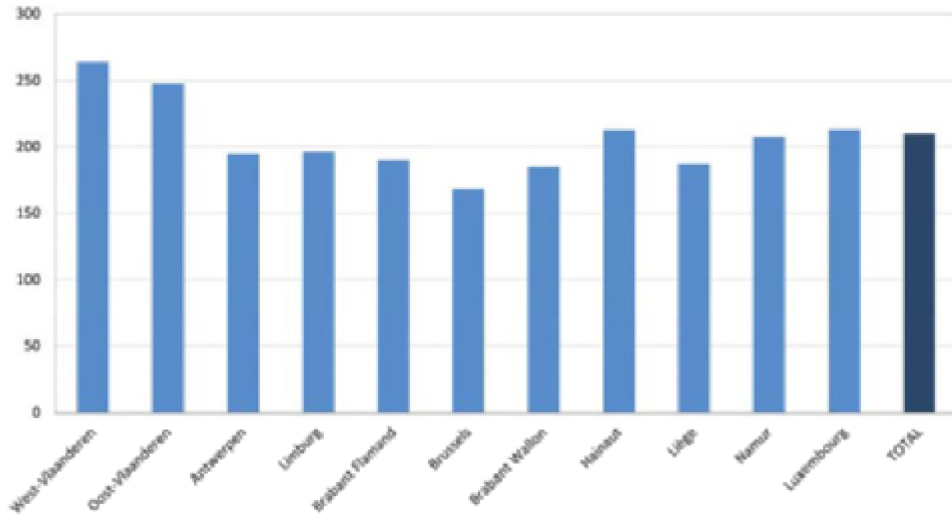


Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Knee replacement

The rate of knee replacement in Belgium is high compared to many other OECD countries (OECD, 2013). However, the variations around the national average are moderate (with a coefficient of variation of 0.14). Still, in 2009, the highest rates of knee replacement in West and Oost Vlaanderen were almost 50% higher than in Brussels (Figure 3.8).

Figure 3.8. Knee replacement standardised rate per 100 000 population, by province, Belgium, 2009

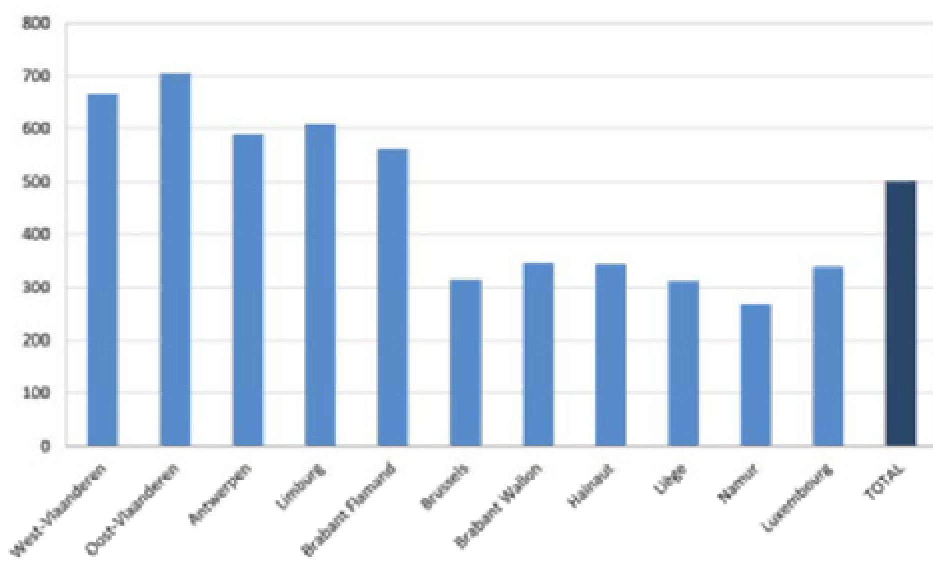


Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Knee arthroscopy

The differences are larger for knee arthroscopy rates (Figure 3.9). The highest rates in West and Oost Vlaanderen in 2009 were than two-times greater than in Brussels, Liège and Namur. In general, the rate in the Flemish provinces was two-times higher than in the Walloon provinces.

Figure 3.9. Knee arthroscopy standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

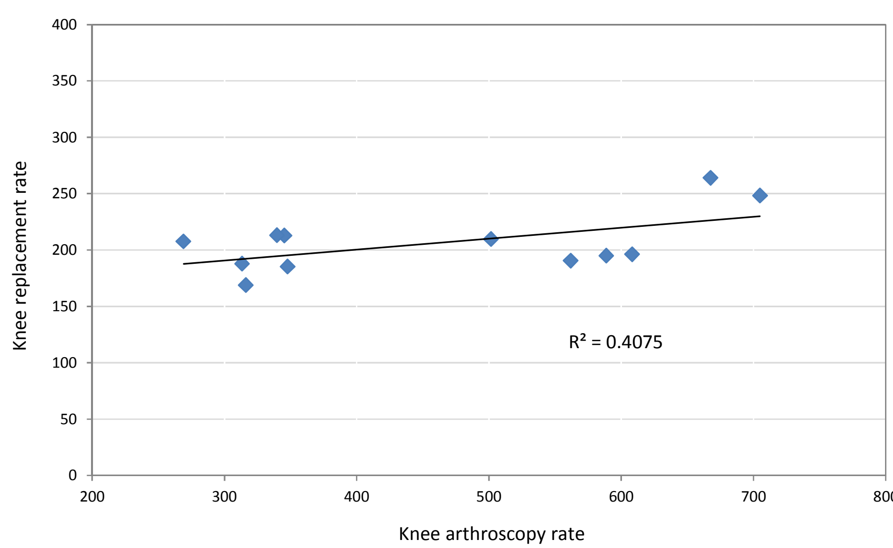
Figure 3.10 shows a positive relationship between the knee arthroscopy rate and the knee replacement rate across provinces: a higher rate of knee arthroscopy is generally associated with a higher rate of knee replacement, and this is particularly true in the West and Oost Vlaanderen.

The 2006 KCE report also found similar variations. One explanation for the particularly large variations in knee arthroscopy rate was that several clinical guidelines existed in Belgium, leaving a lot of uncertainties and discretions for doctors to prescribe this intervention (Jacques et al., 2006).

The 2006 report recommended the establishment of a registry of orthopaedic interventions to gather more systematic information on patient characteristics and other factors leading to clinical recommendations for knee replacement and other joint replacement and analyse the appropriateness and quality of the treatments (Jacques et al., 2006). A registry for knee and hip replacement has recently been set up and is a welcome step in response to this recommendation (INAMI, 2013a). It follows the creation of such joint replacement registries in countries such as Canada and Sweden. The information that will be gathered in this registry should help to provide feedback to professionals based on the patient's clinical situation, which is essential to provide material for peer review and updated guidelines. There is a great need to update clinical guidelines for knee and other joint replacement in Belgium, which have not been updated since 2006.

There is also a need in Belgium, as in other countries, to collect data on patient-related outcomes following knee and other joint replacement, to assess more precisely the benefits of these interventions for patients in terms of pain reduction and improvement in functioning, as is being done in the United Kingdom since 2009 (see the chapter on the United Kingdom/England in this publication).

Figure 3.10. Knee arthroscopy and knee replacement standardised rates per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Gynaecology procedures

Caesarean sections

Belgium has a relatively low rate of caesarean sections compared with many other OECD countries, although the rate is higher than in the Netherlands, which has the lowest rate, along with many other Nordic countries (OECD, 2013). The variation in caesarean section rates across provinces in Belgium is quite low (a coefficient of variation of 0.09).

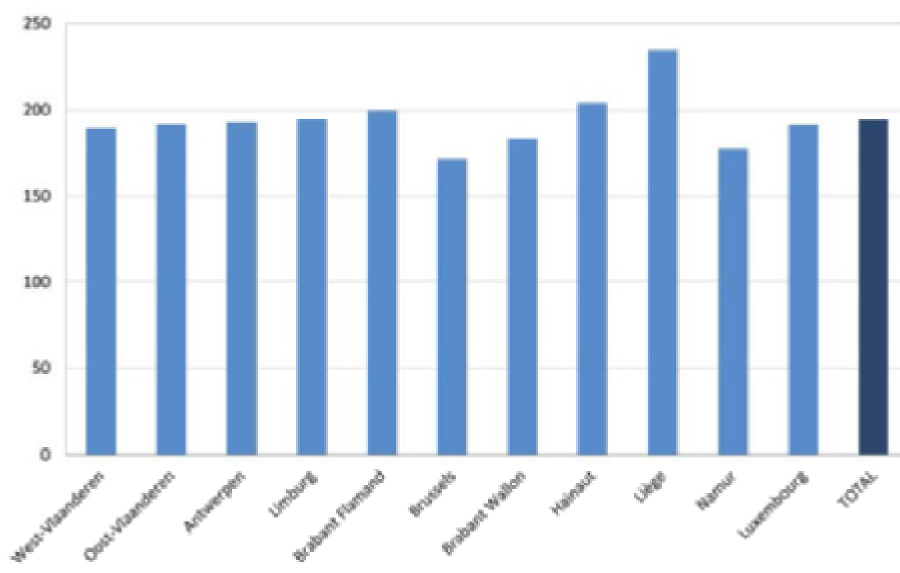
In 2009, Liège had the highest rate (235 per 1 000 deliveries), while Brussels had the lowest rate (171 per 1 000 deliveries) (Figure 3.11).

The 2006 KCE report showed similar differences in caesarean section rates across provinces (Jacques et al., 2006). Taking into account possible factors that might affect caesarean section rates (maternal age, gestation period, etc.), this KCE report was not able to identify any medical reason for variations in rates. The report made some recommendations to further reduce variations across hospitals and provinces, including providing feedback to hospitals and clinicians, financing mechanisms and public reporting to support open discussion between patients and gynaecologists.

Variations in caesarean section rates have been followed up by the Medical College of Mothers and Newborns. Between 2008 and 2011, caesarean section rates generally remained stable overall in Belgium, but there was some convergence across hospitals: many hospitals that had a relatively high rate in 2008 saw their rate come down by 2011, while those who had a low rate in 2008 often saw at least a modest increase (INAMI, 2013b). This convergence in caesarean section rates over a relatively short period of time probably reflects a change in the medical decision-making process.

By pursuing efforts to implement the recommendations from the 2006 KCE report, it may be possible to further reduce unnecessary caesarean sections in those hospitals and provinces where they are still relatively high.

Figure 3.11. Caesarean section age-standardised rate per 1 000 deliveries, by province, Belgium, 2009

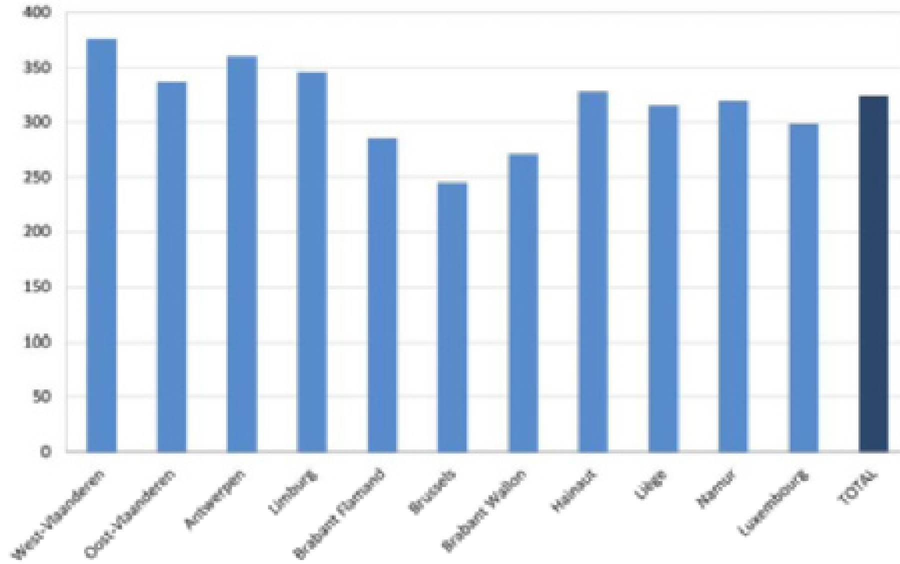


Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

Hysterectomy

Although the hysterectomy rate has declined over time in Belgium, it remained higher than in most other OECD countries in 2009. The variation in hysterectomy rate across provinces was however limited (with a coefficient of variation of 0.12). The hysterectomy rate in 2009 was highest in the Flemish provinces, while it was the lowest in Brussels and in the Brabant Wallon and Flemish Brabant provinces (Figure 3.12). The low rate in Brussels may be related to cultural factors; recent analyses in Belgium have shown cultural differences in women's decisions to have a hysterectomy (Francart et al., 2012).

Figure 3.12. Hysterectomy age-standardised rate per 100 000 females, by province, Belgium, 2009



Source: Authors' estimates based on Federal Public Service (FPS) Health, Hospital Registration Data.

However, there is no epidemiological reason for the higher rate in the Flemish provinces, which is not new. The 2006 KCE report did not find any convincing evidence of differences in patient needs, nor did it find that differences in the supply of doctors could explain these differences. A closer analysis of the 2009 Hospital Registration Data indicates that amongst younger women (aged under 45), the rate in the Flemish region is about 25% to 50% higher than the average rate in the whole of Belgium. The 2006 KCE report concluded that the geographic variations seemed to be due mainly to medical practice variations and suggested the need to develop clearer clinical guidelines and proper monitoring and benchmarking, particularly for outliers. However, no action has been taken yet to follow up on these recommendations. There may be an opportunity for the Medical College of Mothers and Newborns to set out some guidance to address these variations.

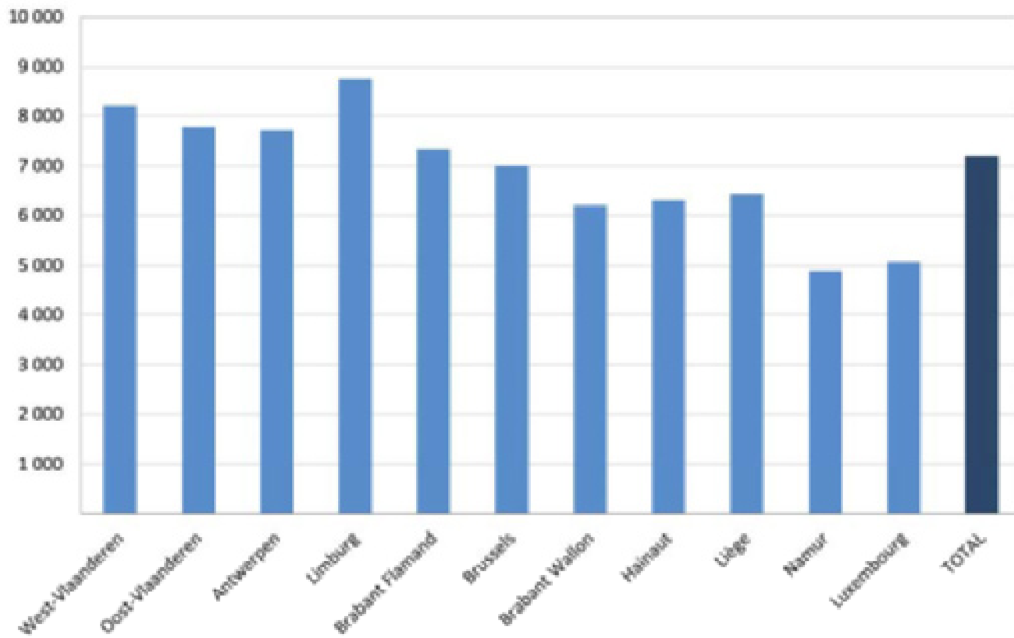
Medical imaging (MRI and CT exams)

MRI and CT exams have become increasingly used in most OECD countries to diagnose a wide range of health problems. MRI and CT exam rates are higher in Belgium than in most other OECD countries (OECD, 2013). There are also significant differences in MRI and CT utilisation across provinces in Belgium (Figure 3.13 and Figure 3.14).

In 2009, the rate of MRI exams in Limburg was nearly 80% higher than in Luxembourg and Namur. In general, the rates in the Flemish provinces were higher than in the Walloon provinces (Figure 3.13).

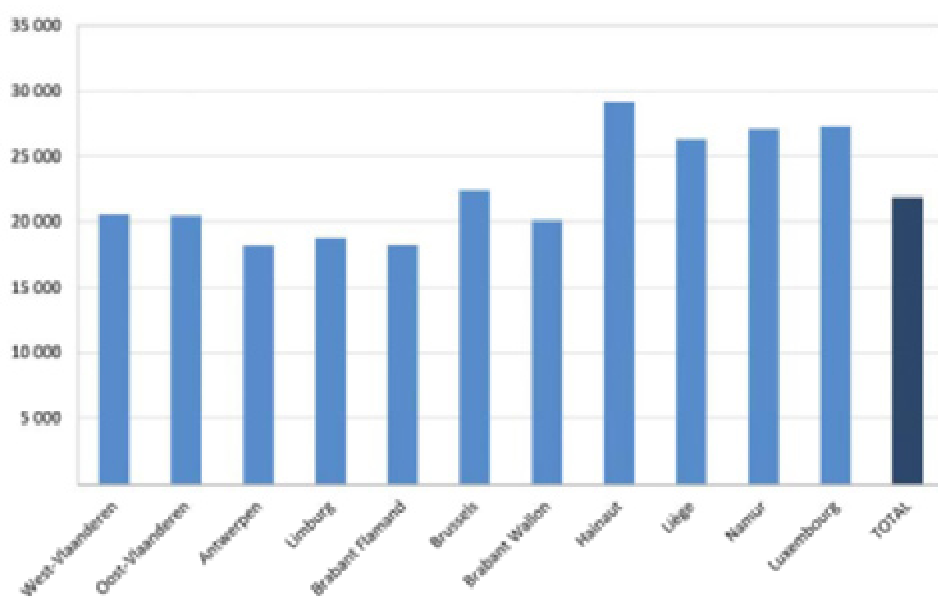
Differences in CT exam rates generally went in the opposite direction, being higher in the Walloon provinces (Luxembourg, Namur, Liege and Hainaut) and lower in the Flemish provinces (Figure 3.14).

Figure 3.13. MRI exam standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on INAMI reimbursement data.

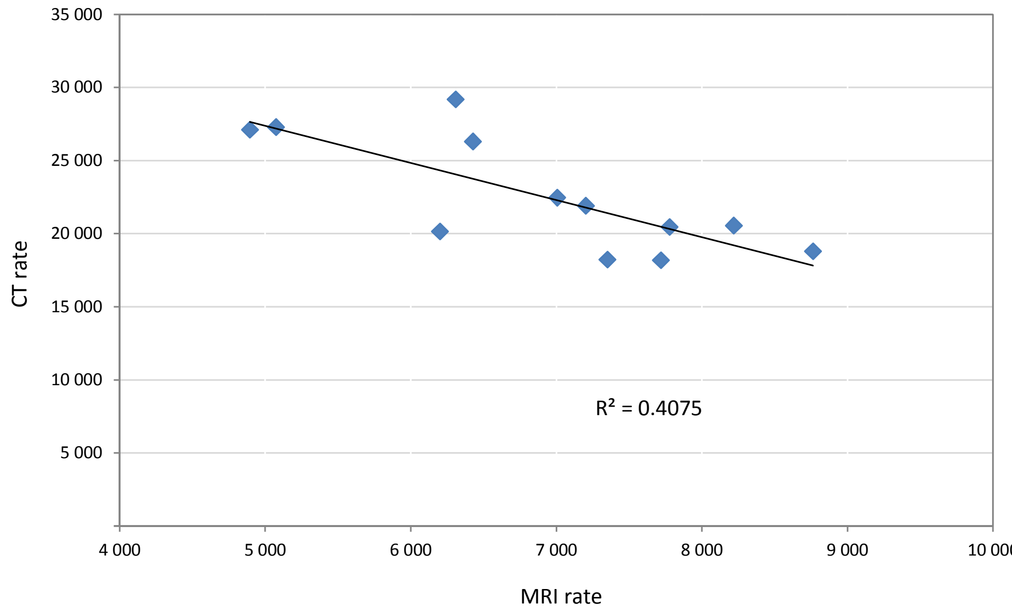
Figure 3.14. CT exam standardised rate per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on INAMI reimbursement data.

Figure 3.15 shows the inverse correlation between MRI exams and CT exams across provinces: higher MRI exam rates are generally associated with lower CT exam rates, and vice versa. This suggests that there is a certain degree of substitution between these two diagnostic procedures.

Figure 3.15. MRI exam and CT exam standardised rates per 100 000 population, by province, Belgium, 2009



Source: Authors' estimates based on INAMI reimbursement data.

The greater use of MRI exams in the Flemish provinces appears to be directly linked to a greater supply of MRI units. Walloon provinces may possibly face an under-supply and under-use of MRI exams. The potential over-use of CT exams in Walloon provinces may be linked to more traditional physician practices, associated with a lack of appropriate substitutes in medical imaging procedures.

A 2009 study from INAMI already identified substantial variations in medical imaging practices (see Annex 3.A1). This led to the development of a strategy aimed at reducing exposure to ionising radiation (which occurs for CT exams, but not for MRI exams), because Belgium had relatively higher exposure levels compared to neighbouring countries such as the Netherlands.

In co-operation with health care professionals (mainly physicians and radiologists), an overall strategy was established by health authorities to reduce variations in medical imaging across the country, making this a policy priority. A reduction in CT and X-ray procedures was targeted. The strategy aimed to reduce exposure to radiation by 25%, with provincial targets set for a selected number of CT (e.g. head, spine) and X-ray (e.g. head, chest, spine) procedures. There was also a strong focus on an information campaign to raise awareness among patients and doctors about excessive exposure to ionising radiation.

The strategy began to be implemented in 2010, and some progress has been noticed since then. Head and spine-related CT exams experienced negative growth between 2012 and 2013, but there has been an overall drop of 27% in X-ray procedures (Table 3.2). Reductions in the number of X-ray examinations are particularly noticeable for the exams that were targeted. In 2013, targets were met for gastro-abdominal examinations (-28%) and spinal examinations (-27%) and there are encouraging signs for other indications.

Table 3.2. Annual change in radiation by examination in relation to the policy targets, Belgium, base year 2008

Evolution (base 2008=100%)	2008	2009	2010	2011	2012	2013	Target	Result 2008-2013	Degree to which target was achieved
1. X-ray	100%	96%	92%	86%	82%	73%			
1. Head	100%	93%	80%	66%	57%	46%	-61%	-54%	89%
3.b. Chest abd: pneumo	100%	101%	96%	93%	93%	86%	-16%	-14%	87%
3.c. Chest abd: gastroentero	100%	94%	88%	83%	78%	72%	-20%	-28%	141%
3.d. Chest abd: urogenital	100%	93%	84%	79%	72%	66%	-50%	-34%	69%
5. ORT: spine	100%	97%	94%	87%	83%	73%	-14%	-27%	195%
2. Tomography (CT)	100%	102%	104%	105%	106%	103%	-19%	3%	-18%
1. Head	100%	102%	100%	99%	100%	100%			
5. ORT: spine	100%	102%	105%	107%	108%	105%			
4. Venography of limbs	100%	103%	99%	93%	93%	84%	-76%	-16%	21%
Relative exposure, obsolete	100%	99%	98%	95%	93%	87%	-25%	-13%	53%
Total exposure in mSv	100%	102%	101%	99%	97%	93%	1.63	2.14	

Source: Authors' estimates based on INAMI reimbursement data (2014).

The strategy has not been fully implemented yet, and subsequent evaluations should provide useful information on trends in CT and X-ray procedures and their potential impact on reducing unnecessary exposure to ionising radiation.

3.5. Conclusions

Measuring geographic variations in medical practice can be a useful way to identify procedures that may be potentially under-used or over-used, pointing towards issues of equity or efficiency in health care delivery. While standardising utilisation rates by age and gender help to remove the possible effect of differences in population structure on the demand for different health services across geographic areas, other factors can also influence demand, including of course morbidity (the incidence/prevalence of various conditions) and the socioeconomic status of the population (although the possible links between socioeconomic factors and utilisation rates of different health services are complex, with possible positive or negative relationships depending on the procedure). The provision of proper information to patients on the potential benefits and risks of different interventions, along with their own preferences vis-à-vis these benefits and risks, can also affect the demand for different procedures. On the supply side, many factors can influence utilisation rates in different geographic areas, including the supply of different categories of physicians, prevailing clinical practice patterns, as well as the supply of the required hospital beds, operating rooms and other medical equipment.

The 2006 KCE report on elective surgery looked at geographic variations for several of the same procedures considered in this chapter, and analysed some of the demand-side and supply-side factors that might have explained these variations (Jacques et al., 2006). When it was possible to measure and take into account morbidity, it did explain a significant part of the variations across geographic areas, but could not explain all of the variations. For some interventions, some measures of a lower socioeconomic status of the population in certain areas were associated with higher utilisation rates (e.g., knee arthroscopy and hysterectomy), but this was not the case for many other interventions.

The report noted the limitations of assessing precisely patient needs based on the data sources used then, and these limitations still remain today.

The supply-side analysis in the KCE report generally did not find any positive relationship between the density of doctors or hospital beds and utilisation rates of different surgical procedures across geographic areas, with the exception of knee (and hip) replacement where a greater supply of orthopaedist surgeons and hospital beds was associated with higher joint replacement rates.

The 2006 KCE report concluded that the limited explanations to the geographic variations in elective surgery rates in Belgium were leaving many unanswered questions about access and appropriateness of care. The recommendations from the report included: more in-depth epidemiological studies to assess more precisely patient needs in regions with particularly high rates or low rates for certain interventions; the development of clinical guidelines based on a literature review at the international level to standardise clinical indications; and revisions of financing structures to reach a better balance in the payments provided for different treatment options (for example, between a normal delivery and caesarean section). Some of these recommendations were implemented, but many were not or only recently introduced.

The findings from this current study, based on more recent data (2009), generally confirm the persistence of significant geographic variations for certain procedures in Belgium. One of the main findings is that the greatest variations seem to be related to the use of diagnostic procedures (including knee arthroscopy, cardiac catheterisation, MRI exams and CT exams). In the case of MRI and CT exams, there is strong evidence of a substitution (inverse relationship) between these two types of exams across provinces: higher MRI exam rates are associated with lower CT exam rates in the Flemish provinces, while higher CT exams are generally associated with lower MRI exams in the Walloon provinces.

While the use of CT exams (and conventional X-rays) exposes patients to ionising radiation, this is not the case for MRI exams. Policy concerns about a high level of exposure (which occurs with the use of conventional radiography such as CT exams) led to the development of a strategy, in co-operation with medical professional associations, to reduce radiation exposure. Provincial targets were set with the aim to reduce variations in medical imaging practices across the country. Although progress in achieving this target reduction has been modest but encouraging so far, it should be acknowledged that the strategy has not been fully implemented yet. There is a need to regularly evaluate progress in the implementation of this strategy and in reducing unnecessary exposure to ionising radiation (see Annex 3.A1).

The Belgian population continues to enjoy relatively good health and long life expectancy, and this is partly due to good access to high-quality and safe care (Vrijens et al., 2012). However, this does not mean that further improvements in equity and efficiency in health service delivery are not possible. Further monitoring and analysis of variations in medical practice, at the geographic and individual level, can help identify some under-use or over-use of certain interventions. Up until now, one of the main focus of efforts has been to raise awareness among physicians by providing them feedback or clinical practice profiles. While this is necessary, it is not sufficient to change practice patterns. Other strategies are needed to improve equity and efficiency in health service delivery. First, there is need for more robust studies, using linked data including for instance broad population-based data and hospital data, to assess more precisely patient needs and utilisation rates for different interventions. The creation in 2013 of a new registry in the area of orthopaedic interventions is a step in the right direction and should provide useful information on appropriateness of care in a context of rising rates of knee and hip replacement. It should ideally include some measures of patient outcomes following joint replacement, as is done in other countries such as Sweden and the United Kingdom. There is also a need to update and harmonise a range of clinical guidelines in Belgium, based where possible on a review of international guidelines. Reimbursement and financing arrangements may need to be adjusted in certain cases to make sure to provide proper incentives for the delivery of appropriate care. Public information and reporting may also help to alter established behaviours among both patients and providers.

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ANNEX 3.A1

Medical imaging strategy in Belgium

In 2009, the INAMI (National Institute for Health and Disability Insurance – NIHDI) observed high levels of exposure to ionising radiation from CT exams and X-ray exams which accounted for 57% and 28%, respectively covering all settings: medical, dental, inpatient and outpatient services

Health insurance databases were used to attribute a theoretical radiation value to each examination (constant from one year to the next), allowing an annual theoretical dose to be calculated for each inhabitant. The theoretical doses are higher in women and especially in older patients. However, the risk associated with exposure is greater for foetal development (women of childbearing age) and in younger patients, even if the latter receive lower radiation doses.

The organs (chest, abdomen, urogenital systems) account for the highest levels of exposure (47%), followed by the spinal column (33%), and the head (5%). About 75% of examinations are performed in outpatient units, particularly head X-rays (90%) or X-rays of the spine (86%). The principal health professionals include specialists (34%), followed by general practitioners (29%) and surgical specialists (23%).

In 2003 the Belgian Radiologists' Association adapted the European recommendations for safe and appropriate use of these examinations (Directive 97/43 from 2002) and circulated these recommendations to all doctors. Despite certain examinations being rarely recommended as a first-line treatment, high rates in Belgium were observed with considerable geographical variations within the country which were not linked to the age, gender or categories of parients.

The strategy consisted of the following components:

- Specific improvement targets were set based on the usage rates in the province using the lowest levels in the outpatient sector after adjustment. The targets aimed to reduce the risk of exposure by 25% by bringing it down from 2.29mSv/inhabitant to less than 1.63 mSv/inhabitant. Specific provincial targets were set for a set of examinations (see Table 3.A1.1)
- Raise awareness among patients, prescribers and dispensers of excessive exposure to ionising radiation via an information campaign "No radiation without reason" (Department of Public Health, 2011) and repeated in 2013. All doctors were informed about excessive exposure to ionising radiation in their care sector and in their practices in 2009 (Assurance Maladie – Health Assurance, 2009).
- Indicators used to monitor the progress of the policy included the level of exposure per inhabitant by geographical units; the relative share of this exposure attributed to each prescribing specialty; and examinations that contribute most to the exposure of ionising radiation (based on volume and "theoretical dose").

- The updated recommendations and guidelines were circulated by a variety of channels (included in the software for managing medical records; educational leaflets; websites).
- Provider level reporting includes relevant information based on their specific practice (INAMI, 2010). General practitioners were targeted due to the high level of obsolete/outdated exams and included the introduction of standardised prescription forms.

Table 3.A1.1. Provincial targets by examination, Belgium, 2010

Targets	National rate 2008	West Flanders	East Flanders	Limburg	Antwerp	Flemish Brabant	Brussels	Walloon Brabant	Namur	Liège	Luxembourg	Hainaut	Flanders	Wallonia	National 2010 target
Rate of exposure/person	**1.71**	-5%	-8%	-7%	0%	-2%	-13%	-13%	-28%	-29%	-28%	-35%	-5%	-30%	**-15%**
Tomography, head + spine	**62**	-15%	-9%	-12%	-5%	0%	-16%	-3%	-33%	-29%	-36%	-42%	-8%	-34%	**-19%**
Chest X-ray/1 000 population	**90**	-13%	-10%	-23%	-15%	-9%	-23%	-1%	0%	-5%	-8%	-32%	-13%	-17%	**-16%**
Spinal X-ray (cervical+ dorsal+ lumbar + sacral)	**72**	-5%	-10%	-19%	0%	-4%	-7%	-14%	-3%	-29%	-20%	-31%	-7%	-26%	**-14%**
Pelvic X-ray	**36**	-23%	-22%	-7%	0%	-9%	-20%	-30%	-13%	-40%	-29%	-43%	-13%	-38%	**-24%**
Skull X-ray (face + base)	**11**	-67%	-71%	-73%	-65%	-60%	-47%	-43%	0%	-50%	-37%	-46%	-68%	-44%	**-61%**
Abdominal X-ray /1 000 population	**17**	-4%	-8%	-21%	-31%	-12%	-37%	0%	-2%	-23%	-11%	-38%	-17%	-26%	**-23%**
Abdominal X-ray + contrast agent	**21**	0%	-10%	-17%	-25%	-7%	-35%	-8%	-9%	-23%	-14%	-36%	-13%	-26%	**-20%**
Urography	**1.0**	-68%	-75%	-84%	-76%	-72%	-38%	-65%	-52%	-32%	0%	-34%	-75%	-38%	**-67%**
Pyelography/cystography	**1.3**	-27%	-37%	-38%	-19%	-34%	-14%	-32%	-30%	-38%	-21%	0%	-30%	-23%	**-27%**
Venography of limbs	**0.1**	-84%	-60%	-87%	-61%	-78%	-73%	-69%	-91%	-66%	0%	-76%	-76%	-74%	**-76%**

Source: Authors' estimates based on INAMI reimbursement data (2009).

Monitoring of this policy includes examining the theoretical level of exposure to ionising radiation, indicators of exams that are obsolete/outdated but are still in use, unnecessary prescribing (e.g. waiting time between two screening examinations in patients without a risk factor); and inappropriate prescribing for examinations with limited indications (e.g. spinal column CT and x-ray exams) and examinations for which there are no longer indications (e.g. X-rays for venography of limbs).

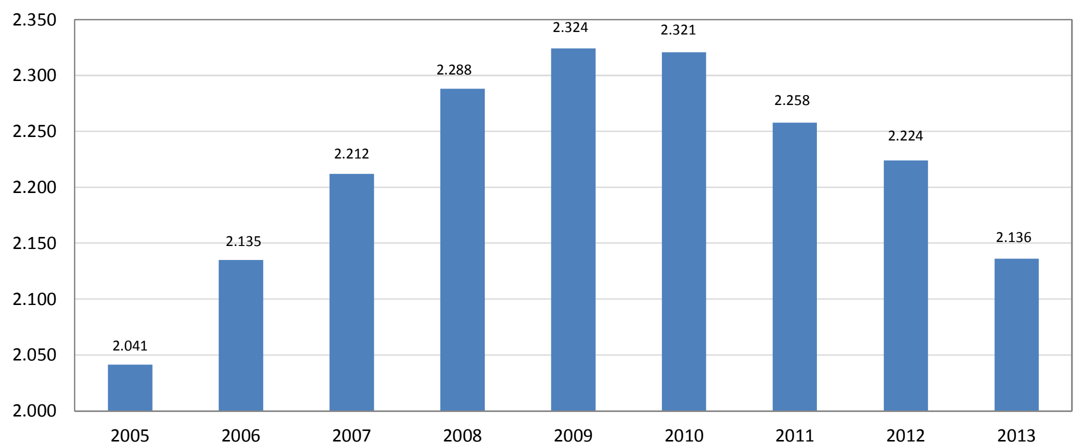
Figure 3.A1.1 below shows a reduction in the theoretical level of ionising radiation since the implementation of the strategy in 2010 to 2.1 mSV/hab in 2013. The reduction is largely due to indicators of examinations that are obsolete/outdated.

There was reduction between 2009 and 2013 (Figure 3.A1.1). These estimates do not capture changes in practice which is related to the replacement of equipment by devices emitting less radiation. This figure is encouraging as the strategy has not yet been implemented fully. Next steps will include the need for the results to be sent electronically to the patient's doctor, information on the doses of radiation to be included in the patient's electronic health files and registration and a review of whether there is an adequate density of MRI and CT equipment across the country.

The slowdown observed is not as significant as expected and is even somewhat disappointing in the light of the modest targets that were set (61% of the target for reducing obsolete examinations was reached, whereas only 10% of the overall exposure target was reached (Figure 3.A1.2). This disappointing outcome is linked to the poor result for spinal CT examinations, which account for a large proportion of ionising radiation. This implies that additional actions will be required, targeting lumbar pathology in particular (Figure 3.A1.3). Once the complete strategy is deployed in the near future, it is anticipated this should lead to an improvement in the results.

Figure 3.A1.1. Theoretical annual level of radiation per inhabitant, Belgium, 2005 to 2013

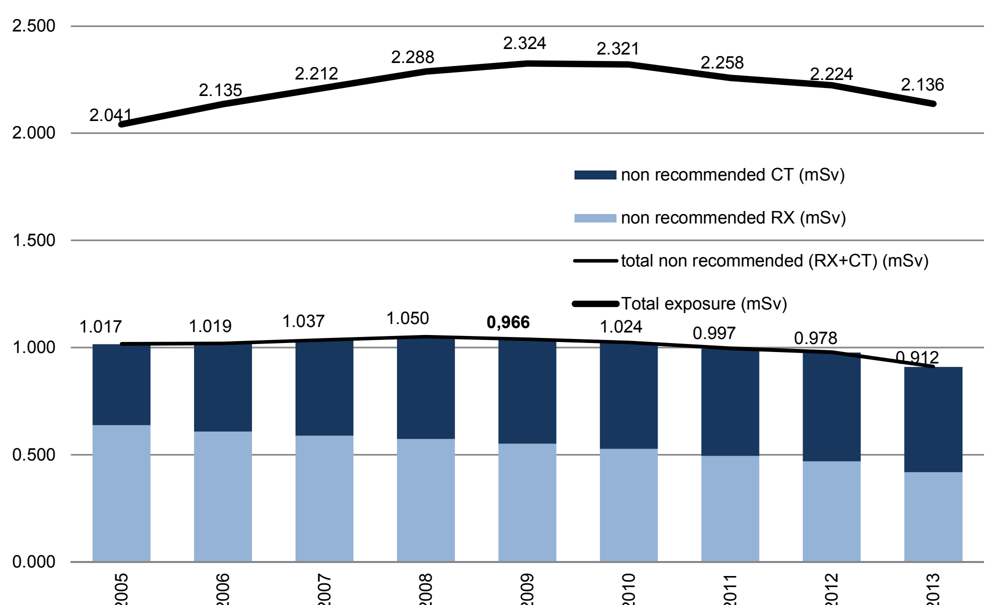
In mSV



Source: Authors' estimates based on INAMI reimbursement data (2014).

Figure 3.A1.2. Theoretical annual radiation level per inhabitant by obsolete examination (RX/CT), Belgium, 2005 to 2013

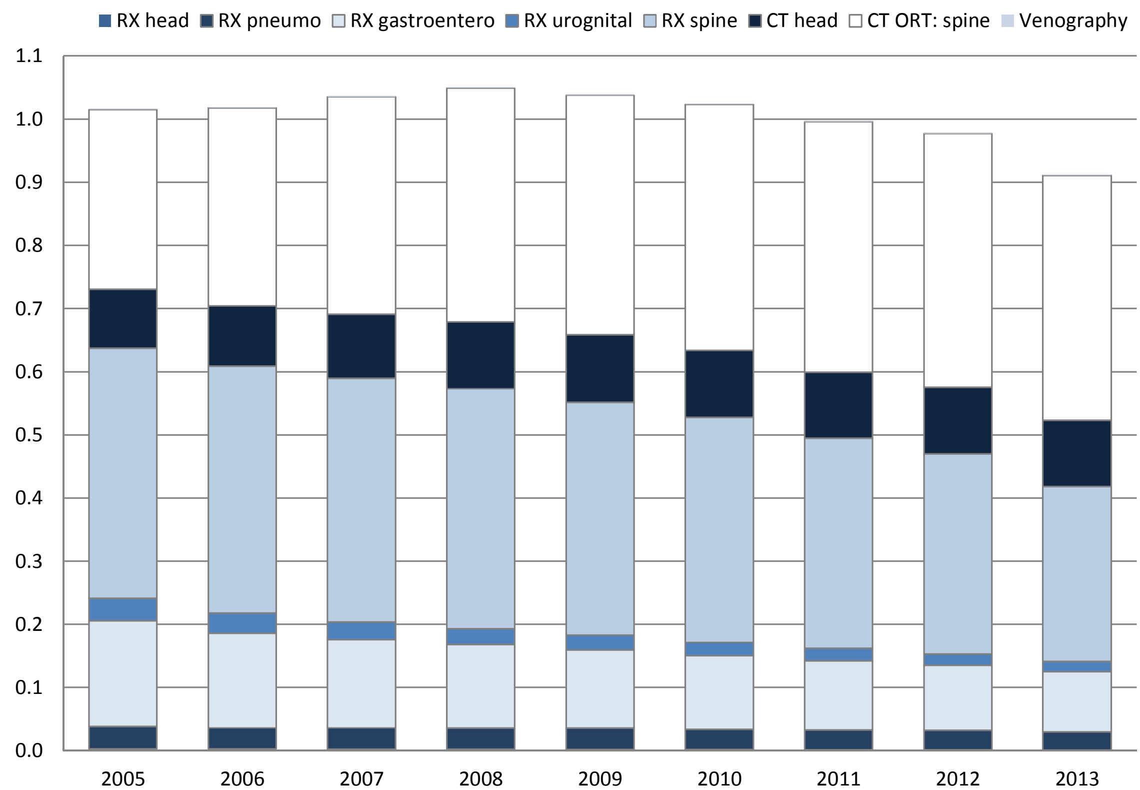
In mSV



Source: Authors' estimates based on INAMI reimbursement data (2014).

Figure 3.A1.3. Radiation exposure due to obsolete imaging per inhabitant, Belgium, 2005-13

In mSV



Source: Authors' estimates based on INAMI reimbursement data (2014).

Chapter 4

Canada: Geographic variations in health care

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In Canada, there continues to be large variations in medical practice across provinces and territories as well as across health regions in each province, raising questions about the efficiency and equity of health service delivery. This chapter focusses on the use of nine health care activities and procedures between 2003 and 2010. Hospital medical admissions have generally declined in Canada and are low compared with other OECD countries, but there remain substantial variations across provinces (nearly two-fold difference) and health regions (nearly four-fold difference). Knee replacement surgery has increased in all provinces since 2003, with no reduction in the large variations across provinces and health regions. This contrasts with coronary angioplasty, which has also increased in all provinces, but more so in provinces that started with a low level in 2003, indicating a certain degree of convergence in the treatment of people following heart attack. There has also been a strong rise in the use of MRI and CT scans, but despite some reduction in the variation in MRI exams across provinces, substantial variation remains (nearly two-fold difference). In 2013, the Canadian Medical Association, in co-operation with some universities and patient groups, adapted the Choosing Wisely campaign initially developed in the United States to promote more informed discussions between doctors and patients and to reduce unnecessary diagnostic tests and procedures. The impact of this new initiative should be closely monitored.

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4.1. Introduction

Research on medical practice variations in Canada dates back to the 1990s. Roos (1992) studied hospital admission rates in Manitoba and found that physicians who were more prone to admit patients to hospitals tended to admit not only more patients with discretionary diagnoses but also patients who were relatively less ill, indicating a possible overuse of hospital admissions. Hall and Cohen (1994) found wide variations in hysterectomy rates in Ontario, and called for more definitive practice guidelines, along with more research into the role of patient characteristics and treatment preferences to explain variations in hysterectomy rates.

Since 2000, research on medical practice variations in Canada has expanded considerably, looking at variations for a wide range of health care activities at different levels (geographic, hospital, provider and patient levels). An important contribution to this research has come from the data published by the Canadian Institute for Health Information (CIHI). CIHI's annual publication *Health Indicators* provides a wide range of data on population health status, non-medical determinants of health, health system performance, and community and health system characteristics, with the data presented at the provincial/territorial level, as well as at health region level. Some editions have included exploratory analysis of variations in health service use at different geographic levels (CIHI, 2008; CIHI, 2009a). At the provincial level, the Institute of Clinical Evaluative Sciences (ICES) has documented variations in medical practice in the form of atlases, focussing its work mainly on the province of Ontario (Hux et al., 2003; Badley and Glazier, 2004; Jaakimainen, 2006). These atlases cover a range of system-wide and disease-specific topics (such as hospital admissions, physician visits, diagnostic testing, prescription drug use, and surgical procedures) and feature breakdowns of regional patterns in health care delivery, with a view to guide quality improvement and decision making. In British Columbia, the University of British Columbia's Centre for Health Services & Policy Research (CHSPR) has published several atlases on variations in pharmaceutical prescriptions across all of Canada (Morgan et al., 2008) as well as atlases on medical and hospital services across regions in the province of British Columbia (McGail et al., 2004; Morgan et al., 2009). Following the public reporting of these variations in medical practice and concerns about the inappropriate use of certain interventions, a number of specialist organisations have also developed clinical practice guidelines to improve clinical decisions (e.g. the Society of Obstetricians and Gynaecologists of Canada, the Canadian Orthopaedic Association and the Canadian Association of Radiologists).

This chapter presents findings on geographic variations in health care for a selected number of health care activities and procedures in Canada, including hospital medical admissions and eight diagnostic and surgical procedures. Section 4.2 provides an overview of the main characteristics of the Canadian health care system. Section 4.3 describes the data sources and methodology used to calculate the utilisation rates for the selected activities and procedures. Section 4.4 presents the results. These results show that while there is low variation for some procedures (for example, for surgery after hip fracture, which was expected given that there is little discretion for doctors to admit and operation patients), there is wide variation for others where there is a higher degree of discretion (such as hospital admissions and knee replacement). The findings also show a certain degree of convergence across provinces and health regions has occurred between 2003 and 2010 for some procedures such as coronary angioplasty and MRI scans, while the extent of variation has not come down for other procedures. These results suggest that there continues to be wide variation in Canada for many health care activities and procedures, which cannot be attributed solely to patient needs, indicating either some under- or over-provision of services. While clinical guidelines exist for a number of these health care activities and procedures, these guidelines do not appear to be closely followed and monitored across the country. The chapter ends with a discussion of some of the recent initiatives that have been taken to reduce the use of unnecessary diagnostic and surgical procedures in Canada.

4.2. Overview of Canada's health care system

Political and organisational structure

Canada is a federation with two levels of government that have the power to legislate and govern, the federal and provincial/territorial governments. There are ten provinces and three territories located in the northern part of the country. The health system is a shared responsibility between the federal and provincial/territorial governments. The federal government's responsibilities include large funding transfers to the provinces and territories, the regulation of prescription drugs and medical devices, public health, health promotion and disease prevention, and funding and facilitating data gathering and research. In addition, the federal government has responsibility to fund or deliver health services for First Nations and the Inuit, and for some federal inmates, military personnel and refugees. The provinces and territories are responsible for the planning, organisation and delivery of health services. The Canada Health Act establishes the criteria and conditions related to insured health services and extended health services (hospital, medical and diagnostic services) that the provinces and territories must fulfil to receive the full federal funding transfer. The aim of the Act is to ensure that all eligible residents of Canada have reasonable access to insured health services without direct charges at the point of service.

Health care expenditure

Health spending accounted for 11.2% of GDP in Canada in 2011, almost 2 percentage points higher than the OECD average of 9.3% (OECD, 2013a). Canada also ranks above the OECD average in terms of health spending per capita, with spending of USD 4 522 in 2011 (adjusted for purchasing power parity), compared with an OECD average of around USD 3 300. The share of current health spending allocated to hospitals was 30% in 2011, less than the OECD average of 36%, although in Canada this excludes most of the fees paid to doctors for the services they provide in hospitals. Between 2000 and 2009, health spending per capita increased in real terms by 3.5% per year on average, but the growth rate slowed markedly after 2009, following the 2008-09 recession.

Health care financing

Health care in Canada is financed mainly by public funds, which accounted for 70% of total health spending in 2011 (OECD, 2013a). Provincial governments receive about one-quarter of their health financing from the federal government. Supplementary private insurance, largely provided in the form of employment-based insurance, covers services such as prescription drugs, dental care and vision care. More than two-thirds (68%) of the population have private health insurance, which accounted for 13% of health spending in 2011. Direct household payments accounted for the remaining 16% of health spending.

Health care delivery and provider payments

Physician services and payments

Physicians are predominantly self-employed in Canada. Primary care physicians are remunerated mainly on a fee-for-service basis, though alternative payment methods exist, including a mix of salary and fee-for-service, or a mix of capitation and fee-for-service. Specialists either work in outpatient departments of hospitals or have their own private practices, and are remunerated on a fee-for-service basis.

Despite the relatively high level of health expenditure in Canada, there are fewer physicians per capita than in most other OECD countries, although their numbers have gone up substantially in recent years. In 2011, Canada had 2.4 physicians per 1 000 population, below the OECD average of 3.2. The split between generalists and specialists was almost equal (47% and 53% respectively).

Hospital services and payments

Hospital care is provided mainly in public hospitals and private not-for-profit hospitals, but a limited number of private for-profit hospitals also operate in some provinces. In most cases, patients who use private for-profit hospitals are still covered under their provincial or territorial health insurance plan. Hospitals are remunerated on a prospective global budget. A fixed amount of funding is distributed to each hospital to pay for all hospital-based services for a fixed period of time (usually one year). Recently, some provinces (e.g. Ontario, British Columbia and Alberta) have moved towards a "patient-based" funding model, where a portion of hospital funding is based on criteria such as how many patients they serve, the services they deliver and the specific needs of the population.

The number of hospital beds in Canada was 2.8 per 1 000 population in 2010, well below the OECD average (five beds per 1 000 population in 2011). As in most OECD countries, the number of hospital beds per capita in Canada has fallen over time, coinciding with a reduction in average length of stay and a growing number of same-day surgical procedures.

4.3. Data and methods

Coverage of procedures and data sources

The health care activities and procedures covered in this report include: hospital medical admission, caesarean section (c-section), revascularisation procedure (CABG and PTCA), knee replacement, hysterectomy, MRI and CT scan, and surgery after hip fracture (which was selected as a "calibration" procedure, based on the assumption that there is little discretion to operate patients suffering from a hip fracture and that the age-standardised rates should be similar across regions, if the incidence of hip fracture is similar). The other procedures selected under the OECD project were not included due either to a lack of data and/or limited data quality. The data sources are summarised in Box 4.1.

Box 4.1. Data sources

- Hospital Morbidity Database (HMDB) for most interventions: This database captures administrative, clinical and demographic information about hospital inpatients in Canada.
- National Ambulatory Care Reporting System (NACRS) for PTCA, CABG and hysterectomy: The NACRS contains data on hospital-based and community-based ambulatory care (day surgery, outpatient clinics and emergency departments).
- National Survey of Selected Medical Imaging Equipment for MRI and CT scanners: This database collects data from all provinces and territories for public and private health care facilities that have one or more of the selected types of medical imaging equipment.

The ICD-9-CM codes proposed for the OECD project were mapped to the Canadian Classification of Health Interventions (CCI), which is the Canadian national standard for classifying health care procedures. CCI codes were used except for hospital medical admissions and MRI and CT scans (see Annex 4.A1).

For most procedures, the measurement unit is per 100 000 population, with the exception of caesarean sections (per 100 deliveries, including live births and stillbirths), MRI and CT scans (per 1 000 population), and surgery after hip fracture (per 100 000 population aged 65 and over). Rates are based on the total number of discharges in a fiscal year (1 April to 31 March), so data for 2010 cover the period from 1 April 2010 to 31 March 2011. Data for 2010 are available for all procedures. Data for 2003 are also presented for most procedures (caesarean section, revascularisation procedure, knee replacement, and MRI and CT exams), while data are only available from 2006 for hospital admission and hysterectomy.

Geographic coverage

The data are presented based on two geographic units: the provincial/territorial level and the health region level in each province (with a minimum population of 50 000; these health regions cover more than 98% of the Canadian population). Table 4.1 presents the population size in each province and territory in 2010. The three most populated provinces are Ontario (13 286 000 population), Quebec (7 929 000) and British Columbia (4 550 000), while the population size of the three territories in the north are very small (33 000 in Nunavut, 35 000 in Yukon and 44 000 in the Northwest Territories).

Health regions are administrative bodies legislated by provincial ministries of health and are responsible for delivering health services to their residents. For the province of Prince Edward Island, and the three territories, the data are presented only for the whole province or territory because there are no health regions. The data for MRI and CT exams are available only at the provincial level. Utilisation rates are reported based on the region of the patient's residence, not the region of hospitalisation or where patients received the service.

Table 4.1. Population size by province and territory, Canada, 2010

Province/territory	Population (thousands)
Newfoundland and Labrador	511
Prince Edward Island	144
Nova Scotia	946
New Brunswick	754
Quebec	7 929
Ontario	13 286
Manitoba	1 239
Saskatchewan	1 048
Alberta	3 735
British Columbia	4 550
Yukon	35
Northwest Territories	44
Nunavut	33
Canada	**34 254**

Source: CIHI (2012), "Health Indicators 2012", Ottawa, Canada, https://secure.cihi.ca/free_products/health_indicators_2012_en.pdf.

Statistics calculations

For most procedures, the rates at the provincial/territorial level and health region level have been age-standardised (based on the 1991 Canadian population, using five-year age groups) to remove the effects of differences in population structure across regions and over time. There are two exceptions where the rates are crude rates (not age-standardised): caesarean section, and MRI and CT exam.

The Canadian average was calculated as the total number of procedures across the country divided by the total population, with the number of procedures being age-standardised (again with the two exceptions of caesarean section and MRI and CT exams). Indicators of geographic variation include: 1) minimum and maximum values across provinces (excluding the three territories); 2) minimum and maximum values across all health regions (including the three territories); 3) the coefficient of variation across health regions (with the coefficient presented both with and without the three territories when this makes a difference in the value). The coefficient of variation is measured as the ratio of the standard deviation to the mean.

4.4. Description of results

This section describes the variations in the selected health care activities and procedures, starting by presenting an overview of the results for hospital medical admission rates and the eight diagnostic and surgical procedures, followed by a more detailed presentation of variations for each health care intervention.

Overview of results

Table 4.2 provides an overall summary of the results for all health care activities and procedures. In 2010, the degree of variations, measured by the coefficient of variation across health regions in Canada, was the lowest for surgery after hip fracture (as expected, given that this procedure was selected as a "calibration" procedure on the grounds that there is little discretion to admit and operate a patient after a hip fracture). The variation across regions was also relatively low for caesarean sections, although the rates have generally gone up over time in most provinces and health regions. On average across Canada, caesarean section rates increased from 25% of deliveries in 2003 to 27% in 2010, a rise that has also been observed in most OECD countries.

The largest variations across regions were related to hospital medical admission, knee replacement and hysterectomy. The rate of hospital medical admission in Canada varies widely, and is particularly high in the three territories, because of the remoteness of hospitals in these territories combined with a lack of primary care providers due to the low population density. This means that people seeking care must often travel far to reach hospitals and are more likely to be admitted for conditions that might otherwise be managed in primary care settings. Leaving aside the territories and their specific geographic characteristics, hospital medical admission rates varied by nearly two-fold across provinces in 2010 (with Ontario and Quebec having the lowest rate and Saskatchewan the highest rate).

There are also substantial variations in knee replacement rates across provinces and health regions, with no sign of a reduction between 2003 and 2010, a period when these surgery rates increased everywhere at about the same rate. There was an almost two-fold difference in knee replacement rates between the province with the lowest rate (Quebec) and the province with the highest rate (Saskatchewan) in 2010.

Table 4.2. Summary of geographic variations for nine health care procedures, by province/territory and health regions, Canada, 2003 and 2010

Procedure		Hospital medical admission	CABG	PTCA	Surgery after hip fracture	Knee replacement	C-section	Hysterectomy	MRI	CT
Unit		per 100 000 pop.	per 100 000 pop.	per 100 000 pop.	per 100 000 pop 65+	per 100 000 pop.	per 100 deliveries	per 100 000 women	per 100 000 pop.	per 100 000 pop.
Age-standardised rates for Canada[1]	2003 (2006)	4 106 (2006)	93	167	435 (2006)	115	25	373	24	87
	2010	3 730	63	173	395	160	27	325	46	125
Min value at provincial level (excluding territories)	2010	3 404	43	146	379	116	21.5	299	28	84
Max value at provincial level (excluding territories)	2010	6 086	79	205	476	210	31.9	435	55	196
Min value at health region level (including territories)	2010	2 617	35	108	279	85	8.7	152	n.a.	n.a.
Max value at health region level (including territories)	2010	9 962	105	287	592	490	34.3	694	n.a.	n.a.
Coefficient of variation at health region level[2]	2003 (2006)	0.35 (2006)	0.24 (0.22)	0.30	0.20 (0.16)	0.29	0.17	0.29 (2006)	0.36	0.32 (0.23)
	2010	0.36 (0.33)	0.23	0.21	0.17	0.34 (0.29)	0.18 (0.16)	0.30	0.24	0.28 (0.24)

1. The rates have been age-standardised based on the 1991 Canadian population, with the exception of caesarean section, and MRI and CT exam, which are crude rates.

2. Values in parentheses show the coefficient of variation without the territories when the values are different.

Source: Authors' estimates based on Hospital Morbidity Database, National Ambulatory Care Reporting System and National Survey of Selected Medical Imaging Equipment.

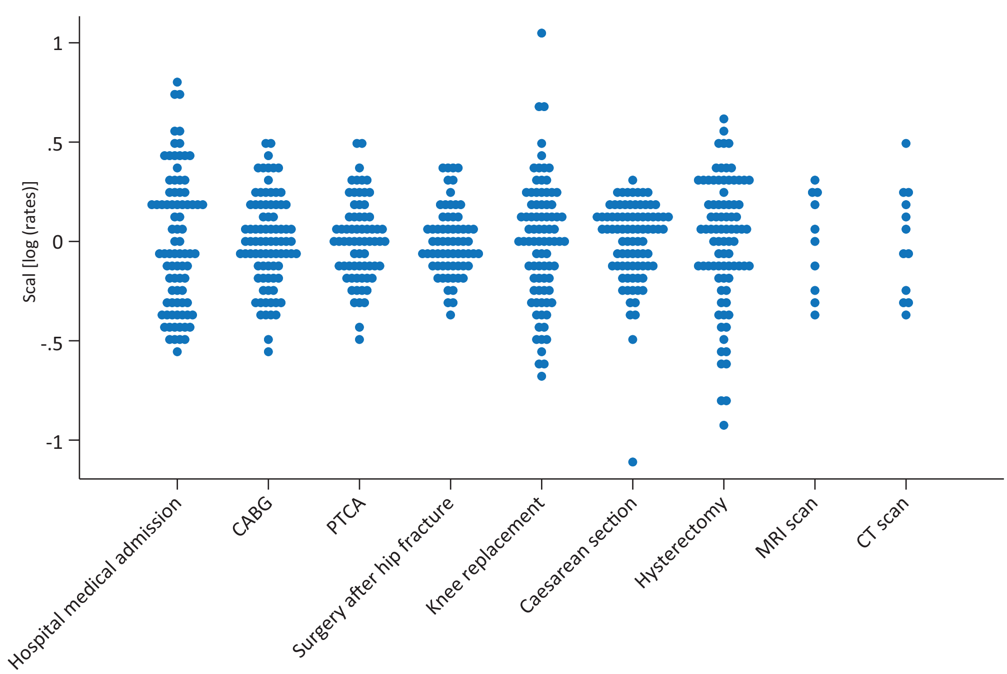
By contrast with knee replacement, hysterectomy rates in Canada have generally declined over the past years, but there has been no reduction in variations across regions. At a provincial level, the rates in Saskatchewan, Nova Scotia and Newfoundland were one-third higher than in British Columbia, Quebec and Ontario in 2010.

Variations across provinces and health regions have come down only for two procedures between 2003 and 2010: MRI scans and coronary angioplasty (PTCA) which is used for the treatment of heart attack. In both cases, this reduction in variation across regions has occurred in a context of an increase in utilisation rates, particularly for MRI exams, which have nearly doubled between 2003 and 2010. This means that the increase has been particularly pronounced in those regions that had relatively low rates in 2003. Still, in 2010, there was an almost two-fold difference in MRI exams between the province with the lowest rate (Newfoundland) and the province with the highest rate (Ontario).

Overall, these results suggest that there continue to be wide variations in Canada for many health care activities and procedures which cannot be attributed solely to patient need, indicating the possibility of either an under-provision of services in certain regions and/or an over-provision in other regions.

Figure 4.1 shows the degree of variation across all health regions for the nine procedures in 2010 (standardised based on a log normalised scale). It illustrates that the spread of variation is largest for hospital medical admission rates, knee replacement and hysterectomy. By contrast, as already noted, there was less variation for surgery after hip fracture and caesarean section.

Figure 4.1. Rates for all procedures by health region (except for CT and MRI scans by province and territory), Canada, 2010



Note: PTCA and surgery after hip fracture in Quebec are not available due to differences in data collection. Data on surgery after hip fracture are also not available for the three territories. CT and MRI scans are available only at the provincial/territorial level.

Source: Authors' estimates based on Hospital Morbidity Database, National Ambulatory Care Reporting System and National Survey of Selected Medical Imaging Equipment.

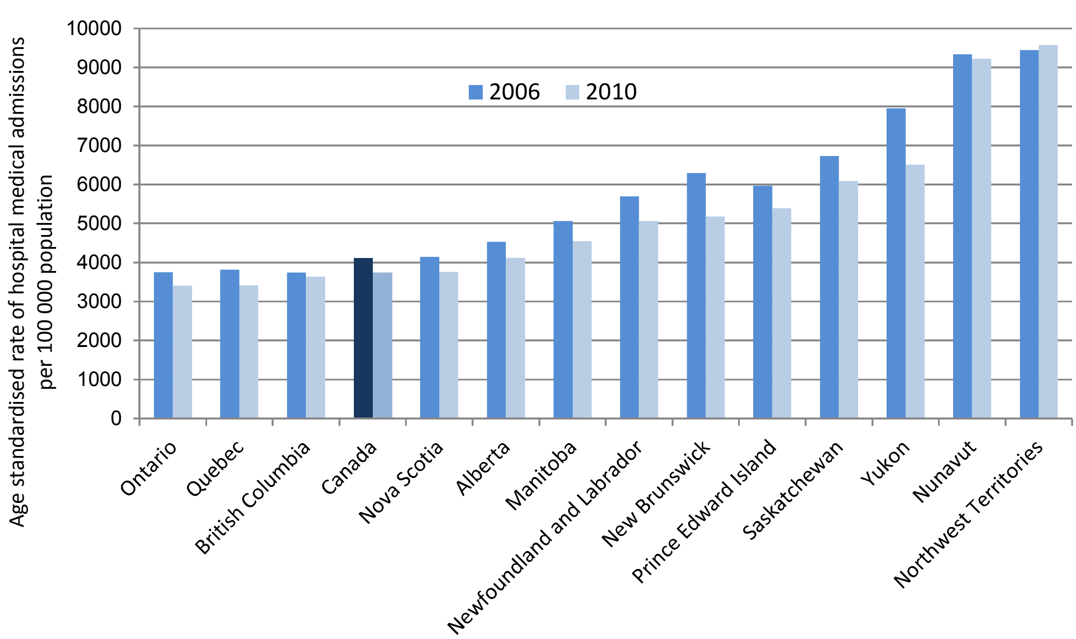
Hospital medical admissions

This section presents hospital medical admission rates due to a medical reason for patients aged 20 and older (excluding mental health and obstetric discharges). In 2006-07, these medical hospitalisations comprised one-third (33%) of all hospitalisations. The data cover only the period 2006 to 2010, as 2006 is the earliest year where a consistent methodology can be applied across all health regions.

There has been a general reduction in hospital medical admission rates across Canada between 2006 and 2010 (Figure 4.2). During that period, the national average declined by 9%, and Canada continues to have one of the lowest rates of hospital medical admissions across OECD countries (OECD, 2013b). In both 2006 and 2010, Ontario, Quebec and British Columbia (the three most populated provinces) had the lowest hospital medical admission rates in Canada, while the rate was almost two times greater in Saskatchewan. Leaving aside the three territories where hospital medical admissions continue to be very high, the degree of variation across health regions within provinces decreased slightly between 2006 and 2010, meaning that the reduction in admission rates tended to be more pronounced in those regions that had high rates in 2006.

Admission rates in the two territories of Nunavut and the Northwest Territories have remained very high between 2006 and 2010, with no sign of a reduction. As already mentioned, the very high rates in these two territories are due to factors such as the remoteness of hospital locations and the lack of primary care providers, leading to admissions of people who might have otherwise been managed without any hospitalisation (CIHI, 2009a). Admission rates in Yukon have come down significantly between 2006 and 2010, although they remain much higher than the national average.

Figure 4.2. Hospital medical admission rate, by province/territory, Canada, 2006 and 2010

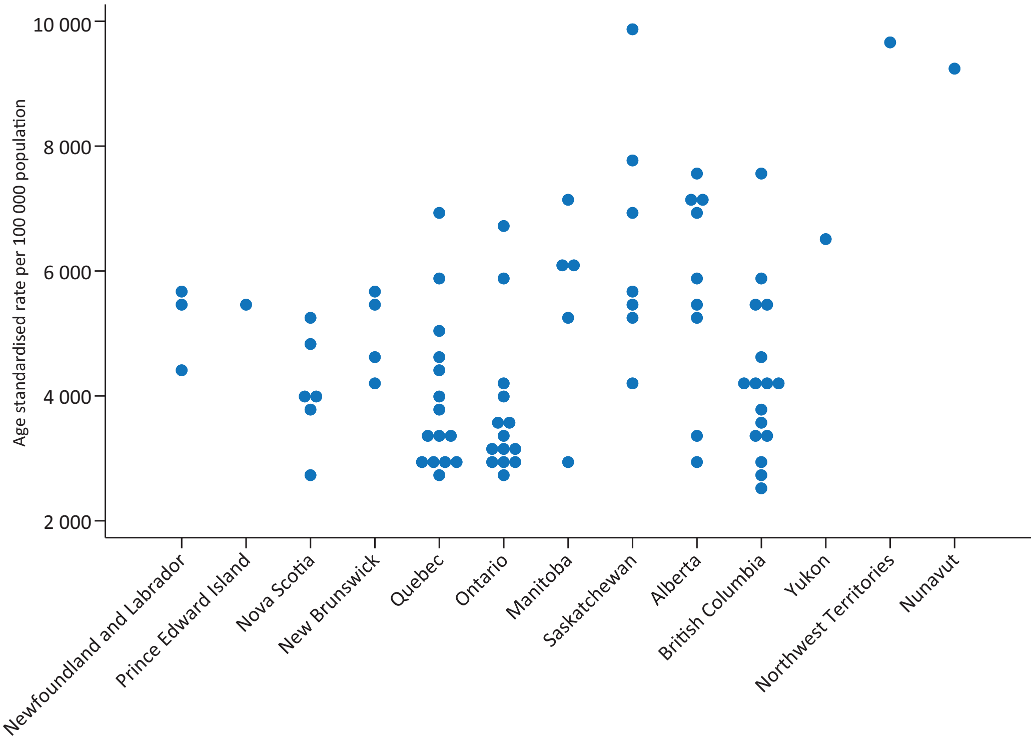


Note: The Canadian rate is calculated as the total number of hospital admissions (age-standardised) divided by the total population.

Source: Authors' estimates based on Hospital Morbidity Database.

There were also large variations in hospital medical admissions across health regions in each province (Figure 4.3). For instance, the rates in British Columbia varied substantially, with the rate in the South Vancouver Island region about three times lower than in the Northwest region. In Saskatchewan, admission rates in the Saskatoon Regional Health Authority region were more than two times lower than in the Sunrise Regional Health Authority (which had rates in the same range as in the Northwest Territories and Nunavut).

Figure 4.3. Hospital medical admission rate, by province and by health region, Canada, 2010



Source: Authors' estimates based on Hospital Morbidity Database.

Some of the differences in hospital medical admission rates across provinces and territories as well as across health regions in provinces are due to differences in admissions for "ambulatory care sensitive conditions" (ACSC). ACSC are defined as conditions where appropriate ambulatory care may prevent or reduce the need for hospitalisation. Hospitalisations for ACSC are used as an indirect measure of access to appropriate primary care. Based on CIHI analysis, in 2006, the rate of ACSC hospitalisation in Canada was more than 50% higher in rural areas compared with urban areas. Furthermore, poor urban neighbourhoods had a higher rate of ACSC hospitalisation (more than two-times higher) than the wealthiest neighbourhoods (CIHI, 2008). Strengthening primary care services in rural areas and poor neighbourhoods would therefore help reduce hospital medical admissions.

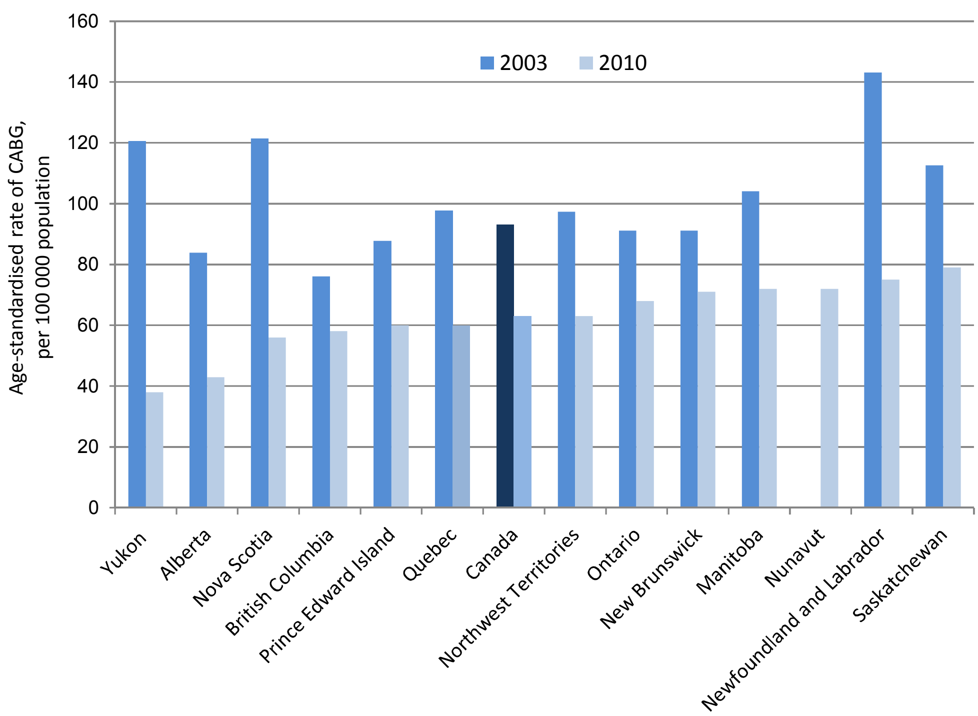
Revascularisation procedures

Coronary artery bypass graft (CABG) and coronary angioplasty (or percutaneous transluminal coronary angioplasty or PTCA, also referred to as PCI for percutaneous coronary intervention) are two recognised revascularisation procedures for patients suffering from ischaemic heart disease (heart attack). In Canada as in most other OECD countries, PTCA has over the past two decades become the main revascularisation procedure as it is a much less invasive than CABG, although the utilisation rate of PTCA and CABG still varies significantly across countries and also within different regions in each country.

Coronary artery bypass graft (CABG)

The use of CABG has continued to decline in all Canadian provinces and territories between 2003 and 2010 (Figure 4.4), while coronary angioplasty (PTCA) increased in most (but not all) provinces and territories (Figure 4.6). On average across the country, the CABG rate decreased by nearly one-third between 2003 and 2010 (from 93 per 100 000 population in 2003 to 63 in 2010), with the reduction being the largest in the provinces of Newfoundland, Nova Scotia, Alberta and Saskatchewan, as well as in the Yukon territory. Still, in 2010, significant variations in CABG rates across provinces remained, with much higher rates in Saskatchewan and Newfoundland compared with Alberta and Nova Scotia.

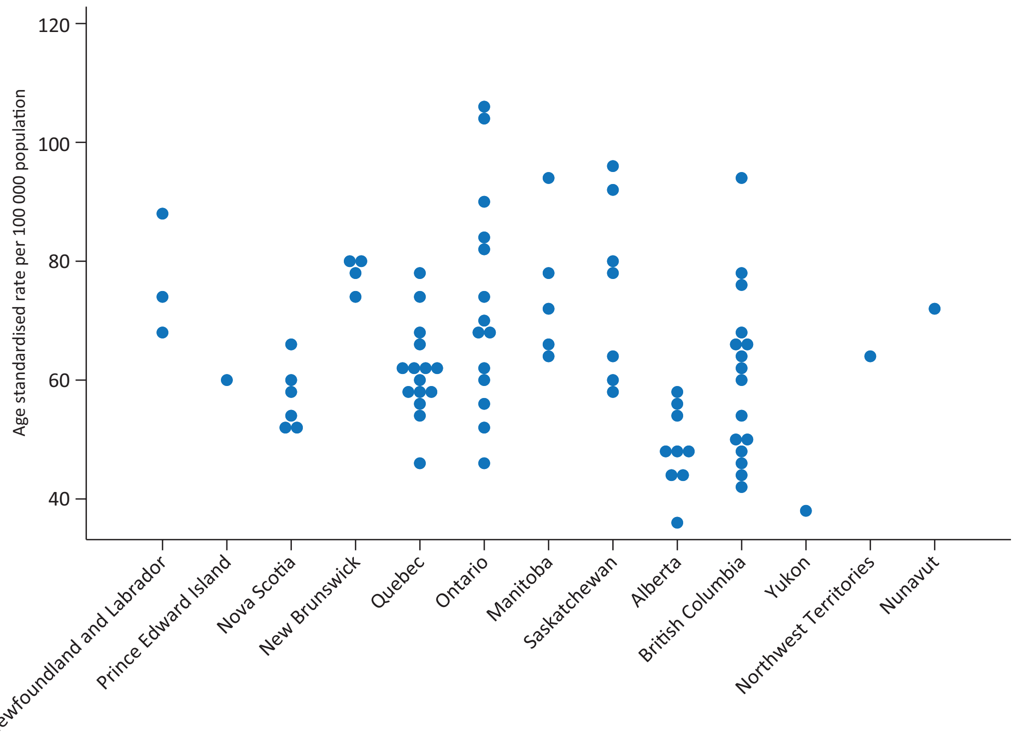
Figure 4.4. CABG rate by province/territory, Canada, 2003 and 2010



Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Among health regions within provinces, the variations in 2010 were particularly large in Ontario and British Columbia (Figure 4.5). In Ontario, the CABG rates in 2010 were more than twice as high in the North West Region and the South East Region (over 100 per 100 000 population) compared with the Toronto Central region (less than 50 per 100 000). In British Columbia, the CABG rates were also more than twice as high in the Northwest region compared with several other regions.

Figure 4.5. CABG rate by province and by health region, Canada, 2010



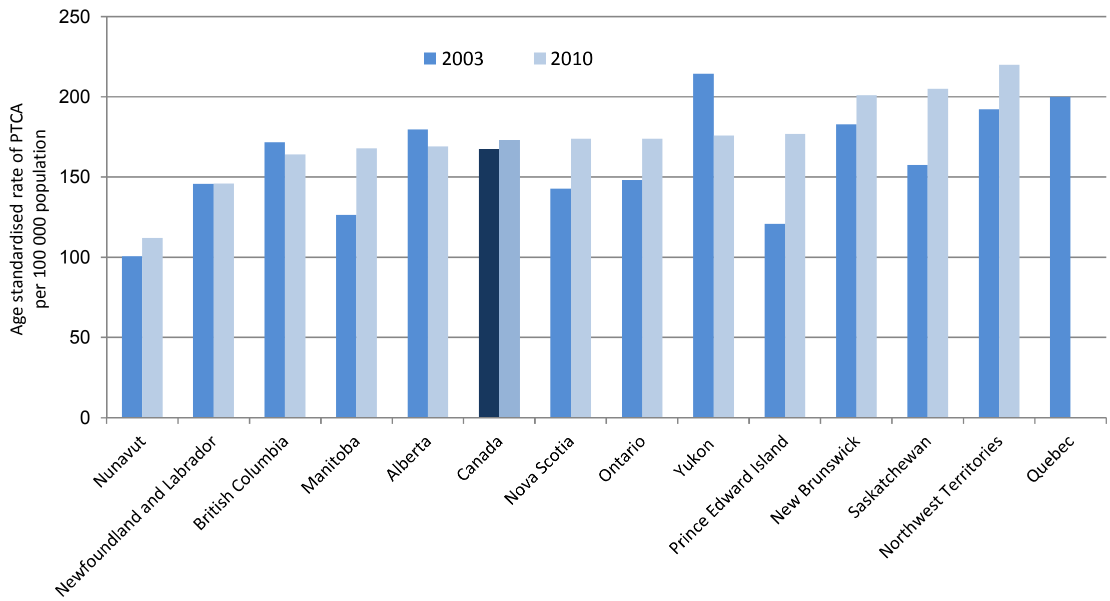
Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Percutaneous transluminal coronary angioplasty (PTCA)

In contrast with CABG, the rates of PTCA have increased in most provinces and territories between 2003 and 2010, although the rise has often been quite small (Figure 4.6). On average across Canada, the age-standardised rate of PTCA rose from 167 per 100 000 population in 2003 to 173 in 2010. The rates came down slightly in two western provinces (British Columbia and Alberta), as well as in the Yukon territory. However, the reduction in PTCA rates in these two provinces and territory was much lower than the reduction in CABG rates, so the share of PTCA in the total number of revascularisation procedures continued to increase during this period (see below).

The variations in PTCA rates generally decreased across different health regions in provinces between 2003 and 2010, indicating some convergence in the use of PTCA (the coefficient of variation came down from 0.30 in 2003 to 0.21 in 2010). Nevertheless, there remain important variations in PTCA rates between health regions in 2010, with Alberta and Ontario showing the largest variations (Figure 4.7). In Alberta, the Peace Country Health Region recorded the highest PTCA rate in the province (287 per 100 000 population), about twice the rate observed in several other health regions. Similarly, in Ontario, some health regions had PTCA rates that were about double those in other regions (e.g. the PTCA rates in the North West and North East Region were 284 and 246 per 100 000 population respectively, compared to about 150 in several other regions).

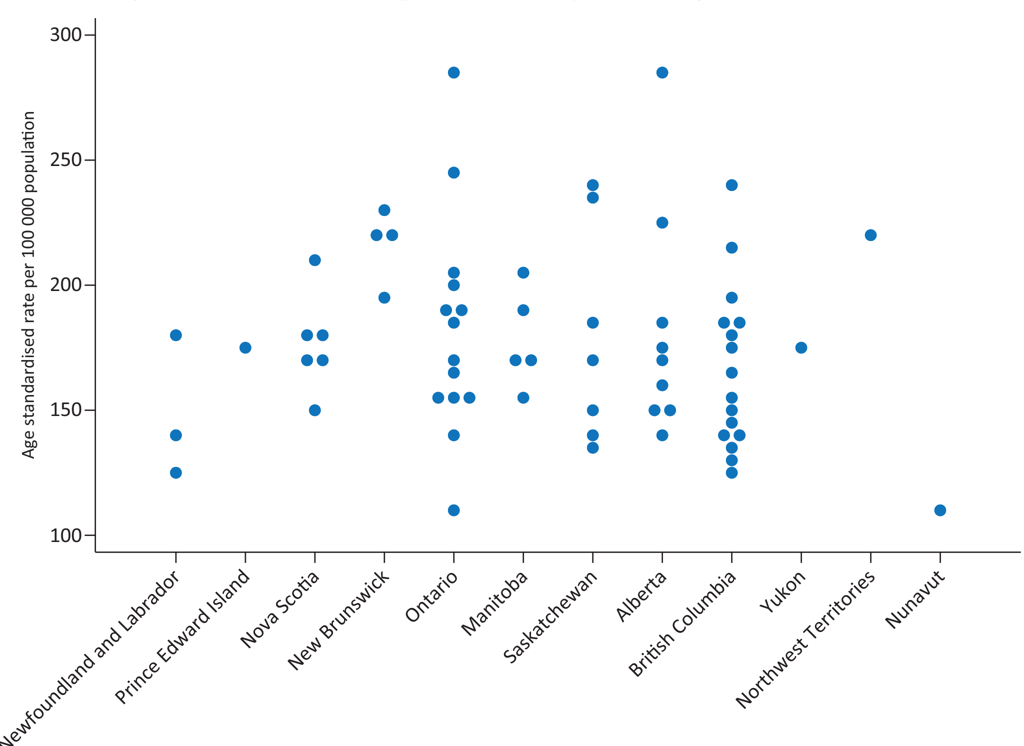
Figure 4.6. PTCA rate by province/territory, Canada, 2003 and 2010



Note: The data for Quebec in 2010 are not available due to differences in data collection.

Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Figure 4.7. PTCA rate by province and by health region, Canada, 2010



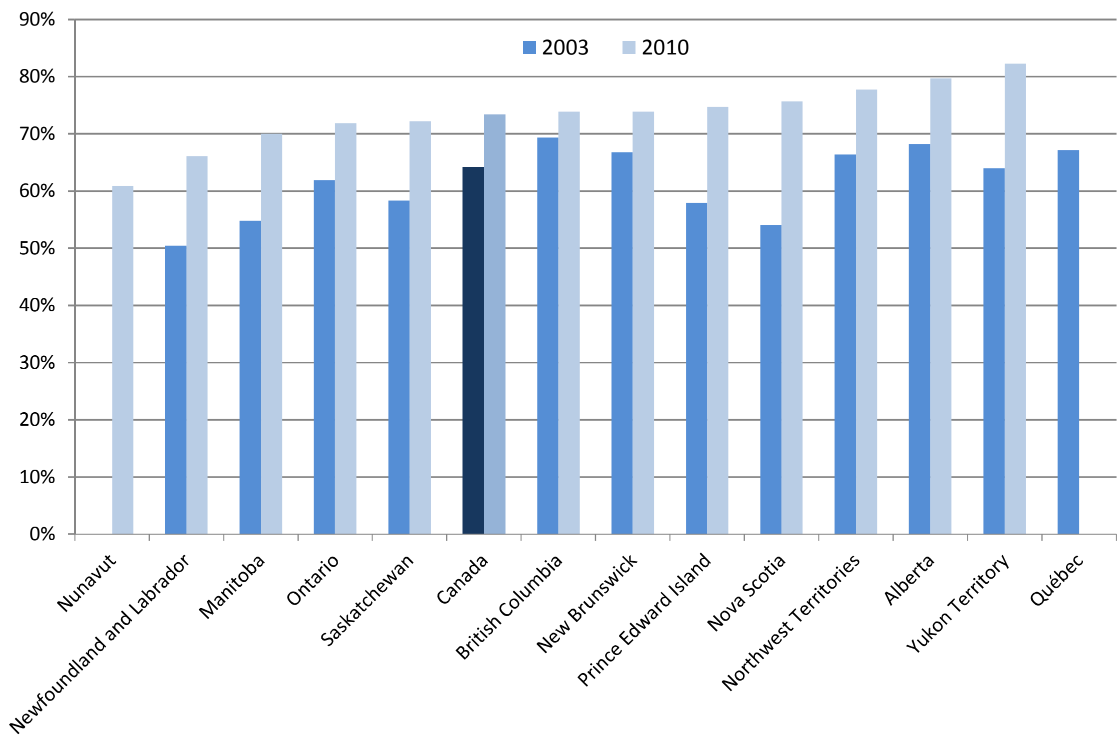
Note: The data for Quebec in 2010 are not available due to differences in data collection.

Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Ratio of PTCA to CABG

As in other OECD countries, the share of coronary angioplasty (PTCA) in the total number of revascularisation procedures has continued to increase in Canada between 2003 and 2010, with the share rising from 64% in 2003 to 73% in 2010 (Figure 4.8). This rise occurred in all provinces and territories. In 2010, the share of PTCA among all revascularisation procedures was highest in Alberta (80%) and Yukon (82%).

Figure 4.8. Share of PTCA in total revascularisation procedures, by province and territory, Canada, 2003 and 2010



Note: Revascularisation procedures include CABG and PTCA.

Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Around the year 2000, concerns about the potential misuse of advanced cardiac care treatments and the associated higher health care costs stimulated the publication of the Canadian Cardiovascular Atlas by the Canadian Cardiovascular Outcome Research Team in 2004 (Tu et al., 2004). This national report and the research conducted as part of it highlighted large variations in CABG and PTCA rates across provinces and health regions around 2000. These variations were not fully explained by clinical factors, which raised questions about the appropriateness of care (Pilote et al., 2004). One of the interpretations for these variations was that the low level of interactions between different jurisdictions in Canada was leading to different levels of investment in cardiac procedures overall and the persistence of variations in clinical practice patterns. These variations have been reduced since then.

More recently, Ko et al. (2012) evaluated the association between the appropriateness of coronary revascularisation and long-term outcomes in 2006-07 in Ontario, for a cohort of stable patients undergoing cardiac catheterisation. This research identified both a substantial under-utilisation and over-utilisation of coronary revascularisation. Under-utilisation, which was defined as the failure to treat patients with appropriate clinical indicators, was associated with significantly increased risks of adverse outcomes at a three-year follow-up, whereas over-utilisation on inappropriate patients was not associated with any positive health outcomes (e.g., lower mortality or lower readmission rates).

Also in Ontario, the Cardiac Care Network (in partnership with the Institute for Clinical Evaluative Sciences – ICES) recently published research on revascularisation practices that found a three-fold variation in the ratio of PTCA to CABG across different hospitals in Ontario (Tu et al., 2012; Cardiac Care Network, 2010). This research identified a list of factors that can influence the mode of revascularisation chosen beyond patient characteristics, and which are more related to physician or hospital characteristics. Variations observed across a wide range of patient characteristics and clinical factors suggest that clinical practice patterns are part of the decision-making culture of each hospital. The study concluded that there are opportunities to improve transparency and consistency in decision making for coronary revascularisation.

Ouzounian et al. (2013) examined the determinants of PTCA versus CABG in three Canadian provinces (British Columbia, Alberta and Nova Scotia). Using data from 1996 to 2007, this study also found that the ratio of PTCA to CABG increased in the three provinces, but the ratios still differed. After adjusting for clinical factors, there remained a significant variation in the choice of PTCA versus CABG between the three provinces over time. The authors concluded that the choice of treatment for patients with ischaemic heart disease appears to be influenced by a range of non-clinical factors, including geographic region, clinical site (hospital), financial structure, medico-legal concerns, and patient preference for less invasive procedures.

Findings from these Canadian research projects suggest that further convergence in clinical practice for patients with ischaemic heart disease may be possible through more consistent implementation of clinical guidelines, although a certain degree of variation may remain due to differences in patient preferences for one type of intervention over the other.

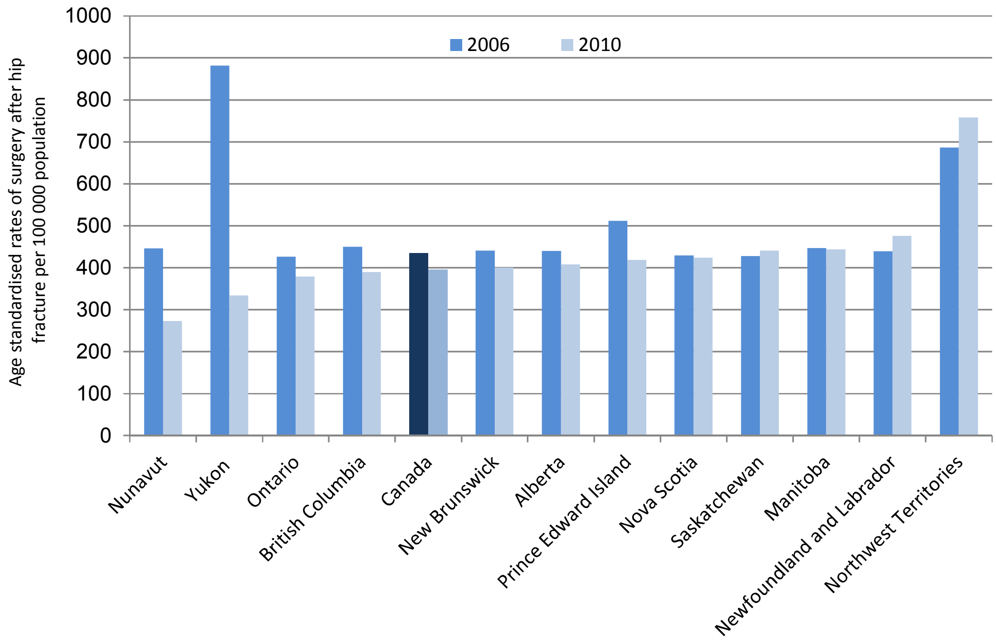
Joint procedures

Surgery after hip fracture

Surgery after hip fracture was selected in this study as a "calibration" procedure, based on the assumption that there was little discretion to admit and operate patients after hip fracture and that the age-standardised rates should therefore be fairly similar across regions if the incidence of hip fracture is similar.

The rate of surgery after hip fracture declined in Canada between 2006 and 2010, from 435 per 100 000 population aged 65 and over in 2006 to 395 per 100 000 in 2010. This continues the downward trend observed over the previous 20 years (Leslie et al., 2009). While the rates in most provinces fell slightly between 2006 and 2010, the trends across the three territories moved in opposite directions: there was a sharp reduction in both Yukon and Nunavut, but a small increase in the Northwest Territories (Figure 4.9). The reasons for the continued high rate of surgery after hip fracture in the Northwest Territories are unknown.

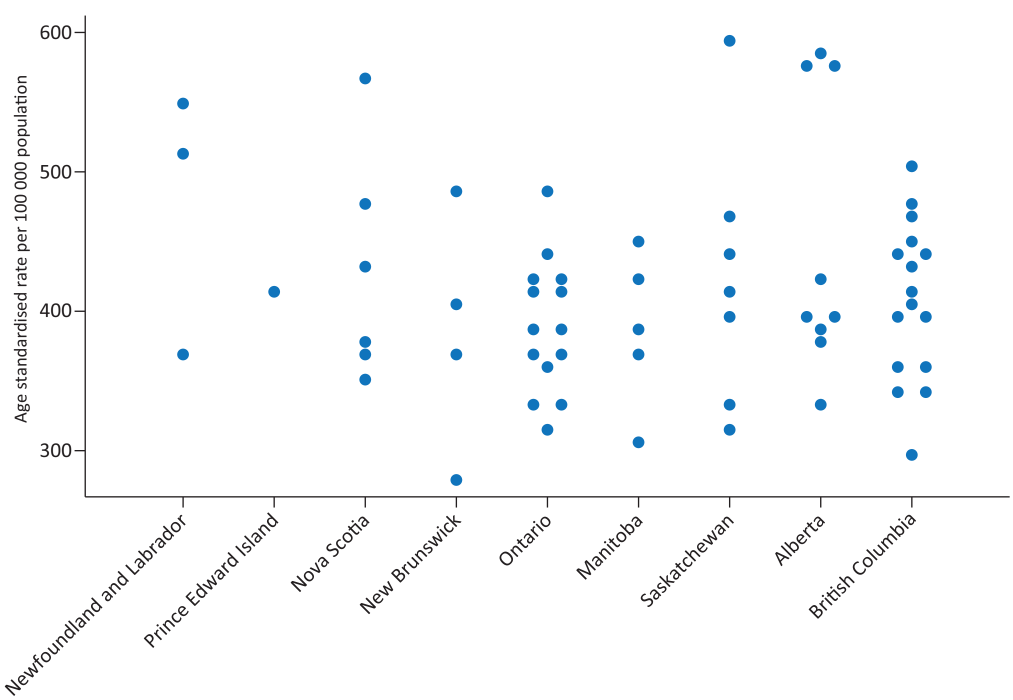
Figure 4.9. Rate of surgery after hip fracture by province/territory, people aged 65 and over, Canada, 2006 and 2010



Note: Data do not include Quebec due to differences in data collection.

Source: Authors' estimates based on Hospital Morbidity Database.

Figure 4.10. Rate of surgery after hip fracture by province and by health region, people aged 65 and over, Canada, 2010



Source: Authors' estimates based on Hospital Morbidity Database.

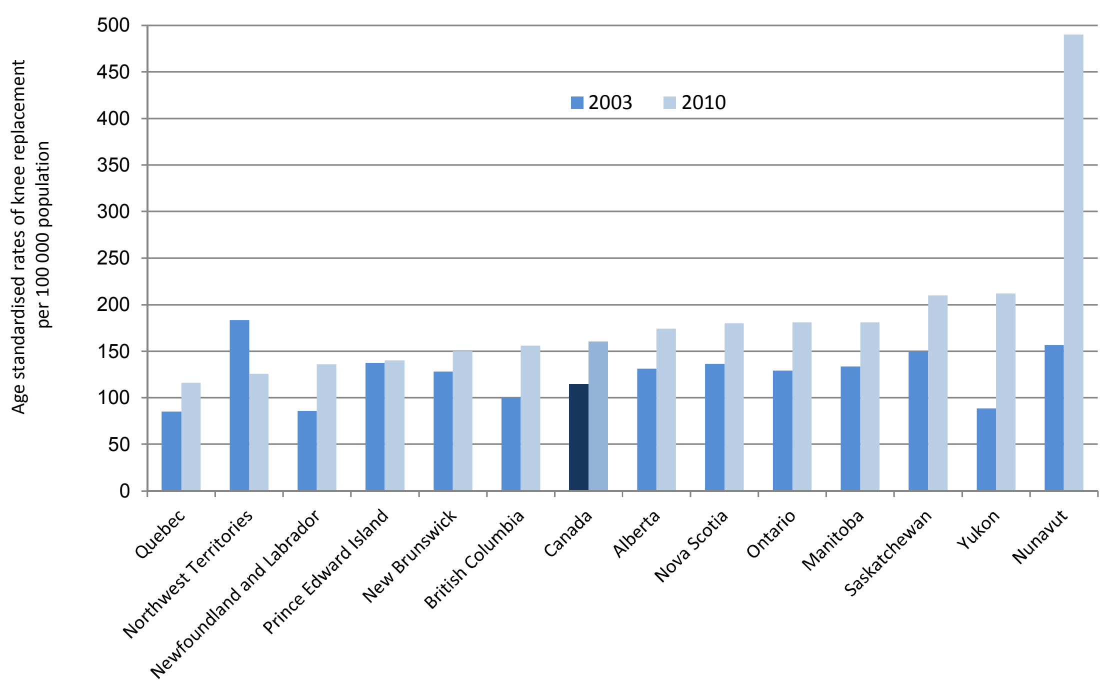
As expected, this procedure shows the lowest variation across provinces and health regions (when the three territories are not taken into account). Still, there is substantial variation between health regions within many provinces (Figure 4.10). The reasons for the very high rates of surgery after hip fracture in certain health regions in some provinces might deserve further analysis.

Knee replacement

Knee replacement rates have increased substantially over the past decade in Canada as in other OECD countries (OECD, 2013b). This increase is due not only to population ageing, but also to the growing use of this intervention for people at younger ages (for example, 38% of people who received a knee replacement in Canada in 2010 were age 45-64 years old).

Figure 4.11 shows that, on average, the age-standardised rate of knee replacement in Canada increased by nearly 40% between 2003 and 2010, rising from 115 per 100 000 population in 2003 to 160 in 2010. All provinces saw an increase, with a particularly strong rise in Newfoundland and in British Columbia (55%), although the rate in Newfoundland still remains below the national average. The knee replacement rate in Saskatchewan grew at the same pace as the national average, and Saskatchewan continued to have the highest rate among all provinces in 2010. The very strong increase in the territory of Nunavut occurred mainly between 2003 and 2006. It is important to keep in mind that the absolute number of knee replacements in Nunavut in 2010 remained very low (less than 100).

Figure 4.11. Knee replacement rate by province/territory, Canada, 2003 and 2010

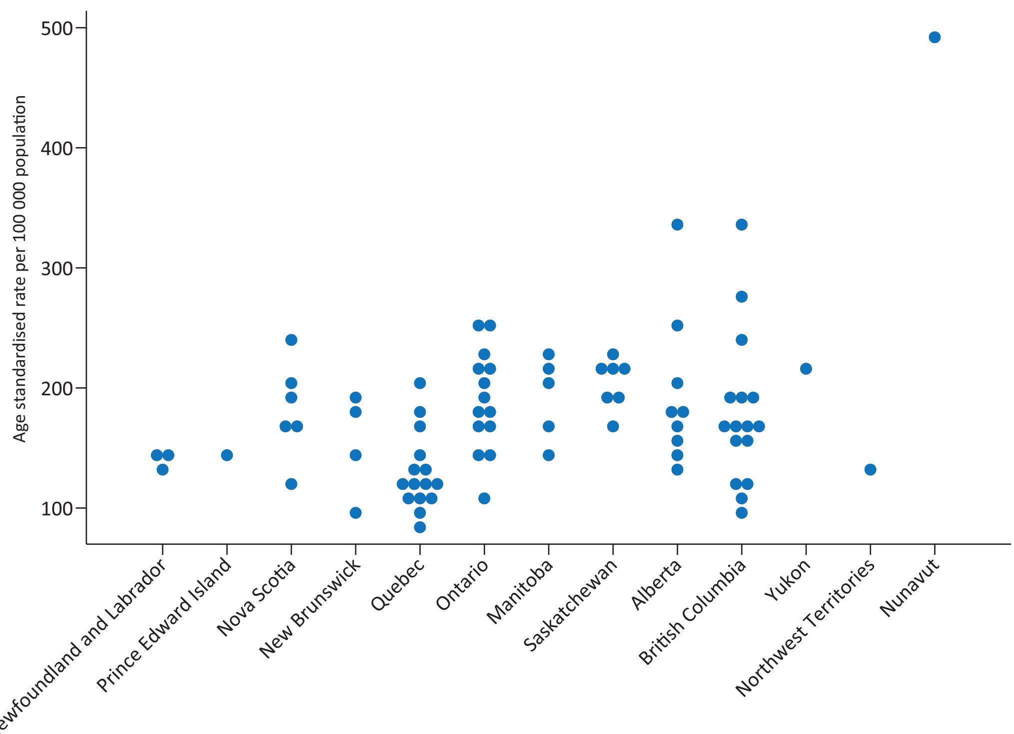


Source: Authors’ estimates based on Hospital Morbidity Database.

Figure 4.12 shows the variations between health regions within provinces in 2010. The largest variations were in British Columbia and Alberta. In British Columbia, there was a more than three-fold difference between the health region with the lowest rate of knee replacement (93 per 100 000 population in the Vancouver region) and the region with the highest rate (332 per 100 000 population in the Northern Interior region). In Alberta, there was a more than two-fold difference in knee replacement rates between the region with the lowest rate (128 per 100 000 population in the Northern Lights Health Region) and the region with the highest rate (330 per 100 000 population in the Chinook Regional Health Authority). There was much less variation in Saskatchewan, although the rates were generally higher than in most regions in Alberta and British Columbia.

Leaving aside the three territories, the coefficient of variation across health regions within provinces remained stable between 2003 and 2010.

Figure 4.12. Knee replacement rate by province and health region, Canada, 2010



Source: Authors' estimates based on Hospital Morbidity Database.

A number of studies have analysed some of the potential reasons for regional variations in knee replacement in Canada. An early study in the late 1990s focusing on health regions in Ontario found that at that time orthopaedic surgeons' opinions or enthusiasm for the procedure was the main determinant of variations (Wright et al., 1999). This study underlined the need to focus on modifying the practice of some surgeons to reduce these variations.

More recently, CIHI's analysis attributed some of these geographic variations to other factors beyond differences in physician practice patterns, including differences in the need for knee replacement in different provinces and regions (for example, the lowest knee replacement rate in Quebec is associated with the lowest proportion of people reporting arthritis, rheumatism or being obese). Another possible explanation was possible differences in access to knee replacement, which was lower in Quebec in 2009. CIHI also carried out analysis on the relationship between knee replacement rates and the waiting times for these interventions (as an indicator of unmet need), but did not find any strong correlation (CIHI, 2009b).

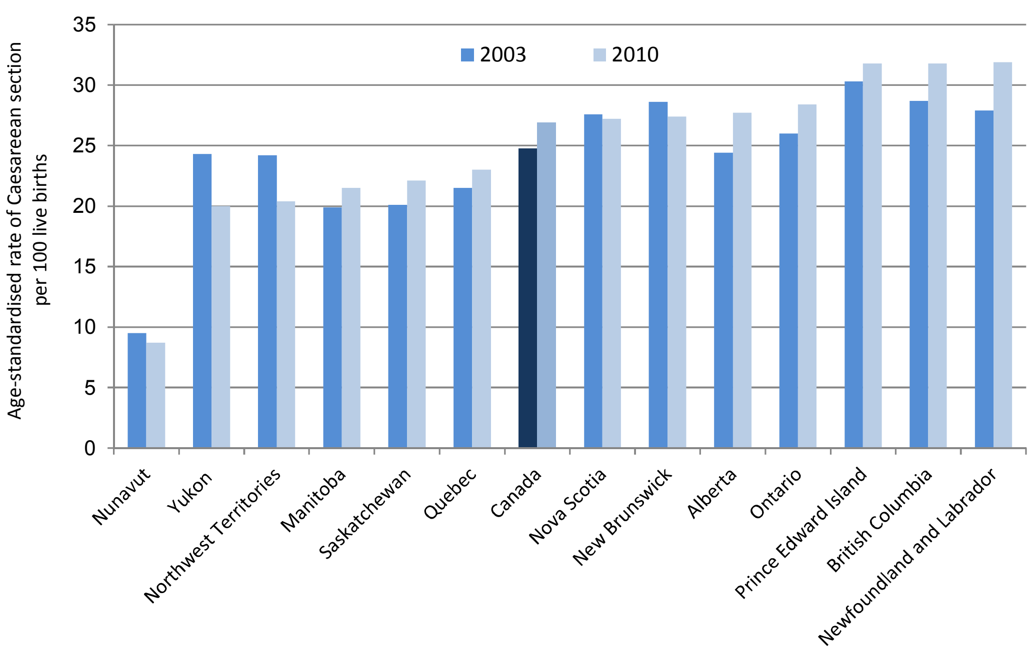
CIHI started to develop a Canadian Joint Replacement Registry in 2001, which as it stands collects data on utilisation rates, patient characteristics, clinical issues and waiting times. So far (up until 2013), this Registry has not collected any data on patient-related outcomes following knee (or hip) replacement, for instance any information from patients about reduction in pain or improvement in functioning. This contrasts with the situation in some other OECD countries, such as Sweden and the United Kingdom, which have been monitoring patient-related outcomes following knee replacement, for more than ten years in Sweden and since 2009 in the United Kingdom. One of the stated future directions of the Canadian Registry will be to improve its ability to contribute to quality improvements for people having knee or hip replacements (CIHI, 2013b).

Gynaecological procedures

Caesarean sections

Between 2003 and 2010, caesarean section rates in Canada rose from 25% of all deliveries to 27% (Figure 4.13). Newfoundland, Prince Edward Island and British Columbia had the highest caesarean section rates in 2010, at over 30%. Leaving aside the three territories where caesarean section rates were the lowest in 2010, the provinces of Manitoba, Saskatchewan and Quebec had the lowest caesarean section rates in both 2003 and 2010, although the rates have increased in these three provinces as well.

Figure 4.13. Caesarean section rate by province/territory, Canada, 2003 and 2010

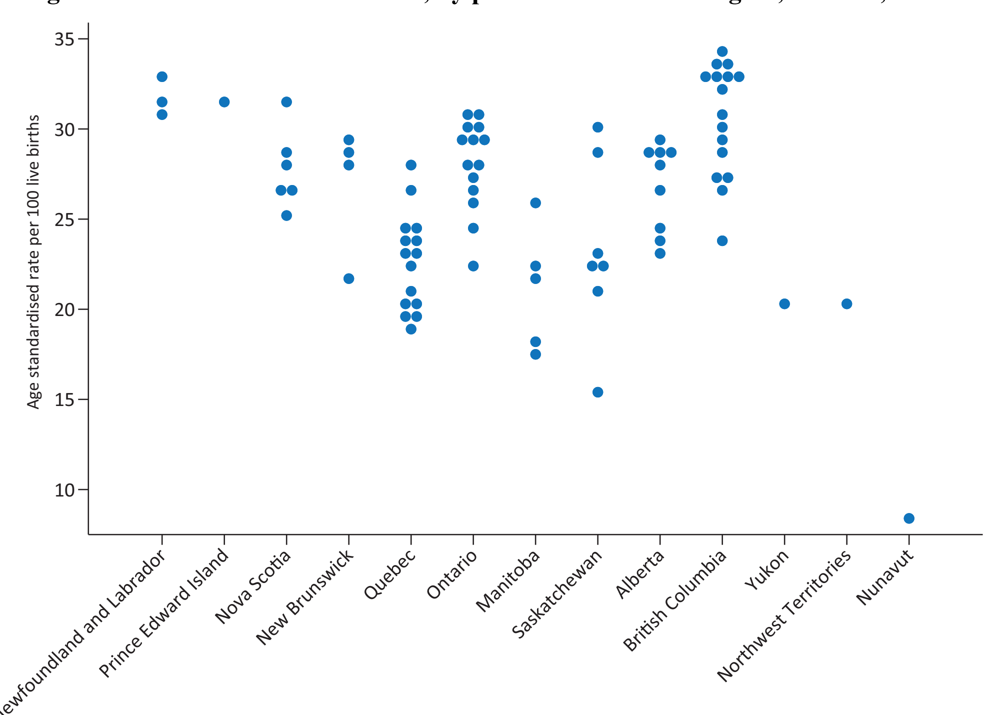


Source: Authors' estimates based on Hospital Morbidity Database.

The territory of Nunavut had, by far, the lowest caesarean section rate in both 2003 and 2010 (less than 10% of all deliveries). This low rate can be attributed at least partly to a much younger average age of mother at childbirth, reducing the risk of a caesarean section. In 2010, the average age of mother at childbirth in Nunavut was five years younger than the national average (24.6 years compared with a national average of 29.6 years). The average age of mother in Nunavut was also significantly lower than in the other two territories. In Yukon and the Northwest Territories, caesarean section rates decreased between 2003 and 2010, from about 25% to 20%, and now fall below the national average. Based on CIHI analysis, the low caesarean section rates in the three territories are due to a combination of a lower rate of primary (first) caesarean section, particularly among women aged under 35, and a lower rate of repeat caesarean section (the proportion of women who had another caesarean section after a previous one), particularly in Nunavut. While more than 80% of women in Canada who had a previous caesarean section had a repeat caesarean section in 2010, this proportion was only about 40% (half) in Nunavut (CIHI, 2012b).

Across health regions in provinces, there are also wide variations in caesarean section rates (Figure 4.14). In British Columbia, the caesarean section rate reached a high of almost 35% in some regions in 2010 (e.g., 34% in the Fraser North region), while it was less than 25% in the Northwest region. In Saskatchewan, the rates varied from a high of over 30% in one region (Five Hills Regional Health Authority) to a low of just over 15% in another (the Prince Albert Parkland Regional Health Authority). The rates in Manitoba and Quebec also varied substantially across health regions.

Figure 4.14. Caesarean section rate, by province and health region, Canada, 2010



Source: Authors' estimates based on Hospital Morbidity Database.

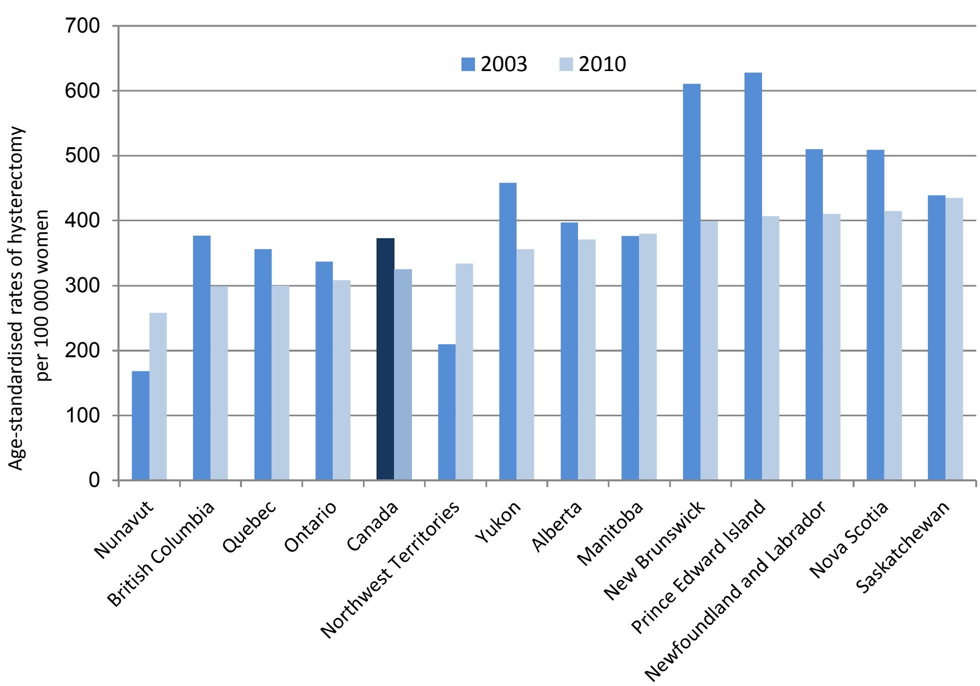
Research in Canada has shown that even after controlling for maternal characteristics (including age and having had a previous caesarean section), caesarean section rates still vary considerably (Heffner et al., 2003; Hanley et al., 2010). Using data from British Columbia between 2004 and 2007, Hanley and colleagues (2010) found that primary caesarean section rates varied two-fold across different health regions in the province, even after controlling for known risk factors. These findings suggest that some of the variation may be attributed to providers (obstetricians) and/or patient preferences for caesarean sections.

In response to the rise in caesarean section rates across the country, the Society of Obstetricians and Gynaecologists of Canada released in 2008 a joint policy statement aimed at reducing unnecessary caesarean sections and promoting normal childbirth whenever possible. The Society also recommended that women who had already had a caesarean section should be given an opportunity to attempt vaginal birth in subsequent deliveries (Society of Obstetricians and Gynaecologists of Canada, 2008). However, as noted by CIHI, the lack of a general consensus in Canada and internationally on clear clinical indications for caesarean sections has meant that these recommendations have remained quite general and decisions to opt for caesarean sections continue to be discretionary and often based on non-medical factors (CIHI, 2010).

Hysterectomy

As in most other OECD countries, there has been a gradual reduction in hysterectomy rates (the complete or partial removal of the uterus) in Canada between 2003 and 2010 (Figure 4.15), continuing a downward trend that started in the 1980s. Still, hysterectomy remains the second most common surgery among Canadian women, after caesarean section delivery (CIHI, 2010).

Figure 4.15. Hysterectomy rate by province/territory, Canada, 2003 and 2010

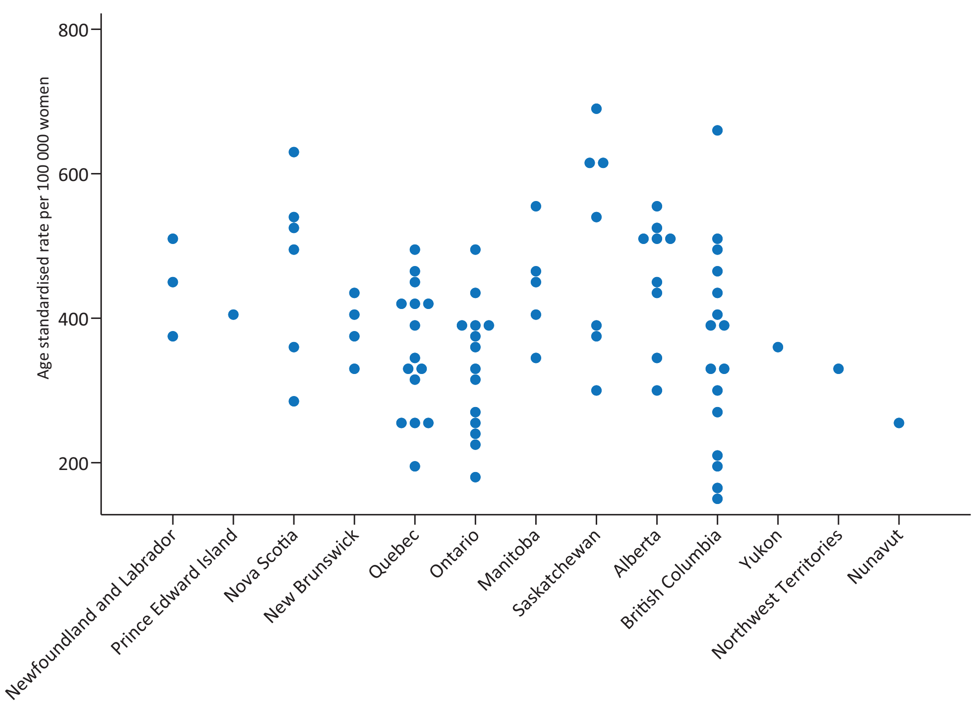


Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

The reduction in hysterectomy rates between 2003 and 2010 was more pronounced in certain provinces than in others. For example, while there was a substantial reduction in provinces like New Brunswick and Prince Edward Island (which had by far the highest rates in 2003), there was virtually no change in Saskatchewan, leaving Saskatchewan with the highest rate in 2010, more than one-third higher than in British Columbia, Ontario and Quebec.

There are also large variations in hysterectomy rates across health regions within provinces, and these variations have not diminished between 2003 and 2010. In 2010, in British Columbia, hysterectomy rates varied more than four-fold, from the highest rate of 658 per 100 000 women in the Northern Interior region to the lowest rate of 152 per 100 000 women in the Vancouver region. In Saskatchewan and Nova Scotia (which have the highest hysterectomy rates among all provinces), there are also large variations across health regions, with some reporting very high rates while others have low rates (Figure 4.16).

Figure 4.16. Hysterectomy rate by province and by health region, Canada, 2010



Source: Authors' estimates based on Hospital Morbidity Database and National Ambulatory Care Reporting System.

Clinical practice guidelines on the use of hysterectomy have been developed and updated by the Society of Obstetricians and Gynaecologists of Canada (2010). While these guidelines might have contributed to the continuous reduction in hysterectomy rates overall, they do not seem to have managed to reduce the variations across provinces and health regions.

Research by CIHI found that (age-standardised) hysterectomy rates in 2008-09 were significantly higher for women living in rural areas (464 per 100 000) compared with women living in urban areas (318 per 100 000). This may be due to greater access to other treatment options for women living in urban areas (CIHI, 2010). Some qualitative, small-scale research in Nova Scotia also suggests that cultural factors may play a role in women's decisions to have (or not to have) a hysterectomy (Fredericks, 2013).

Computed tomography (CT) and magnetic resonance imaging (MRI) exams

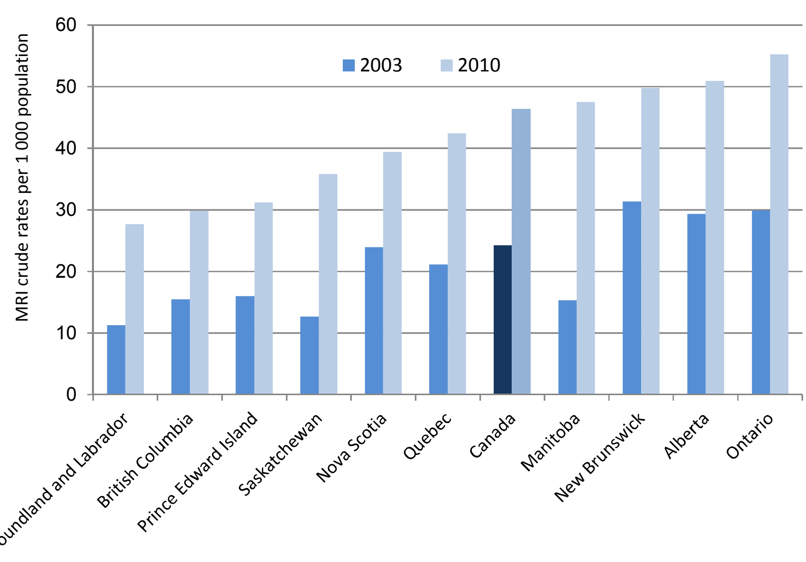
The use of medical imaging equipment, such as computed tomography (CT) scanners and magnetic resonance imaging (MRI) units, has increased greatly throughout Canada between 2003 and 2010 (Figures 4.17 and 4.18). While the rate of CT exams went up by over 40% (from 87 per 1 000 population in 2003 to 125 in 2010), the rate of MRI exams nearly doubled (from 24 to 46 per 1 000 population).

The number of CT exams and MRI exams increased in all provinces (and territories in the case of CT exams). In many cases, the increase has been faster in those provinces (and territories) that had lower rates in 2003, indicating a certain degree of convergence in the use of CT and MRI exams. For CT exams, the rapid rise in the two territories led to a reduction in the coefficient of variation (from 0.32 in 2003 to 0.28 in 2010). However, if these two territories are excluded from the analysis, there was no reduction in the variation across provinces. In the case of MRI exams, there was an unambiguous reduction in the degree of variation across provinces (with the coefficient of variation coming down from 0.36 to 0.24 between 2003 and 2010).

Nonetheless, there remained significant variations in the use of CT exams and MRI exams between provinces in 2010. The rate of CT exams in Alberta was less than half that in New Brunswick. CT exam rates were also much lower in the two territories where there are CT scanners (probably due to low population density). For MRI exams, the rates in Newfoundland, British Columbia and Prince Edward Island were much lower than in Ontario, Alberta and New Brunswick.

There appears to be a certain degree of substitution between MRI and CT exams in provinces like Newfoundland, Saskatchewan and Nova Scotia, which have above-average rates of CT exams, but below-average rates of MRI exams.

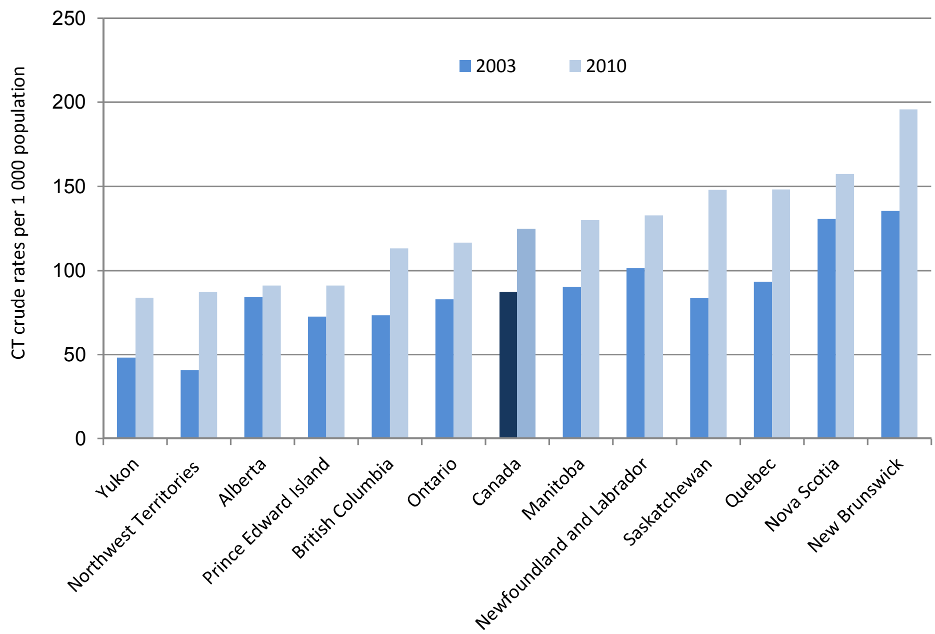
Figure 4.17. Rate of MRI exams by province, Canada, 2003 and 2010



Note: There was no MRI unit in the three territories in 2003 and 2010.

Source: Authors’ estimates based on National Survey of Selected Medical Imaging Equipment Database.

Figure 4.18. Rate of CT exams by province/territory, Canada, 2003 and 2010



Note: There was no CT unit in the territory of Nunavut in 2003 and 2010.

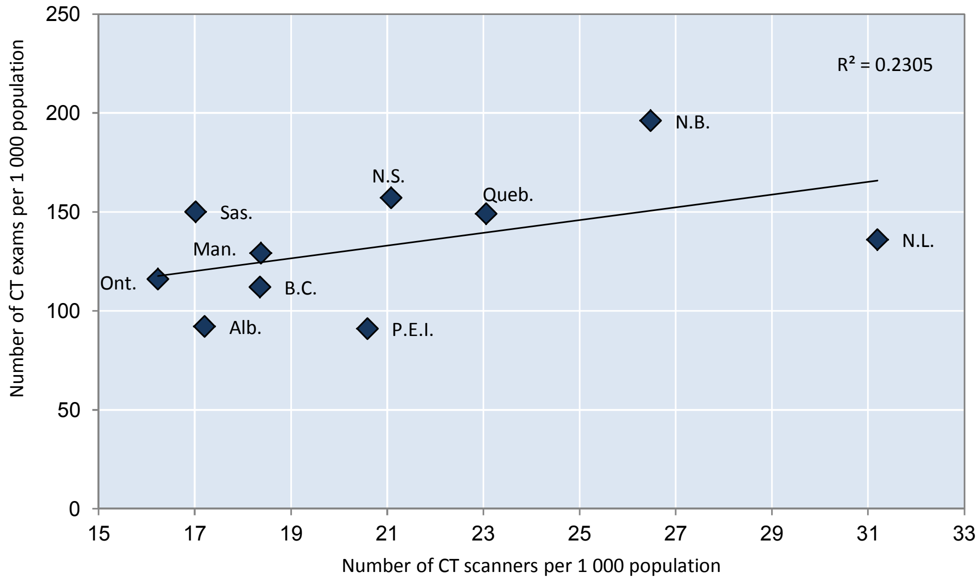
Source: Authors' estimates based on National Survey of Selected Medical Imaging Equipment Database.

Since the 2004 federal/provincial agreements on a *10-year Plan to Strengthen Health Care* in Canada, substantial investments have been made throughout the country to expand the number of CT and MRI units, with the aim of improving access and utilisation rates and reducing waiting times. The strong rise in the number of CT and MRI exams are linked at least partly to these large investments. Nationally, the total number of CT scanners increased by nearly 50% (from 341 at the end of 2003 to 502 at the end of 2010), while the number of MRI scanners nearly doubled (from 157 to 293) (CIHI, 2013c). The increased availability of CT and MRI scanners was widespread across all provinces, although the rise was particularly rapid in certain provinces, including Ontario, British Columbia and Quebec.

There is a positive correlation between the availability of CT scanners and the number of CT exams across provinces (Figure 4.19). For example, the greater supply of equipment in New Brunswick and Quebec is associated with a greater number of exams than in most other provinces.

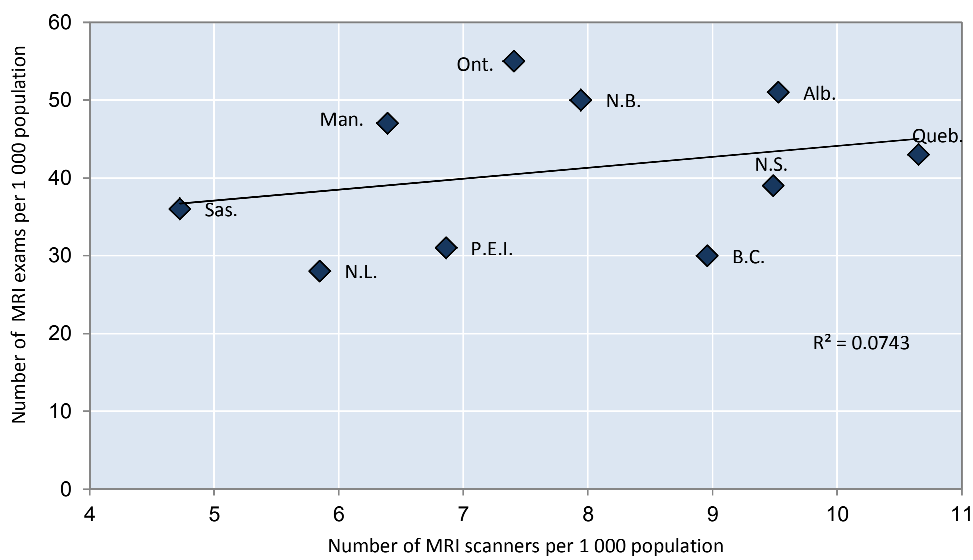
However, the correlation between the supply of MRI scanners and the number of MRI exams is almost nil (Figure 4.20). This indicates that the number of MRI exams is not mainly driven by the availability of the equipment, but rather by the intensity of use of each machine.

Figure 4.19. Number of CT scanners and CT exams by province, Canada, 2010



Source: Authors' estimates based on National Survey of Selected Medical Imaging Equipment Database.

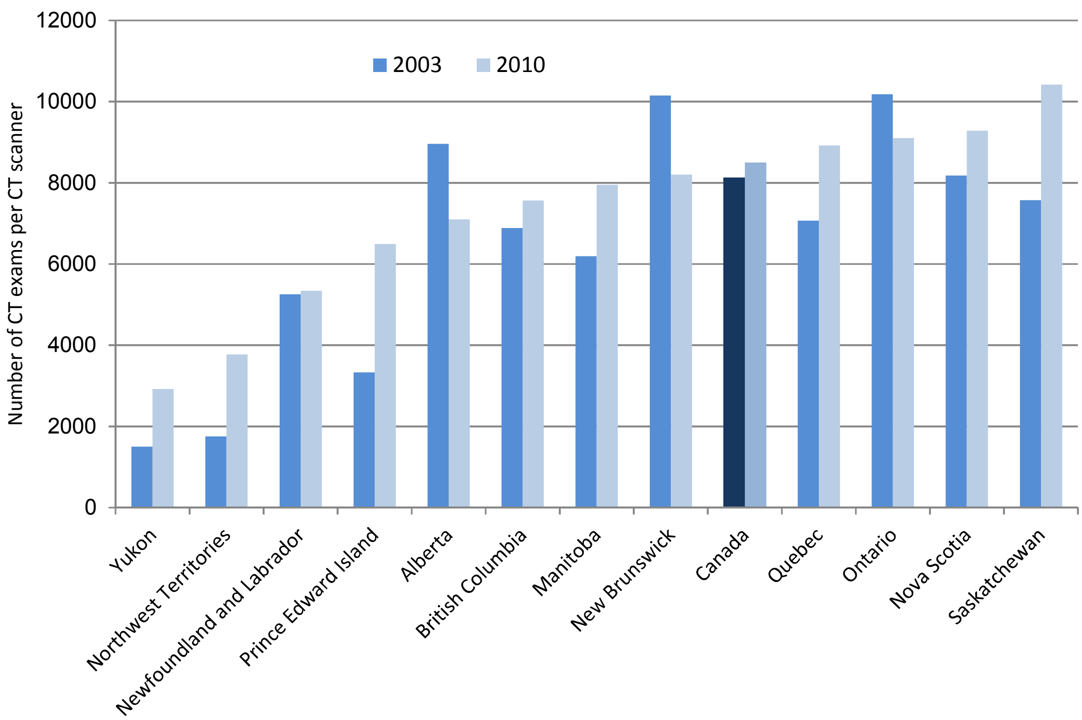
Figure 4.20. Number of MRI scanners and MRI exams by province, Canada, 2010



Source: Authors' estimates based on National Survey of Selected Medical Imaging Equipment Database.

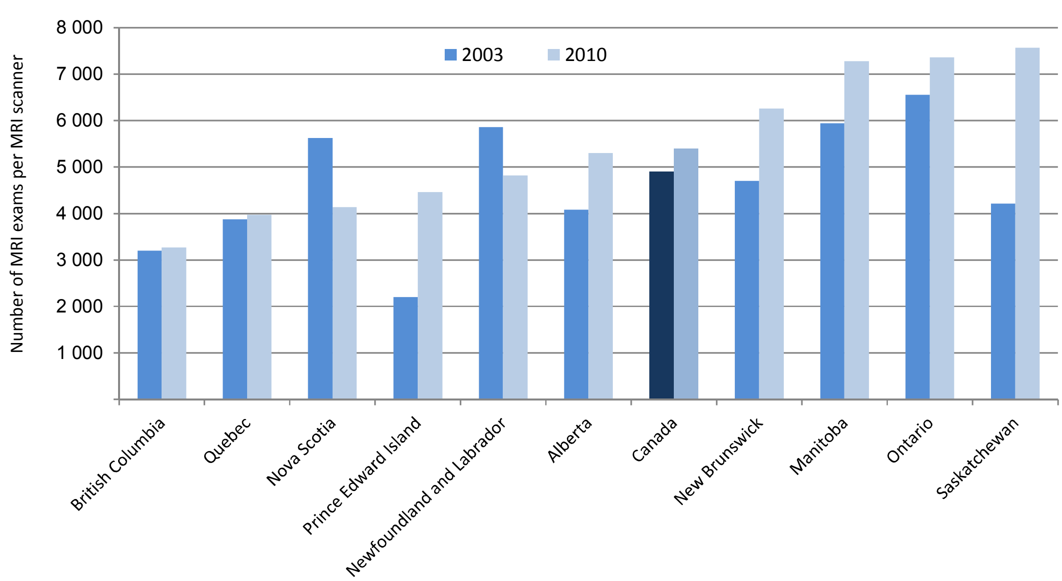
The intensity of use of CT scanners and MRI scanners (measured as the number of exams per machine) has decreased in a few provinces between 2003 and 2010 as the number of machines was expanding. However, in most provinces, the intensity of use has increased (Figures 4.21 and 4.22). For MRI scanners, the intensity of use decreased in only two provinces (Nova Scotia and Newfoundland), while it increased in all others, particularly in Saskatchewan and Prince Edward Island.

Figure 4.21. Intensity of use of CT scanners by province/territory, Canada, 2003 and 2010



Source: Authors' estimates based on National Survey of Selected Medical Imaging Equipment Database.

Figure 4.22. Intensity of use of MRI scanners by province/territory, Canada, 2003 and 2010



Source: Authors' estimates based on National Survey of Selected Medical Imaging Equipment Database.

In 2007, a first major review of the impact and appropriateness of diagnostic imaging in Ontario found that some testing patterns yielded either very little or uncertain clinical information (You et al., 2007). This review noted that high-income people in Ontario had more MRI exams (but not CT exams) than low-income people (despite the fact that low-income people tend to have poorer health), raising the possibility that need was not necessarily driving some of the increase in MRI exams (You et al., 2007).

The usefulness of some of the MRI and CT exams prescribed by doctors continues to be debated in Canada. Over the past ten years, the Canadian Association of Radiologists has developed guidelines to assist doctors in their referral practices (Canadian Association of Radiologists, 2013), but these guidelines leave considerable flexibility and autonomy to physicians in making referrals. The Canadian Medical Association has also recently begun to adapt the Choosing Wisely initiative from the United States in a Canadian context, which aims among other things to reduce unnecessary tests (Levinson and Huynh, 2014).

4.5. Conclusions

This chapter reviewed the degree of geographic variations in hospital medical admissions and eight diagnostic and surgical procedures in Canada, at both the provincial/territorial level and across health regions within provinces. Where possible, it also reviewed the evolution of these geographic variations between 2003 and 2010.

One of the main findings is that, in 2010, there continued to be wide variations in the use of these health care interventions across Canada, even after standardising utilisation rates to take into account differences in population structure in different parts of the country. For only two procedures – MRI exams and coronary angioplasty (PTCA) – has there been an unambiguous reduction in the degree of variation across provinces or health regions within provinces between 2003 and 2010, in a context of a growing use of these two diagnostic and surgical procedures. For all the other selected health care activities and procedures, the geographic variation has either remained unchanged or has increased over this time period.

Part of the persisting geographic variation in health care use in Canada may be explained by certain unique geographic characteristics of the country, including the very low population density in certain remote areas (particularly in the three northern territories, but also in the northern part of many provinces), and the long distance that the population may have to travel to reach the nearest hospital or any other health care facility in these areas. These particular geographic characteristics may explain, for example, the high hospital admission rates in the northern part of the country, which can be linked to lower admission thresholds. However, such geographic considerations cannot explain why there are substantial variations across and within provinces in the use of different diagnostic and surgical procedures.

Geographic variations in caesarean section rates across health regions in Canada have remained relatively stable between 2003 and 2010, but the rates have generally gone up, as has been the case also in other OECD countries. In response to this rise in caesarean section rates, the Society of Obstetricians and Gynaecologists of Canada released a joint policy statement in 2008 to reduce unnecessary caesarean sections and promote normal childbirth whenever possible. However, as noted by CIHI, the lack of a general consensus on clear clinical indications for caesarean sections has meant that these clinical recommendations have remained quite general, and decisions to opt for caesarean sections continue to be based often on physician’s discretion and non-medical factors

(CIHI, 2010). Canada may be able to learn from the experiences of other countries such as Spain that have developed clear clinical guidelines for caesarean sections and are closely monitoring their implementation, which has led to reversing the previous upward trend at least in certain parts of the country.

Knee replacement rates in Canada are continuing to increase at a rapid pace, with the intervention increasingly performed on people at younger ages (under 65), and large geographic variations persist. As for any other health care service and procedure, these variations may indicate either an under-provision to patients who might benefit from the intervention or an over-provision to patients whose health outcomes may improve only marginally (or not at all) following the intervention. An important way to shed light on the appropriateness of the decision to perform a knee replacement is to collect information on patient-related outcomes to find out whether the intervention has led to a reduction in pain and improvement in functioning. Over the past ten years, CIHI has developed a Canadian Joint Replacement Registry, which collects data on the use of knee and hip replacement, the characteristics of patients receiving the treatment, clinical methods and waiting times. It would be very useful for this registry to start collecting information on patient-related outcomes, following the example of other countries such as Sweden and the United Kingdom.

As in most other OECD countries, the ratio of coronary angioplasty (PTCA) to coronary artery bypass grafts (CABG) has continued to increase in Canada between 2003 and 2010. In 2010, on average across the country more than three-quarters of revascularisation procedures for people suffering from ischaemic heart disease were PTCA. The rising share of PTCA is contributing to better patient outcomes and recovery, and also to lower cost, as PTCA is less invasive and resource-intensive than CABG. There has also been a convergence in the use of PTCA across the country over that period of time. Some of this convergence in clinical practice for cardiac care may be attributed to the substantial efforts that have been devoted over the past decade to document and publicly report on variations in the use of revascularisation procedures, at different levels (provincial and hospital level), through projects such as the Canadian Cardiovascular Atlas produced by the Canadian Cardiovascular Outcome Research Team (Tu et al., 2004) as well as the ongoing work of the Cardiac Care Network in Ontario (Cardiac Care Network, 2010). Tu and colleagues (2009) concluded that the use of report cards in the EFFECT (Enhanced Feedback for Effective Cardiac Treatment) project, which aimed to measure and improve cardiac care across 86 hospitals in Ontario, resulted in positive changes in hospital procedures, including positive patient outcomes.

The use of diagnostic procedures, such as CT and MRI scanners, has increased greatly throughout Canada over the past decade, with CT exams per capita going up by over 40% between 2003 and 2010 while MRI exams nearly doubled during this seven-year period. This rapid rise in CT and MRI exams can be explained at least partly by the large investments that have been made to install a greater number of scanners throughout the country to improve access and reduce waiting times. In 2010, there remained however significant variations in CT exams and MRI exams across provinces. Some variations are due to differences in the supply of these scanners: for example, there is evidence of some correlation between a greater supply of CT scanners and a greater number of CT exams across provinces. On the other hand, there appears to be little correlation between the supply of MRI scanners and the number of MRI exams. This indicates that the number of MRI exams is driven not mainly by the availability of these scanners, but rather by the intensity of use of each machine. The intensity of use of CT scanners and MRI scanners has increased in most provinces between 2003 and 2010 which, combined with the greater availability of machines, explains the rapid growth in exams. There are ongoing discussions in Canada about whether all the costly diagnostic exams are really needed. The Canadian Association of Radiologists has developed guidelines over the past ten years to assist doctors in their referral practices (Canadian Association of Radiologists, 2013), although these guidelines leave considerable flexibility and autonomy to physicians in making referrals.

The Canadian Medical Association, in collaboration with the University of Toronto, the Government of Ontario, Canadian medical speciality groups and patient groups, recently began to adapt the Choosing Wisely initiative from the United States in a Canadian context, with a view to reduce unnecessary tests and procedures that may be overused (Levinson and Huynh, 2014). The Choosing Wisely campaign is designed to engage physicians and patients in making the best choices between diagnostic and treatment options for people with different conditions. The impact of this new initiative should be closely monitored.

More generally, the public reporting of medical practice variations in Canada over the past decade or so has helped to raise questions about the efficiency and equity of health service delivery across the country, in particular to detect "outliers" at the regional level on the low side or the high side. Public reporting raises awareness of variations in health care use and clinical practice, and can be an important first step towards identifying possible unwarranted variations that are not related to patient needs. However, public reporting alone may not be sufficient to modify health care use. Further policy levers are needed to address unwarranted variations, including the development of clinical guidelines based on the best evidence available, feedback to providers, and a more systematic reporting of health outcomes to assess the benefits and risks of different interventions and support patients in deciding on treatment options. There is considerable scope for the provinces and territories to support such efforts, working in collaboration with professional associations and patient groups. There is also a need for CIHI to continue to play a useful role in collecting relevant data to monitor progress on the appropriate use of care across different jurisdictions.

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ANNEX 4.A1

Codes used for surgical procedures

Procedure	ICD-9-CM code	CCI code
Caesarean sections	74.0-74.2 Classical, low cervical or extraperitoneal caesarean 74.4 Caesarean section of other specified type 74.99 Other caesarean section of unspecified type	5.CA.88^^, 5.CA.89^^, 5.CA.93^^
CABG	36.1, 36.11-36.19 Aortocoronary bypass for heart revascularisation	1.IJ.76^^
PTCA	36.0 Removal of Coronary Artery Obstruction and Insertion of Stent(s)	1.IJ.50^^, 1.IJ.57.GQ^^
Knee replacement	81.54 Total knee replacement 81.55 Revision of knee replacement, not otherwise specified OR 00.80-00.84 Revision of knee replacement if specified	1.VG.53^^
Surgery after hip fracture	820.0-820.3, 820.8,820.9 Only emergency admissions of fracture of neck of femur Plus 733.14 Pathologic fractures	1.VA.74.^^, 1.VA 53.^^, 1.VC.74.^^ 1.SQ.53.^^ along with hip fracture diagnosis codes (ICD-10-CA codes of S72.0, S72.1, S72.2)
Hysterectomy	68.3-68.9 Abdominal or vaginal hysterectomy	1.RM.89^^, 1.RM.91^^, or any of the following codes: 1.RM.87.CA-GX, 1.RM.87.DA-GX, 1.RM.87.LA-GX with extent attribute coded as SU

CCI: Canadian Classification of Health Interventions.

ICD-9-CM: International Classification of Diseases, Ninth Revision, Clinical Modification.

Source: CIHI (2012), "Canadian Coding Standards for Version 2012 – ICD-10-CA and CCI", Ottawa, Canada.

Chapter 5

Czech Republic: Geographic variations in health care

Tomáš Roubal and Luděk Šídlo, Ministry of Health[1]

This chapter gives an overview of geographic variations in the Czech Republic for hospital medical admissions, caesarean section, knee replacement, hip replacement, and hysterectomy. Age- and gender-standardised rates of utilisation are reported for the 14 regions and the 77 former districts, in 2011.

While the number of caesarean sections and knee and hip replacements is increasing, the number of hysterectomies is gradually declining. Geographic variations are particularly high for hysterectomy and, to a lesser extent for knee replacement. Regions do not constantly show a low or high prevalence for all health care interventions. Prague has a high prevalence of caesarean sections but low prevalence of knee and hip replacements and hysterectomies. Regions with a lower socioeconomic profile have heterogeneous patterns. While Northwest Bohemia has a low prevalence of caesarean sections, North Moravia has the highest rate. At the district level, high prevalence of gynaecological procedures (caesarean section or hysterectomy) in some areas cannot fully be explained by patient preferences and provider motivations require further investigation.

1. This analysis was commissioned by the Ministry of Health of the Czech Republic. The technical part was calculated by Luděk Šídlo using datasets prepared by the Institute of Health Information and Statistics (Jan Zofka and Miroslav Zvolsky). The report was initiated, revised and translated by Tomas Roubal. The authors are thankful to Ondřej Roztomilý, Michal Paulus and Lenka Poliakova for their contribution.

5.1. Introduction

The Czech Republic is a landlocked country situated in central Europe. The country covers an area of approximately 78 867 sq.km and has 10.5 million citizens. The Czech health system has the following characteristics: a relatively low total health care expenditure as a share of GDP compared to western Europe; low out-of-pocket payments that are distributed quite evenly across household income deciles; and human resources that have some significant regional disparities. The population enjoys virtually universal coverage and a broad range of benefits, and some important health indicators are better than the EU averages (such as mortality due to respiratory disease) or even among the best in the world (infant mortality).

The Ministry of Health commissioned this chapter for the Czech Republic. It has been the first report on medical practice variation in the Czech Republic that is open to experts and the public and the second report on this topic ever. The only prior study on medical practice variation was written for internal purposes only for the ministry.

This chapter is structured in four parts. In Section 5.2, the health system of the Czech Republic is described briefly, with a focus on the hospital sector and its development in the period 2007-11. It sketches the differences between regions based on access to health services, cultural variations and geographical topography, and provides an overview of the numbers of hospitals, inpatient beds and physicians in each region. Section 5.3 describes the data used for this study. The methodology provided by the OECD was used and applied to the data. Certain limitations and country-specific aspects of the data are discussed. Section 5.4 provides the reader with the study results, with tables, graphs and maps on variations in medical practice with respect to hospital admissions, caesarean sections, hysterectomies, knee replacements, and total hip replacements. The last section gives an interpretation of the results and recommendations for next steps.

5.2. Overview of the Czech Republic's health care system

Political and organisational structure

In the Czech Republic, responsibility for health care is shared between the central government and the regions. The Ministry of Health sets the health policy agenda, prepares legislation, and administers the public health network and the State Institute for Drug Control (SÚKL) (Bryndová et al., 2009). On 1 January 2000, 14 newly created regions (the capital city of Prague and 13 regions) were delegated authority from the previously state-administered districts. The regions have responsibility for overseeing the organisation and delivery of services related to health care, social welfare, education, transportation communications and environmental protection (Bryndová et al., 2009). Each region has its own assembly, council and governor. The councils are, within the scope of their delegated authority, the executive bodies of the regions and report to their respective assembly. In 2003, ownership of approximately half of the hospitals and some of the other health care facilities that had previously been owned by the state was transferred to the regional authorities (Bryndová et al., 2009).

Health care expenditure

Total health spending accounted for 7.5% of GDP in the Czech Republic in 2011, lower than the average of 9.3% in the OECD countries (OECD, 2013). The

Czech Republic also ranks below the OECD average in terms of total health spending per capita, with spending of USD 1 966 in 2011 (adjusted for purchasing power parity), compared with an OECD average of around USD 3 300. Spending in the Czech hospital sector in 2011 accounted for 32% of the total, higher than the OECD average of 29%.

Health spending per capita in the Czech Republic grew, in real terms, by an average of 5.9% per year between 2000 and 2009, but it fell sharply in 2009/10 (-4%), before increasing again moderately in 2010/11(+2.8%). Most other OECD countries – especially those hit hardest by the economic and financial crisis – also experienced a marked slowdown or reduction in health spending in 2010 and 2011, following the need for fiscal consolidation.

Health care financing

Since the early 1990s, the Czech Republic has had a system of social health insurance (SHI) based on compulsory membership in one of a number of health insurance funds, which are quasi-public, self-governing bodies that act as payers and purchasers of care (Bryndová et al., 2009). Patients are able to select their health insurance funds and health care providers, and the SHI funds are obliged to accept all applicants who are citizens or have permanent/residence status, irrespective of their age or health status (Bryndová et al., 2009). SHI contributions are mandatory and take the form of a payroll tax that is split between employers and employees; self-employed individuals must contribute a fixed percentage of their profits, and the government pays for economically inactive citizens (Bryndová et al., 2009). The two main sources of health system funding (OECD, 2013) were SHI funds (79%) and out-of-pocket (OOP) payments (15%). OOP payments are used mainly for pharmaceuticals, medical aids, and certain health services such as doctor visits and dental care (Bryndová et al., 2009). Private health insurance plays a very small role, accounting for 0.1% of total health expenditure in 2011 (OECD, 2013), and applies mainly to temporary migrants who are not yet eligible for standard compulsory insurance but are required to be insured.

Health care delivery and provider payments

Physician services and payments

Physicians may work as private or public providers of services, but in both cases they are contracted by the health insurance funds and are reimbursed with public funds. GPs are predominantly self-employed, and services are typically provided in solo practices (OECD Health Systems Characteristics Survey, 2012). GPs do not play a gatekeeping role, as patients can arrange to see a specialist directly.

Specialists working in hospitals are paid on a salary basis. Specialists who are self-employed are remunerated by a capped fee-for-service (FFS), whereas self-employed GPs are remunerated by a capitation fee that is risk adjusted, which includes age and information on prior utilisation of health care services, but a small portion of their remuneration comes from a capped FFS (Bryndová et al., 2009; OECD Health Systems Characteristics Survey, 2012). The capped FFS payment has numerous regulatory measures that are imposed by insurance funds on outpatient specialists, including the number of individual patients treated and a maximum reimbursement per patient (OECD Health Systems Characteristics Survey, 2012). A pay-for-performance scheme was introduced in 2009 to remunerate GPs for services relating to preventive care and to ensure the greater availability of office hours and advance appointment bookings (OECD Health Systems Characteristics Survey, 2012).

The Czech Republic had 3.6 practising physicians per 1 000 population, compared to an OECD average of 3.2 in 2011. About 19% of doctors were generalists and 79% as specialists, relative to the OECD averages of 30% for generalists and 62% for specialists in 2011 (OECD, 2013).

Hospital services and payments

While the majority of the 188 hospitals are publicly owned hospitals (either managed directly by the central or local government or as a joint stock company fully owned by the regional government), private for-profit hospitals and a relatively few private non-profit hospitals, largely run by charities, also offer services. The regional hospitals are the country's largest provider of inpatient acute care. The second-largest owner of hospitals is the Ministry of Health, which runs the university hospitals and Minister of Health appoints the directors of the university hospitals. The university hospitals are located mainly in the capital of Prague (*Praha*) (which virtually has no other type of hospital) and in the largest regional towns – Brno, Ostrava, Plzen and Hradec Kralove. There were no rapid changes in the legal structure of hospital ownership during the study timeframe.

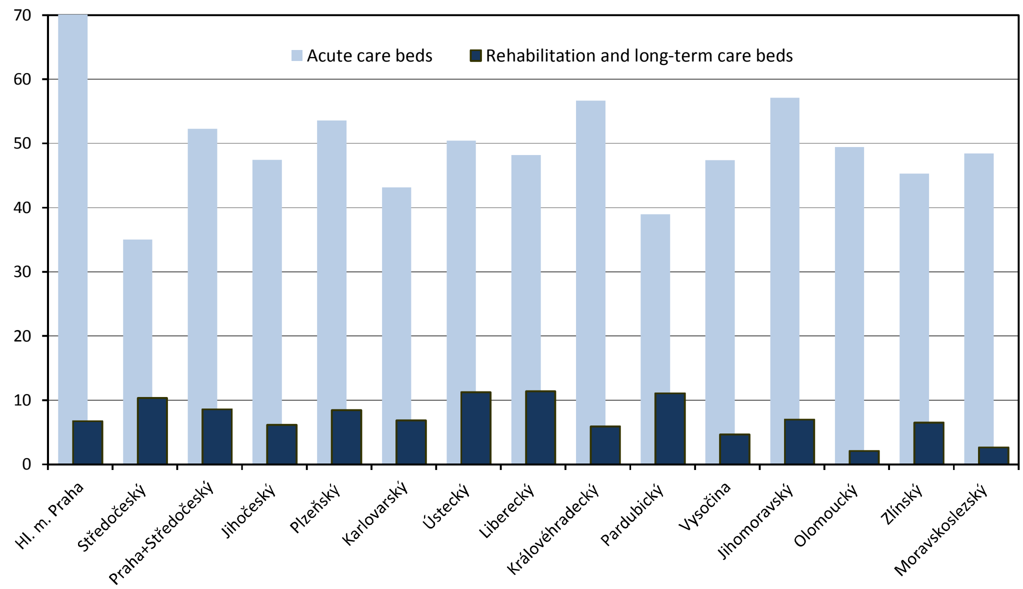
Hospitals are reimbursed through a variety of payment methods, including DRG case-based payments, individual contracts, global budgets, capped fee-for-service payments for outpatient care, and a small per diem applied in rehabilitation and long-term care (Bryndová et al., 2009).

The Czech Republic had a total of 6.8 hospital beds per 1 000 population in 2011, above the OECD average of around five beds per 1 000 population. As in most OECD countries, the number of hospital beds per capita has fallen over time. This decline has coincided with a reduction in the average length of stay in hospitals and an increase in the number of day surgeries.

The network of inpatient acute care facilities in the Czech Republic is dense. Hospitals have been historically organised into a three-layer structure (basic/regional/specialised). While this structure is no longer respected, it has left a legacy in some regions. Every district had a basic level hospital from where patients could be transferred to regional hospitals (14 regions) or to a specialised university hospital run by the Ministry of Health. Currently, patients can go freely to any hospital they wish, but historical ties between providers seem to still play a role in the patient's choice.

Hospital beds and the numbers of physicians working in hospitals by region are presented in Figure 5.1 and 5.2. Prague (*Praha)* stands out as an outlier with the highest levels of hospital beds and physicians due to the high concentration of facilities and health professionals in Prague.

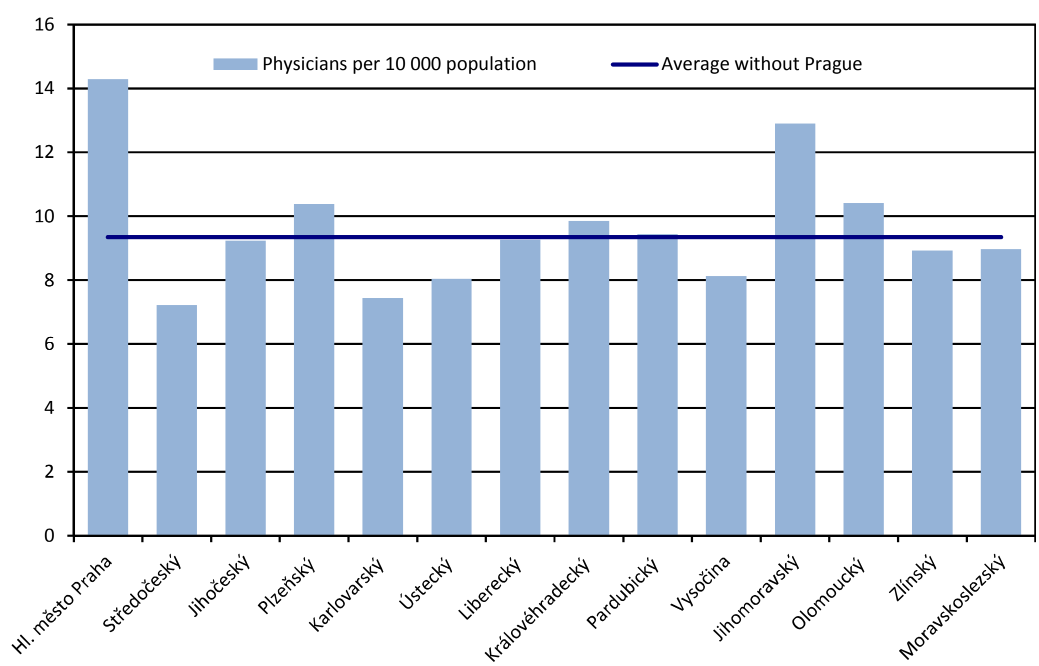
Figure 5.1. Hospital beds per 10 000 inhabitants by region, Czech Republic, 2011



Note: Prague is also presented as part of *Stredocesky kraj* – a region it is closely connected to.

Source: IHIS (2012), "Hospitals in the Czech Republic in 2011", IHIS CR, Prague.

Figure 5.2. Physicians working in hospitals per 10 000 inhabitants by region, Czech Republic, 2011



Source: IHIS (2012), "Network of Health Establishments", IHIS CR, Prague.

5.3. Data and methods

The Czech data for hospital medical admissions, knee interventions, hip replacements and hysterectomies are from the National Register of Inpatient Discharges (NRHOSP), which is embedded in the Czech legislation (Law No. 372/2011 on health care services). The NRHOSP is a population register that can be traced back to the 1960s. The NRHOSP registers patients who were admitted to inpatient wards and afterwards discharged. The data have been processed annually since 1992; since 1994, the ICD-9 has been replaced by the ICD-10. The data on caesarean sections are from the National Register of Mothers (NRROD), which is also embedded in the Czech legislation (Law No. 372/2011 on health care services). The NRROD has recorded all mothers subject to reporting obligations since 1991 (see Annex 5.A1).

This study draws on data files that contained the number of inhabitants for each of the regional units (regions, districts, municipalities) for the period 2007-11. All regional differences are calculated for the permanent residence of the patient. The definition of permanent residence has limitations, as it does not capture situations where the patient may be temporarily working or based (e.g. students, migrant workers, retired persons living with families). Patients have a free choice of provider, and no gatekeeping is in place. There is a wide network of inpatient facilities, and most patients visit the closest health care provider. It is only for specialised care and procedures (e.g. revascularisation, cancer, and trauma), for which "centres of excellence" exist, that the patient has to travel.

The methodology applied was suggested by the OECD Secretariat (Annex 5.A1). Data are provided for all hospitals without any division between private and public hospitals. The geographic coverage of the 14 regions and districts is presented in Figure 5.3.

Figure 5.3. Map of regions and districts in the Czech Republic

Source: Czech Statistical Office (2012), "Malý lexikon obcí 2012", e-1302-12, www.czso.cz/csu/2012edicniplan.nsf/p/1302-12.

The capital Prague is very much interlinked with the region around it – *Stredocesky kraj*– because many people living there work in the city and use the health services there. Prague also attracts patients needing more specialised care from all over the country. *Ustecky* and *Moravskoslezsky kraj* are industrial regions and many large hospitals have been built in these regions. *Jihocesky* and *Zlinsky kraj* are rural areas without a university hospital, and thus have large and complex hospitals owned by the regional government. *Kralovehradecky* and *Pardubicky kraj* are closely interconnected (the regional capitals are geographically close), and there is a university hospital in *Hradec Kralove* (a former region) that attracts many patients from the latter region.

The *Jihomoravsky kraj* has the country's second-largest town, Brno, which has two university hospitals that attract numerous patients. *Kraj Vysocina* lies in the middle of the Czech Republic which has a hilly countryside that can create problems accessing health care facilities during the winter. *Karlovarsky kraj* is the smallest region, with a relatively small number of inhabitants and hospitals. It borders Germany, where many Czech physicians commute to earn larger salaries. *Plzensky* and *Olomoucky kraj* have large university hospitals that attract inpatient acute care. Some parts of these regions border other countries (in the mountains), which makes access to health care complicated. *Liberecky kraj* has one of the largest regional hospitals and is well connected to Prague.

5.4. Description of results

Not surprisingly, the variation is larger at the district level than at the regional level (see Tables 5.1 and 5.2). The greatest variation was found in hysterectomy procedures, mainly due to the high maximum values for *Karlovarsky kraj;* however, during the study period the number of hysterectomies fell. Regional variation for men was higher in regions as well as in districts and in both procedures (hip and knee replacement). This was mainly caused by low minimum levels of procedures in some regions and districts.

Table 5.1. Summary of results on geographic variations for selected health care procedures by region, Czech Republic, 2011

	Hospital medical admissions	Hip replacement	Knee replacement	Caesarean section per 1 000 live births	Hysterectomy per 100 000 female population
Crude rate	16 418	121	97	237	152
Unweighted average standardised rate	20 057	124	99	232	173
Minimum	15 569	99	66	198	100
Maximum	23 262	156	119	274	342
Q10	18 383	105	79	204	110
Q90	22 588	142	112	266	242
Coefficient of variation	0.1	0.13	0.16	0.11	0.38

Note: Hospital medical admissions include deliveries. Unless otherwise specified, all rates are age- and sex-standardised per 100 000 population.

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011; NRROD – National Register of Mothers 2007-2011.

Table 5.2. Summary of results on geographic variations in selected health care procedures by district, Czech Republic, 2011

	Hospital medical admissions	Hip replacement	Knee replacement	Caesarean section per 1 000 live births	Hysterectomy (per 100 000 women)
Crude rate	16 418	121	97	237	152
Unweighted average standardised rate	19 974*	123	99	237	163
Minimum	12 116*	56	48	137	29
Maximum	36 511*	185	176	441	404
Q10	17 102*	93	72	184	89
Q90	22 754*	152	126	284	257
Coefficient of variation	0.15*	0.2	0.25	0.2	0.44

Note: Hospital medical admissions include deliveries. Unless otherwise specified, all rates are age- and sex-standardised per 100 000 population. *Not age- nor sex-standardised.

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011; NRROD – National Register of Mothers 2007-2011.

Hospital medical admissions declined over the study period (2007 to 2011). Prague had the lowest standardised numbers of hospitalisations and the highest number was found *Liberecký kraj* which has one of the largest regional hospitals and is well connected to Prague. This result for Prague region seems rather surprising as the supply of inpatient services is abundant in Prague.

The regions with the lowest standardised number of hip replacement procedures are *Moravskoslezsky kraj, Ustecky kraj* and Prague, which had very high density of inpatient capacities. These are also urban regions with good infrastructure. The highest number of hip replacements can be found in the regions of *Vysocina, Kralovehradecky kraj, Pardubicky* and *Olomoucky kraj*. These are mainly rural areas with a lower density of hospitals. There was an east-west gradient for men, with fewer procedures in the west and more in the east.

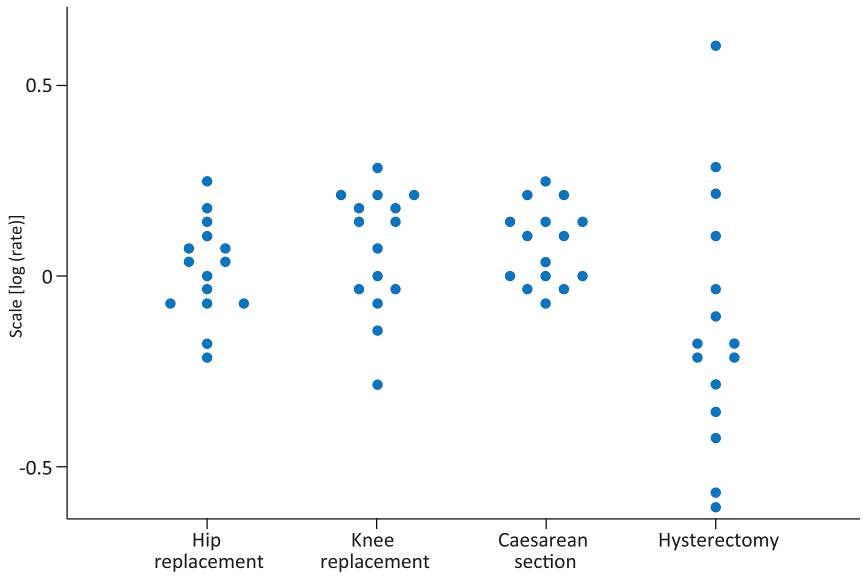
The regional differences in knee replacements are caused mainly by the increase in maximum values, as minimum values were stable throughout the period. The regions with higher standardised numbers of knee replacement procedures had similar rates for men and women, and were in the eastern part of the Czech Republic (*Jihomoravsky* and *Zlinsky kraj*). The citizens of Prague had the lowest number of procedures of any region.

There was a significant increase in caesarean sections between 2007 and 2011. The standardised rate remained stable in some regions (*Pardubicky* and *Ústecky kraj),* but experienced a significant 40% increase in others (*Vysocina*). The highest regional rate was in *Olomoucky kraj* (a rural area with low hospital density) and the lowest rate in *Ustecky kraj* (an urban area with high hospital density).

Karlovarsky kraj had the highest standardised number of hysterectomy procedures per 100 000 women during the whole period (over 330). At the other extreme was *Moravskoslezsky kraj* and the capital Prague, with around 100 hysterectomies per 100 000 women.

As can be seen in the next three graphs, the regional variation rises in particular for hysterectomy procedures. For other procedures, the coefficient of variation rises slightly or is stable or slightly decreasing. Regional variations increased over time while variations at the district level appear to have levelled off. As the regional governments are co-responsible for health care provision and run many regional hospitals, there are concerns in the Czech Republic that each region will develop a different network system of providers. This might result in an increase in inter-regional differences observed in this study.

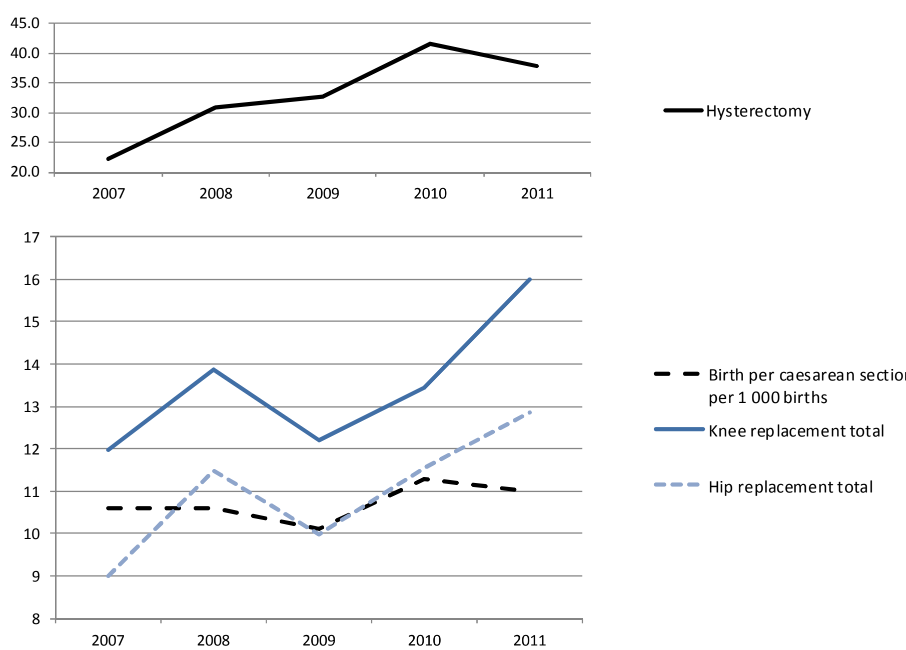
Figure 5.4. Variations in selected procedures by region, Czech Republic, 2007-11 (average)



Note: The vertical axis depicts variation around the mean of each variable on a log scale where the transformed variables (variables in logs) are standardised rates for the procedures.

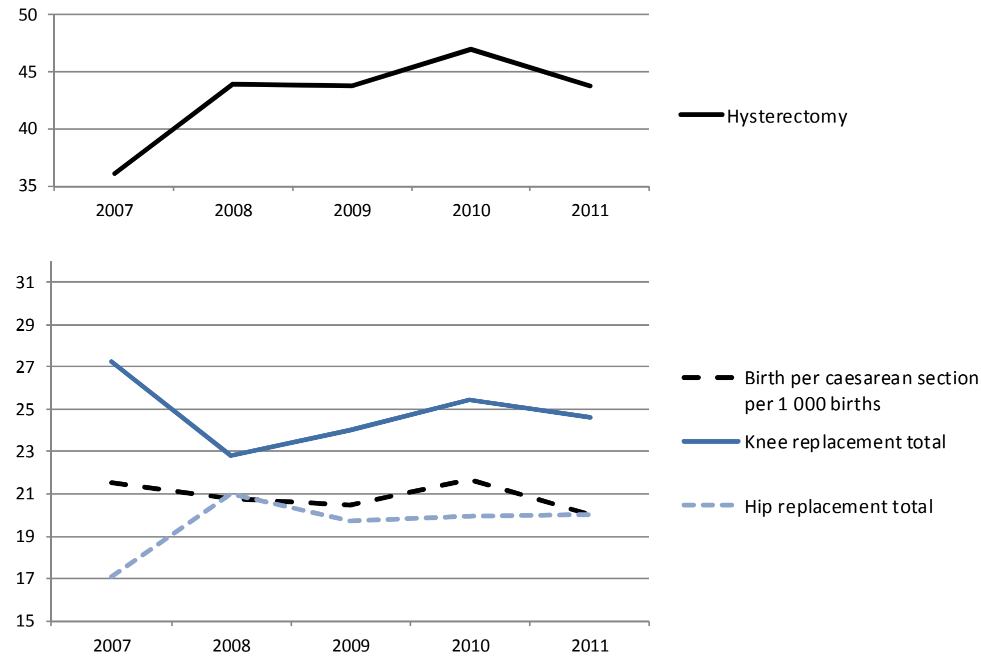
Source: NRHOSP – National Register of Inpatient Discharges 2007-2011; NRROD – National Register of Mothers 2007-2011.

Figure 5.5. Coefficient of variation for selected procedures by region, Czech Republic, 2007-11



Source: NRHOSP – National Register of Inpatient Discharges 2007-2011; NRROD – National Register of Mothers 2007-2011.

Figure 5.6. Coefficient of variation for selected procedures by district, Czech Republic, 2007-11



Source: NRHOSP – National Register of Inpatient Discharges 2007-2011; NRROD – National Register of Mothers 2007-2011.

Hospital medical admissions

In 2011, about 16% of the Czech population were admitted to hospitals for medical admissions (non-surgical) reason, but including vaginal delivery. Hospital medical admissions have declined between 2007 and 2011. The lowest standardised numbers of hospitalisations were found in the region *Praha* (15 569 per 100 000) and the highest number in *Liberecký kraj* (23 262 per 100 000) – 1.49-fold variation.

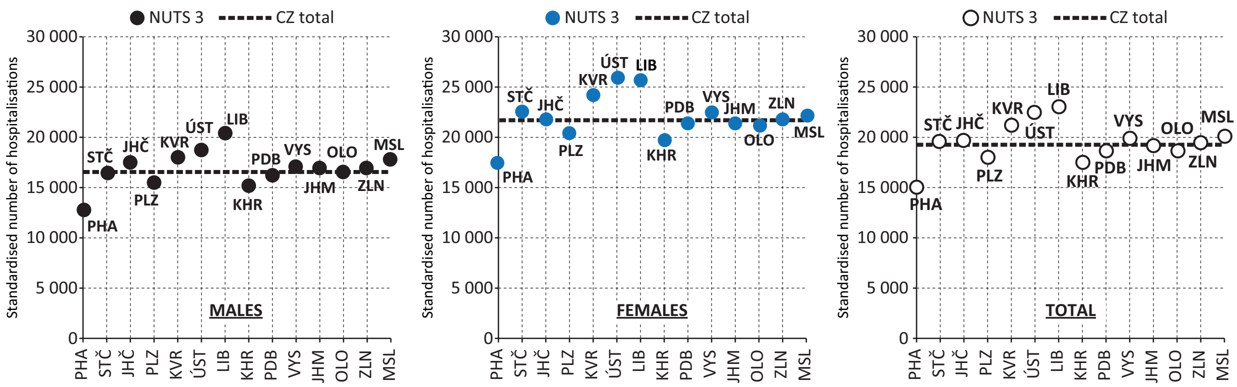
Liberecký kraj had the highest rates for males and *Ústecký kraj* for females – the rates were more than 30% higher than in Prague. Variability between regions for both sexes was relatively consistent (as measured by the coefficient of variation). Lower rates were observed in *Plzeňský kraj* and *Královéhradecký kraj*.

Table 5.3. Hospital medical admissions for all causes, standardised rate per 100 000 population, by region, Czech Republic, 2007-11 (average)

Indicator		Total
Average standardised rate		20 057
Minimum value	Prague	15 569
Maximum	Liberecky kraj	23 262
Percentile	Q90	22 588
	Q10	18 383
Coefficient of variation		0.1

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

Figure 5.7. Hospital medical admissions for all causes, standardised rate per 100 000 population, by region, Czech Republic, 2007-11



Note: NUTS 3 = region, CZE total = CZE average standardised rate.

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

Joint procedures

Total hip replacement

The rate of hip replacement was 124 per 100 000 in 2011 and ranged from 99 to 156 across regions (1.6-fold variation). During the first two years, the number of hip replacements rose rapidly, by 24% (from 10 600 procedures in 2007 to 13 100 in 2009), with a slight decrease in 2011 to 12 500. The gender breakdown of those undergoing the procedure during the study period was relatively stable, at 42% men and 58% women. A greater proportion of women undergo the procedure in the older age groups where of those aged 75 and older, 25% were women and 15% were men.

Table 5.4. Hip replacement standardised rate per 100 000 population by region, Czech Republic, 2007-11

Indicator	2007	2008	2009	2010	2011	Average 2007-11
Crude rate	103	123	126	123	121	119
Unweighted average standardised rate	106	127	128	126	124	122
Minimum	89	104	104	101	99	103
Maximum	122	149	151	152	156	146
Q10	94	111	117	108	105	107
Q90	113	148	145	145	142	139
Coefficient of variation	0.09	0.11	0.1	0.12	0.13	0.11

Note: Numbers may not add due to rounding.

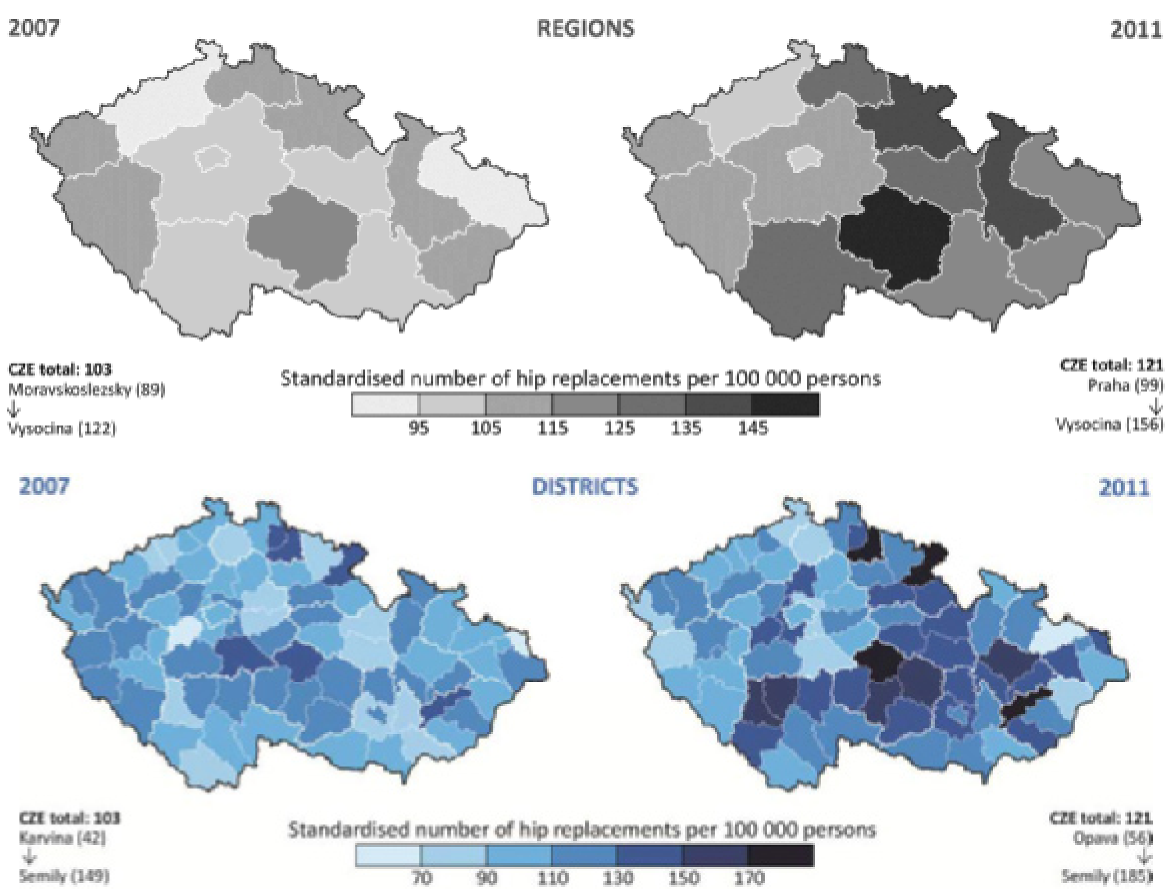
Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

The highest standardised number of hip replacements per 100 000 population can be found in the regions of *Vysocina, Kralovehradecky kraj, Pardubicky* and *Olomoucky kraj*. These are mainly rural areas with a lower hospital density. Vysocina is also a mountainous region, which could contribute to a more complicated living environment. These regions experienced the largest increase in the number of procedures during the study period.

The regions with the lowest standardised number of hip replacements per 100 000 population are *Moravskoslezsky kraj, Ustecky kraj* and the capital city Prague, which have very high level of hospital densities. These are also urban regions with good infrastructure.

Low numbers of hip replacements at the district level can again influence the range and level of variation across districts. In general, differences in variability are very similar for men and women, with a convergence toward similar minimum and maximum values during the study period. Higher rates are found in districts mainly in Vysocina. There is no clear explanation for changes in district rates of hip replacements. However it may be inferred that the rapid changes upwards may be the result of newly enhanced capabilities of local providers or changes in policies of health insurance funds.

Figure 5.8. Map of hip replacement standardised rate per 100 000 population by region and district, Czech Republic, 2007-11



Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

Knee replacement

The knee replacement rate was 98 per 100 000 population in 2011 and ranged from 66 to 119 per 100 000 (1.8-fold variation) across regions (see Table 5.5). Between 2007 and 2011, about 9 500 knee replacement procedures were performed each year, with a clear increase in the number of procedures during the period. While in 2007 around 7 400 procedures were performed, there were more than 10 000 procedures in 2011 (an increase of over 30%). The standardised rate increased from 72 per 100 000 to 98 per 100 000. Variations across regions remained fairly stable between 2007 and 2010 and increased in 2011 (coefficient of variation of 0.16).The trend in knee replacement rates was similar to the trajectory for hip replacements.

Table 5.5. Knee replacement standardised rate per 100 000 population by region, Czech Republic, 2007-11

Indicator	2007	2008	2009	2010	2011	Average 2007-11
Crude rate	71	86	98	99	97	90
Unweighted average standardised rate	72	88	99	100	98	91
Minimum	60	65	80	76	66	70
Maximum	89	117	132	122	119	114
Q10	63	75	89	82	79	80
Q90	83	97	107	116	112	98
Coefficient of variation	0.12	0.14	0.12	0.13	0.16	0.12

Note: Numbers may not add due to rounding.

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

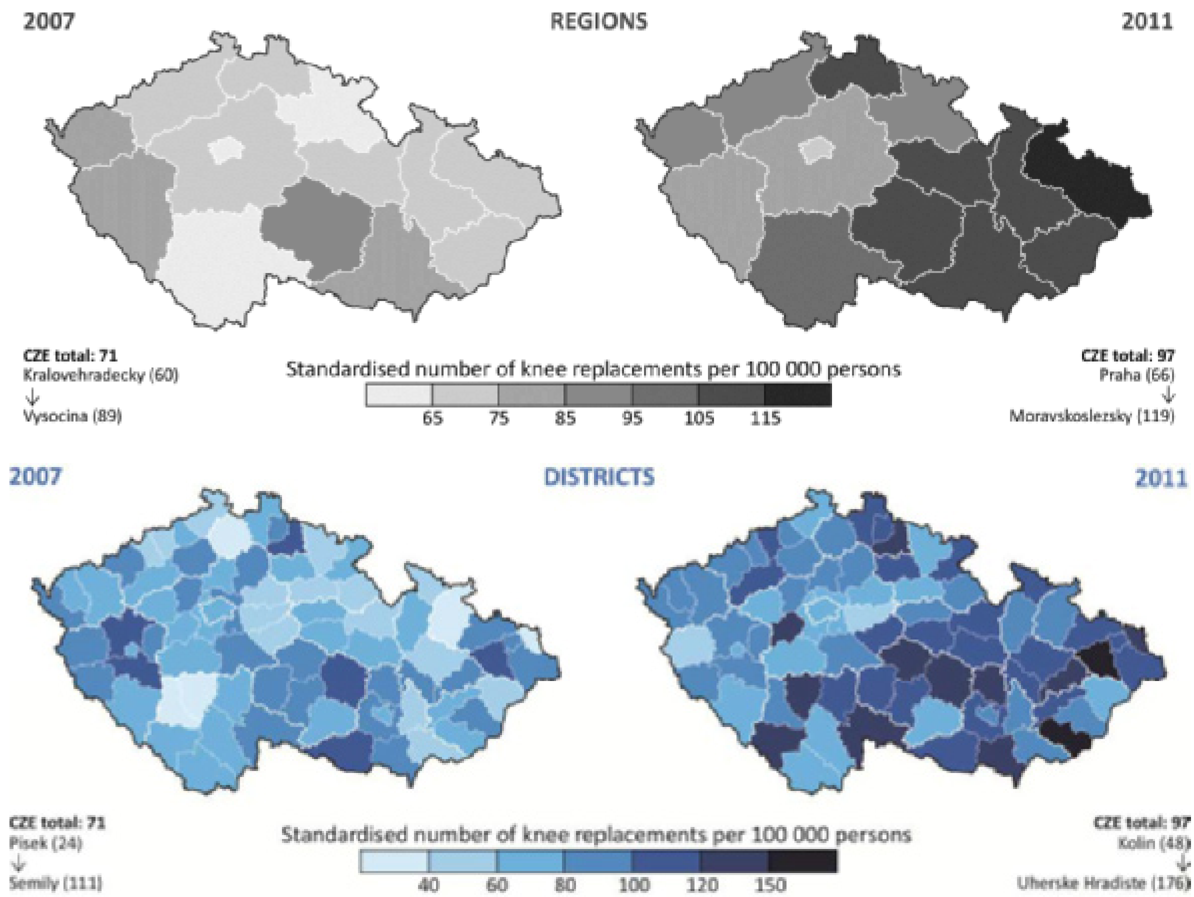
The regions with high rates of knee replacement are in the eastern part of the Czech Republic (Figure 5.9). The wider variation observed at the district level is influenced by the relatively low number of procedures.

High rates in *Vysocina* and *Liberecky kraj* may in part be due to the mountainous terrain which might contribute to a higher prevalence of rates for people with knee problems. It could also point to provider preferences in treating these problems. Prague had the lowest number of procedures among all regions. The regional variability was 1.79-fold in 2011. The relatively low rates observed in Prague may be in part due to its dense public transportation system and relatively well-developed infrastructure, as well as to the availability of alternative treatments due to its large number of university hospitals and research centres.

The analysis does not take into account the potential influence of various insurance funds and their different contractual agreements with providers. In individual provinces the number of clients of individual health insurance funds is different, in *Vysocina* and *Liberecky kraj* the largest health insurance fund, VZP, has the highest share of population insured. The result could therefore point to policy-differences between the funds.

The regional variability is greater for men than women (higher coefficient of variation). For women, the range of the standardised number of knee replacements increased from 44 per 100 000 population in 2007 up to 63 in 2011. *Plzensky kraj* experienced a decrease for women. This region has quite low levels of procedures, which might be caused by a lack of providers or a limited increase in the funding for these procedures. On the other hand, some regions (*Moravskoslezsky, Pardubicky, Jihocesky* and *Olomoucky*) experienced increases between 2007 and 2011 of up to 90%. Twice as many women had knee replacements as men during the period. Nearly half of all procedures were in patients aged 65-74, and a quarter were provided to patients older than 75.

Figure 5.9. Map of knee replacement standardised rate per 100 000 population by region and district, Czech Republic, 2007 and 2011



Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

On the district level, the increase of utilisation is too high to be explained by patient preferences (e.g. the increase in Pisek and Tabor districts). Possible explanations could be due to new technologies for interventions which permit patients who are relatively riskier to treat to have access to these services.

Gynaecological procedures

Caesarean sections

In the Czech Republic, in 2011, nearly 24% of deliveries occurred with caesarean sections, an overall increase of 20% since 2007. As expected, the share of births by caesarean section increases with the mother's age, ranging from 17% for those aged 20 and under to 32% for those aged 40-49. The average age of mothers having caesareans is highest in regions such as Southeast Moravia and Prague (nearly 30) and lower in Northwest Bohemia and in Moravia-Silesia (about 28). At the district level, the higher age of mothers is found in districts in which there is a regional hospital (Plzeň, Hradec Králové, Pardubice, Olomouc, Zlín) – except for Ústí nad Labem, Karlovy Vary, Ostrava. During the study period, however, the average age of mothers having a caesarean section remained stable at 29.

The caesarean section rate was 214 per 1 000 live births in 2011 and ranged from 182 to 245 (1.3-fold variation) across regions (see Table 5.6). Standardised rate of caesarean sections increased by 17% between 2007 and 2011 while variations across regions remained stable.

Table 5.6. Caesarean section standardised rate per 1 000 live births by region, Czech Republic, 2007-11

Indicator/year	2007	2008	2009	2010	2011	Average 2007-11
Crude rate	200	208	216	229	237	218
Unweighted average standardised rate	198	206	213	223	232	214
Minimum	167	167	173	179	198	182
Maximum	230	233	243	260	274	245
Q10	168	179	191	194	204	187
Q90	224	230	241	257	266	243
Coefficient of variation	0.11	0.11	0.1	0.11	0.11	0.1

Note: Numbers may not add due to rounding.

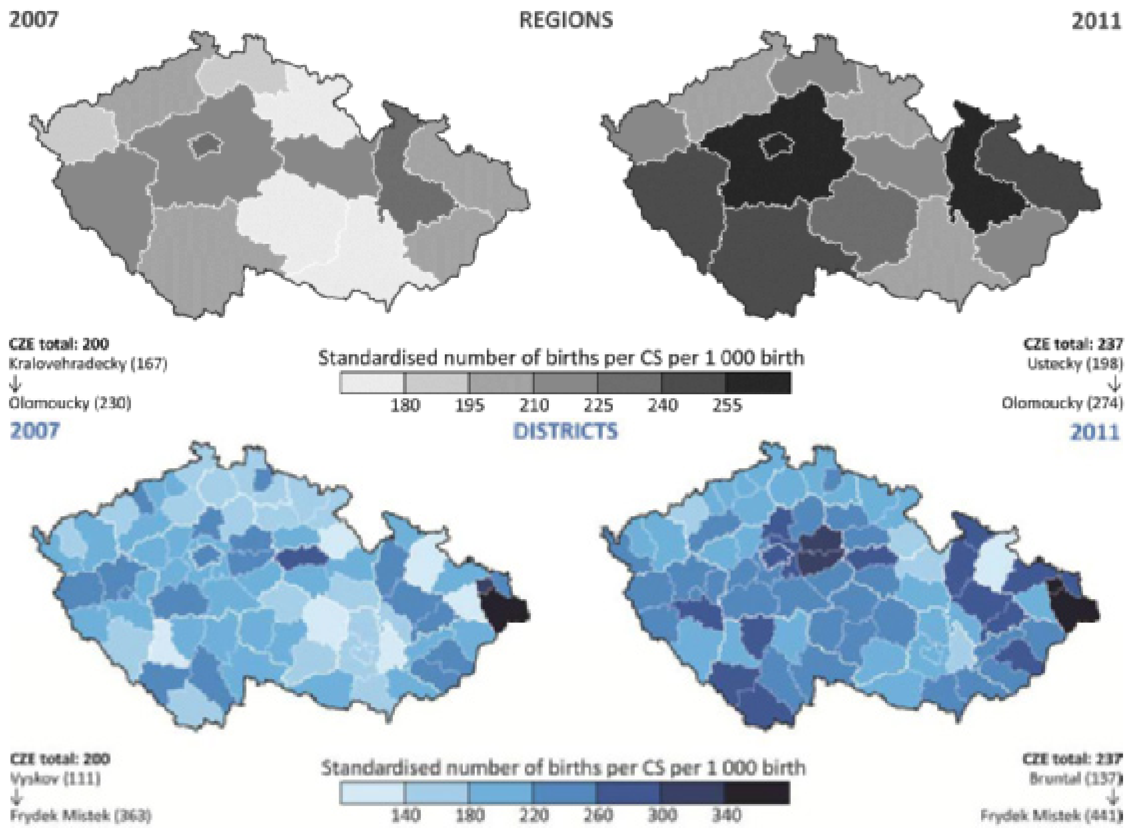
Source: NRROD – National Register of Mothers 2007-2011.

Caesarean sections are less frequent in the northwest regions, on the border with Germany, and southern Moravia, near Austria (Figure 5.10). They are more common in central and western Bohemia and northern Moravia (regions with high hospital densities). Rather surprisingly, *Olomoucky kraj* was among the regions with the highest rates, with almost 275 caesarean sections (out of 1 000 births) in 2011. *Olomoucky kraj* is a rural area with lower income levels and a lower hospital density, at least in some parts. On the other hand, the industrial region *Ústecky kraj* had fewer than 200 births by caesarean section.

There is, of course higher variability observed at the district level (Figure 5.10). While there was a 1.3-fold in variation at the regional level, there was a 3.2-fold variation at the district level in 2011. The highest variability was observed in 2010, with a 4.8-fold variation between districts Ceská Lipa (92 caesarean sections per 1 000 births) and Frydek-Mistek (437). During the study period, the district of Frydek-Mistek had the highest share of births by caesarean section, followed by Ostrava-town. Both these districts are located in *Moravskoslezsky kraj,* which has a high density of hospitals. Such a high difference is hard to explain solely by different patient preferences and cultural norms.

There was a significant increase in all the regions of birth by caesarean section during the reporting period (Figure 5.10). However, trends differ across regions. The standardised rate remained stable in *Pardubicky* and *Ústecky kraj*, whereas the rate for *Vysocina* increased significantly by 40%. On average, there were 112 000 births during the period 2007-11, of which approximately every fifth new-born was delivered by caesarean section. The highest number of births by caesarean section was recorded in 2010 (26 000). While the number of caesareans fell by about 1 000 in 2011, its overall share increased due to an overall decline in the birth rate. Data on births by caesarean section does not contain information relating to, for instance, the birth weight or height of the new-born, or whether it was an emergency or elective procedure which limits more in-depth analysis.

Figure 5.10. Map of caesarean section standardised rate per 1 000 live births by region and district, Czech Republic, 2007 and 2011



Source: NRROD – National Register of Mothers 2007-2011.

Hysterectomy

There were 197 hysterectomies per 100 000 women in 2011 and the rate ranged from 100 to 342 (3.4-fold variation) (Table 5.7). While the variation across regions increased, the total number of hysterectomy procedures decreased during the study period. The number of hysterectomies was well above 11 500 in 2007 and fell to nearly 8 000 in 2011 (minus 30%). The largest part of the reduction occurred in the lower age groups (a drop of over 40%). The average standardised rate of hysterectomy procedures per 100 000 women also decreased during the study period from 236 to 180 per 100 000. The variability between regions increased, mainly because the maximum values of standardised rates of hysterectomies per 100 000 women did not change in some regions, but the minimum values decreased.

Women most often undergo hysterectomy around age 50 (45-54) when they reach the end of their reproductive age. The oldest women undergoing a hysterectomy procedure can be found in *Moravskoslezsky* and *Plzensky kraj* and in Prague, where the average age is around 65 (67 for *Moravskoslezsky kraj*). The lowest average age is in the middle of the Czech Republic (*Pardubicky kraj* and *Vysocina*) and also in *Karlovarsky kraj,* where the average is about 58 years. An even greater variability in the average patient age can be found on the district level, where the range between the highest and lowest average age is 12 years.

Table 5.7. Hysterectomy standardised rate per 100 000 females by region, Czech Republic, 2007-11

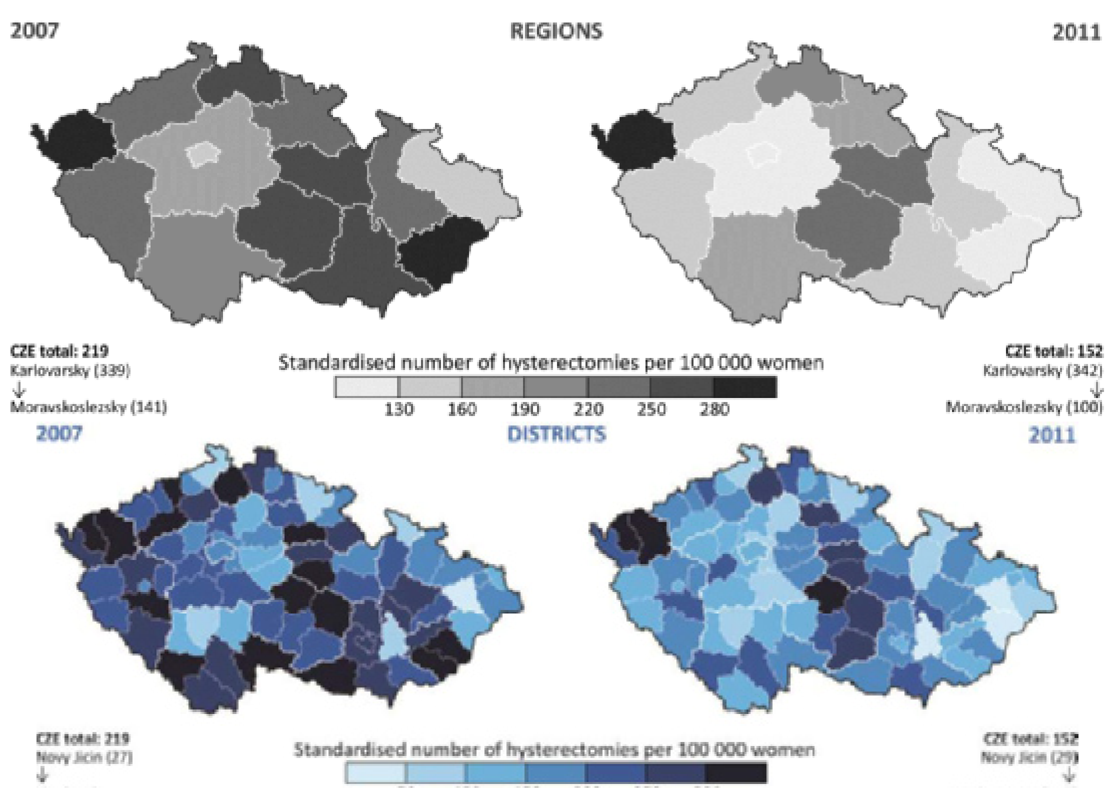
Indicator	2007	2008	2009	2010	2011	Average 2007-11
Crude rate	219	187	169	158	152	177
Unweighted average standardised rate	236	206	187	181	173	197
Minimum	141	125	119	94	100	117
Maximum	339	342	333	381	342	348
Q10	163	137	127	118	110	130
Q90	286	292	259	257	242	263
Coefficient of variation	0.22	0.31	0.33	0.42	0.38	0.31

Note: Numbers may not add due to rounding.

Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

Across regions, *Karlovarsky kraj* had the highest standardised number of hysterectomy procedures per 100 000 women, at over 330 procedures, during the whole period where the average age of women is relatively low. At the other extreme, with the lowest standardised rate, was *Moravskoslezsky kraj* (which has a relatively older female population) and Prague, with around 100 hysterectomies per 100 000 women. The largest falls in the standardised number of procedures per 100 000 women were in southern Moravia – *Zlinsky kraj* (decrease of 58%) and *Jihomoravsky kraj* (decrease of 45%).

Figure 5.11. Map of hysterectomy standardised rate per 100 000 females by region and district, Czech Republic, 2007 and 2011



Source: NRHOSP – National Register of Inpatient Discharges 2007-2011.

At the district level, the differences between minimum and maximum values are up to 20-fold throughout the period (Figure 5.11). Districts in Northwestern Bohemia (Karlovy Vary and Sokolov) and in the eastern Bohemia showed high rates. The lowest rates were found in northwest Moravia (Vsetin and Jeseník) and also in the south (Strakonice, Pisek, Tabor) and in most of the Central Bohemian districts.

5.5. Conclusions

The data presented in this chapter show a range of regional variations in the selected procedures during the period 2007-11. It was the first analysis of this kind in the Czech Republic. With regard to caesarean sections, there was a steady increase from 20% of all births in 2007 to 24% in 2011. Hysterectomies experienced a significant decrease (30%) between 2007 and 2011 in the number of procedures, especially in younger age groups. This implies an increase in the average age of women undergoing a hysterectomy. The situation in the Czech Republic may reflect the adoption of new treatments, which may contribute to the reduction observed across the country. The data for knee and total hip replacements indicate an increase in the number of procedures, particularly for middle-aged and elderly patients, but a decrease in the oldest category (75 and older). For these two procedures, the average patient age remains at the same level throughout the period, at around 70 and 72, respectively, even though population ageing increased the numbers in the older age groups.

Certain factors, such as a region's economic, social or cultural features, may contribute to the variation observed. First, some regional populations have consistently low/high rates for the majority of procedures, while some have higher rates than the national average. The specific position of the capital city of Prague is a case in point. As the centre of the country's science, research, and education, it has the largest number of medical facilities, equipment and physicians, and so attracts patients from around the country. The citizens of Prague do not consume the largest amounts of services (standardised for age and gender) which is quite surprising, but might be explained by better access to outpatient specialist care. The notion of high health care utilisation in Prague is mostly due to the inflow of patients from other regions. Prague is surrounded by the *Stredocesky kraj,* which is home to large numbers of commuters to the city and also many patients who come for treatment. Because of these factors, Prague has a high level of capacity for the size of its population. While the rate of caesarean sections is relatively high, rates for knee and hip replacements are relatively low, as well as the hysterectomy rate, which is among the lowest in the country.

The regions of northwest Bohemia and North Moravia are often considered problematic as they have been particularly affected by industrial restructuring and the burden of heavy industry and mining. Numerous social and economic problems have arisen as a result of high unemployment and a high level of ethnic heterogeneity in the population. The pattern of rates is mixed in these regions. Northwest Bohemia's population has lower standardised rates of caesarean sections, while North Moravia's population has the highest rate. The opposite is true for hysterectomies, where Northwest Bohemia (especially *Karlovarsky kraj*) has the highest rate and North Moravia is below average. As for knee and total hip replacements, the differences between these two areas are not so pronounced. *Ustecky* and *Moravskoslezsky kraj* have low rates of hip replacements, but in the case of knee replacement *Moravskoslezsky kraj* is above the national average.

The area on the border of Bohemia and Moravia including *Kralovehradecky, Pardubicky kraj* and *Kraj Vysocina* along with the adjacent districts of *Olomoucky, Jihomoravsky, Stredocesky* and *Jihocesky kraj* are not generally perceived as being particularly problematic with respect to access to health care and the socioeconomic structure of the population. On the contrary, some parts of this region have the best values for health indicators (e.g., *Kralovehradecky kraj,* with above-average life expectancy at birth, etc.). This part of the Czech Republic has the highest numbers of knee replacements and total hip replacements. The patients undergoing these procedures are also the oldest in the Czech Republic.

At the system level, revenues of the health care system increased rapidly due to new investment from the European Union's Structural funds between 2007 and 2009. After 2010, private expenditure decreased and spending by the health insurance funds has stagnated since 2011. This forced the health insurance funds to change the reimbursement mechanisms towards diagnosis related groups (DRGs). Physicians also succeeded in increasing their wages which might have had a significant have an impact on some hospitals. These changes may have had an impact on the rates observed across geographic areas as hospitals were then forced either to increase efficiency or decrease production.

The analysis could also be improved by moving from administrative regional units to more relevant units, such as rural/urban clusters. Further analysis could include better classification of the severity of patient conditions. In this study, only age and gender could be used as a proxy of patient need. Future data analysis could include information about whether the surgery was elective or urgent and on the progression of the disease. Waiting times may also pose limits on access in some regions, which could influence regional variation, but this is poorly identified in the Czech health care system. Information on the impact of contractual agreements between insurance funds and outpatient specialists (who provide referrals) and hospitals would also allow better understanding of the situation.

At the policy level, there has been little focus to date in the Czech Republic on programmes to improve shared decision-making so as to increase people's understanding of their options, including alternatives to surgery. For example, there is no clear clinical consensus on indications for knee replacement, and patient preferences are likely to influence the decision to operate or use alternative treatments (Brownlee et al., 2011). More information on the clinical guidelines available for some procedures could also help to understand the regional variations and support further analysis of geographic variations in health care in the Czech Republic.

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ANNEX 5.A1

Definition of data used for the Czech Republic

Hospital medical admissions

The number of hospital medical admissions (or discharges) is an indicator of the intensity of hospital use across different regions. This includes all hospital admissions for a medical (non-surgical) purpose involving at least one night of stay, including admissions in both general hospitals and more specialised hospitals (but excluding mental hospitals). The statistical unit is a discharged patient on a ward of an inpatient health care provider. The data include deliveries.

For the purposes of this study, only facilities for acute inpatient care were included. Data on medical admissions were aggregated by diagnosis groups – ISHMT (International Shortlist of Hospital Morbidity Tabulation) – and by sex, region of permanent residence of the patient and age group.

An independent study focusing on medical admissions was conducted. Since this overall study on medical practice variations was being performed for the first time in the Czech Republic, it was suggested that an overview of medical admissions would provide a good starting point.

Caesarean sections

For this procedure the number of births was used in order to calculate the number of caesarean sections per 1 000 births. The source of information was the national register of mothers (NRROD), which is embedded in the Czech legislation (Law No. 372/2011 on health care services). The purpose of obtaining the requested information is to provide basic data on the reproductive history of women in the course of pregnancy and childbirth plus information on newborns. The obtained information is a valuable source of information for gynaecological and obstetric care and an important tool for improving care for pregnant women and mothers. The NRROD has recorded all mothers subject to reporting obligations since 1991. The data are reported by the Department of Obstetrics and Gynaecology in all inpatient health facilities; in case of delivery outside a health care facility (birth at home, in ambulances, public areas, etc.) the obligation of notice is on the health care professional.

Knee interventions (knee replacement and knee arthroscopy)

The Czech data for this procedure were extracted from the National Register of Inpatient Discharges (NRHOSP). The data include knee replacements, partial replacements or other procedures on the knee. Triangulation and several selection methods were applied with similar results, but further work with the data and inclusion of other data sources (e.g. reimbursement claims by the health insurance funds) are needed to get a deeper insight into regional variations on knee interventions.

Surgery after hip fracture

Surgery after hip fracture was selected for calibration purposes, as this procedure is expected to vary little across regions.

The Czech data for this procedure were extracted from the National Register of Inpatient Discharges (NRHOSP). The data include hip replacements, partial replacements and other procedure on the hip joint. Triangulation and several selection methods were applied with similar results, but further work with the data and inclusion of other data sources (e.g. national register of joint replacements) are needed to get a deeper insight into regional variations in hip replacement interventions. The Czech data were exported from the National Register of Joint Replacements (NRKN), which is embedded in the Czech legislation (Law No. 372/2011 on health care services). The purpose of this register is to obtain information on patients relating to the treatment (e.g. type of replacement, size, specifications of the prosthesis, the use of cement, the incidence of complications).

Hysterectomies

Data from the registry of discharges (NRHOSP) were used and this procedure was easily identified in the dataset.

Revascularisation procedures (PTCA and CABG) and MRI and CT

Revascularisation procedures and MRI and CT scans were not available for analysis. The Czech Republic has a register of cardiac interventions (the National Cardiac Registry, NKCHR) which is embedded in the Czech legislation (Law No. 372/2011 on health care services). The NKCHR was created in 2002 based on the need for all cardiac centres to obtain information about the number of cardiac surgeries and to allow a more accurate assessment and analysis of performance quality, including mortality, length of hospital stay and the stratification of risk factors. The registers now include patient level data, but they were not available when the study was conducted. For MRI and CT scans, the available data sources do not include the number of MRI and CT scans in the Czech Republic on the patient level. The number of procedures on the regional level by provider is available, but that would not be comparable with the previous part of the study where information on the region of permanent residence is used. The data for MRI and CT scans are available at the health insurance funds' claims dataset, and further co-operation with them is needed in order to produce these results for the Czech Republic.

Data identification used in the analysis

The dataset from the register of discharged patients was defined by these fields:

YEAR|SEX|AGEGROUP|ISHMT|ORPPATIENT|REGIONPROVIDER|NUMBER

Where

- YEAR = the year of discharge of the patient (2001-11)
- SEX = the gender of the patient (man/woman/unknown)

- AGEGROUP = the five-year age group of the patient (0-4, 5-9, 10-14, …, 95+, unknown)
- ISHMT = the diagnostic group by ISHMT classification
- ORPPATIENT = the municipality of permanent residence of the patient (that can be aggregated to districts and regions)
- REGIONPROVIDER = the region of the facility of the provider
- NUMBER = number of discharges for the relevant combination

For individual procedures, instead of ISHMT a relevant procedure was used based on the OECD project guidelines.

Chapter 6

Finland: Geographic variations in health care

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This chapter describes geographic variations in the rates of medical admissions to hospitals and in eight surgical procedures performed for 20 hospital districts over the period 2001 to 2011. While medical admission rates decreased by over 20% and hysterectomy rates by over 40% over this period, knee replacements increased by 80% and coronary revascularisations by 30%. These changes obviously reflect the trends in developing treatments and care.

There were also changes in the extent of geographic variation in hospital use, such as a decrease in variations of knee interventions and an increase in variations for coronary revascularisations. These trends may be associated with several factors, such as differences in resource development and the adoption of new practices, but also with policy measures adopted (for instance for hysterectomy and knee interventions).

In Finland, several measures have already been introduced to tackle practice variations, such as the establishment of comprehensive health care registers, the production of performance indicators, and the development of national clinical guidelines and common criteria for treatments. More systematic implementation and monitoring of these measures may be needed.

6.1. Introduction

In Finland, the first studies on regional variations in health care were carried out relatively early, in the 1960s and 1970s. A data registry on hospital discharges (Finnish Hospital Discharge Register) was established in 1967, which provided an option to investigate hospital activities. However, these studies focused on the overall use of hospital care and the use of care in different specialties or in relation to major diagnostic categories. After the coding of surgical procedures was introduced in the Discharge Registry in 1986 and the Medical Birth Registry was launched in 1987, it was possible to conduct research on medical practice variation along the lines of the studies published earlier in the United States by John Wennberg and his colleagues. The development of this research tradition in Finland and other Nordic countries was boosted by the establishment of the WHO Collaborating Centre for the Study of Regional Variations in Health Care. In 1988, the Centre started a collaborative project on health care variations in the Nordic countries, which resulted in a Nordic joint publication on rates of surgery (Madsen et al., 1994) as well as in national publications (Keskimäki et al., 1993, 1994; Teperi et al., 1995). These reports addressed variations in the rates of 11 common procedures in 1987-88 in Finland. Of the procedures, the variability of rates was largest for haemorrhoidectomy, back operations and hysterectomy, where differences of 3.5-fold to 6.5-fold were observed across hospital service areas (Keskimäki et al., 1993, 1994).

In another early Finnish study, clear variations in hospital medical admissions were found between hospital districts in 1989-93 (Häkkinen et al., 1995). Regional variations have also been found in studies concerning orthopaedic surgery in 1987-2002 (Mikkola et al., 2005) as well as re-operations after lumbar disc surgery in 1987-95 (Keskimäki et al., 2000). In the latter study, the re-operation risk varied among the university hospitals but tended to be higher for neurosurgery than for orthopaedic surgery (Keskimäki et al., 2000). Regarding orthopaedic surgery, large differences between hospital districts in the treatment protocols of knee fractures were detected in 1997-99. In Helsinki (southern Finland), the probability of undergoing surgery of the knee was two times as high as in Oulu (Northern Finland) (Turunen et al., 2004). In 2010 in the eastern and northern parts of Finland, the numbers of coronary revascularisations were higher than in other parts of the country (Mustonen et al., 2012). Also regional variations were found in earlier studies concerning coronary revascularisations (Häkkinen et al., 2002, Lumme et al., 2008).

In conclusion, marked regional variations have been repeatedly demonstrated in the use of health services in Finland. Studies have shown variations in the use of outpatient and inpatient hospital care, in surgical and medicinal treatments as well as in laboratory tests and other diagnostic services. The explanations given for these variations have included differences in a wide range of factors, such as population morbidity and preferences, health care resources and efficiency, and differences in medical practices and the diffusion of medical technologies (Keskimäki et al., 1993; Teperi and Keskimäki, 1993). These explanations are generic, and it is plausible that depending on the health care activity assessed they continue to exert a varying impact on geographic variations in health care.

In Finland, medical practice variation was recognised as a health policy challenge relatively early. Prompted by studies published in the early 1990s that demonstrated large variations in health care activities and surgical procedures, the Ministry of Social Affairs and Health set a goal of decreasing unwarranted variations in health care in its strategy. At least partly in relation to this strategy focus, the Finnish Office for Health Technology

Assessment (FinOHTA) was launched in 1995 as a unit of the National Research and Development Centre for Welfare and Health (STAKES, currently the National Institute for Health and Welfare, THL). The ministry also initiated financial support for the production of clinical guidelines by the Finnish Medical Society Duodecim. The production and updating of these guidelines as well as government support for "Current Care" guidelines is today a nationally co-ordinated activity, which involves the Duodecim and most medical specialist societies. There are currently a total of 101 guidelines.

6.2. Overview of Finland's health care system

Political and organisational structure

The Ministry of Social Affairs and Health (MSAH) directs and guides the development of social welfare and health care policy and services at the national level. The ministry prepares reforms and proposals for legislation and monitors their implementation and co-ordination. Every four years the government adopts a National Development Plan for Social and Health Care Services and allocates funds to local and regional development projects (Ministry of Social Affairs and Health, 2008).

The lower level of state administration comprises six regions plus the autonomous Åland Islands (Jonsson et al., 2013). The Regional State Administrative Agencies promote the national and regional objectives of the central administration and guide and supervise both public and private health care providers (Jonsson et al., 2013).

The municipalities are responsible for the provision of health care services (i.e. primary care, specialist and long-term care; nursing homes and social services for the elderly), and may purchase services from other municipalities, organisations and private service providers. Each municipality belongs to one of the 20 hospital districts, and in 2011 there were 336 municipalities with a median number of 6 000 inhabitants (Jonsson et al., 2013). A municipal council that is elected every four years appoints an executive board, and members of municipal committees make decisions on health care delivery in their municipality (Vuorenkoski et al., 2008).

Health care expenditure

Total health spending accounted for 9.0% of Finland's GDP in 2011, just below the average of 9.3% in the OECD countries (OECD, 2013). With per capita health spending of USD 3 374 in 2011 (adjusted for purchasing power parity), Finland was also close to the OECD average of USD 3 300. Spending in the hospital sector accounted for about 30% of total health spending, which is in line with the OECD average in 2011 (OECD, 2013).

Between 2000 and 2009, health spending per capita in Finland increased, in real terms, at a rate of 3.9% per year on average, but at a lower rate of 1.6% on average between 2009 and 2011.

Health care financing

The Finnish health care system provides universal coverage and is financed mainly from general taxation (60% in 2011) and National Health Insurance (NHI) (15%), although it is complemented by patients out-of-pocket fees (OOP) (20%) (OECD, 2013). The Social Insurance Institution (SII) runs the NHI statutory scheme, which is funded by the insured, employers and the state. The insured population are subject to income-based fees, which are collected alongside taxation (Vuorenkoski et al., 2008). Municipalities have the right to levy taxes (e.g. income and property) and receive a share of corporate taxes. The Finnish Government provides transfers to municipalities to even out differences in revenue-raising capacity across municipalities. The main sources of funding come from municipalities (35%), central government (25%) and the NHI (15%) (National Institute for Health and Welfare, 2012). While municipalities fund municipal health care services, except for outpatient drugs and transport costs, the NHI funds part of outpatient drug costs, occupational health care costs and private health care costs (Vuorenkoski et al., 2008).

OOP payments are levied on psychiatric, primary care services and other kinds of care. There is an annual payment cap on municipal services (EUR 636 in 2012) (Jonsson et al., 2013). Patients also have to pay fixed co-payments for outpatient visits to a public hospital and day surgery and per diem co-payments for inpatient stays (OECD, 2013). Voluntary private health insurance provides supplementary coverage (14.2% of the population) and accounted for 2.1% of health financing in 2011 (OECD, 2013).

Health care delivery and provider payments

Physician services and payments

In 2011, Finland had 172 health centres, most of which have GP-run inpatient units. Services include primary care, dental care, physiotherapy and occupational health care; some maternity care services; and care of the elderly and other specific patient groups. They are equipped with facilities for minor surgery, X-rays, clinical laboratory and a pharmacy for inpatient services. Health centres use prospective budgets, which are set prospectively and based on past utilisation and service volume. Patients do not have a choice about which doctor is assigned to treat them at the health centres, but they can choose physicians in private practice.

Physicians may work in the public system or in the private sector. In the public system, they work either in health centres or in hospitals and are salaried (OECD Health Systems Characteristics Survey, 2012). In 2013, 21% of all doctors worked in municipal health centres and 44% in hospitals (Finnish Medical Association, 2013). Four percent of doctors worked in occupational health services, which are mainly offered by private providers. Municipal health centre and hospital doctors may practice privately outside their normal working hours, and are then paid on a fee-for-service (FFS) basis. The NHI reimburses a portion (25.8% on average in 2011) of patient fees and other costs for examinations and treatments in the private sector. A portion (65% on average in 2011) of the cost of prescription medicine is also reimbursed by the NHI (Mossialos and Srivastava 2008; Social Insurance Institution, 2012).

About 18% of physicians had a private practice and close to one-third of these worked full-time as a private practitioner (Finnish Medical Association, 2013). In 2011, Finland had 3.3 physicians per 1 000 population, close to the OECD average of 3.2. Finland had a higher generalist workforce (36% of physicians) than the OECD average (30%) and a lower specialist workforce (44%) than the OECD average (62%) for 2011. The lower proportion of specialists may reflect that 20% of physicians are in an undefined specialty (OECD, 2013).

Hospital services and payments

Each hospital district consists of at least one hospital. The hospital district organises and provides specialist hospital services and is funded by the municipalities (Jonsson et al., 2013). The prices for the services are also decided by the municipalities. Recently, there has been a trend away from bed-day payments towards using activity-based prices for billing part of the services (14 out of 20 hospital districts used diagnosis related groups for billing municipalities in 2011) (Kapiainen et al., 2012). Only a very small proportion of Finland's hospitals are privately operated.

Finland had 5.5 hospital beds per 1 000 population in 2011, above the OECD average (five beds), with the majority in public hospitals. As in most OECD countries, the number of hospital beds per capita in Finland has fallen over time. This decline has coincided with a reduction in the average length of stay in hospital and an increase in day surgery.

6.3. Data and methods

This chapter includes data for all of the health care activities and procedures covered under this OECD project except for MRI and CT scans. These procedures are commonly performed on surgical patients and account for a large proportion of all surgical interventions in Finland. Coronary artery bypass grafting (CABG) and percutaneous transluminal coronary angioplasty (PTCA) procedures were combined and analysed together. The catheterisation group was considered only in cases with a catheterisation code but without CABG and PTCA codes.

Data on the procedures were obtained from two sources of routinely gathered data, the Finnish Care Register for Health Care and the Finnish Medical Birth Register. The Finnish Care Register for Health Care (a continuation of the Hospital Discharge Register, which has data on patients discharged from hospitals between 1969 and 1993) was used to analyse the regional variation of surgical procedures. The Finnish Medical Birth Register was used to analyse caesarean sections. Both registers cover all Finnish hospitals, including the few private ones. More than 95% of all hospital discharges can be identified in the Finnish Care Register for Health Care (Sund, 2012) and about 99% of all caesarean sections are covered in the Finnish Medical Birth Register (Gissler et al., 1993). Data are reported according the patient's place of residence.

Our approach was to compare activities between 20 hospital districts (see Table 6.1 and Figure 6.1 below). All data were adjusted for population characteristics (age and sex) using the 2011 Finnish population. The Åland Islands, an autonomous archipelago county located between mainland Finland and Sweden, were excluded from the analysis due to its small population (less than 30 000) and because a considerable share of the county's patients who need surgery are referred to Swedish hospitals.

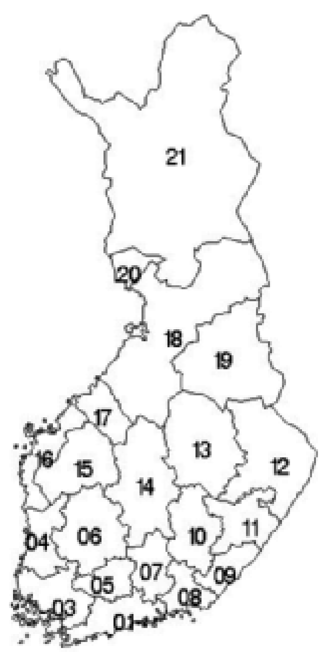
Some additional variables were also included in the chapter. To compare resource availability between hospital districts, we asked for data from the Finnish Medical Association, which provided us information on the density of the following physicians: obstetricians and gynaecologists, cardiac surgeons, cardiologists, orthopaedic surgeons and traumatologists, along with the total number of physicians. Another variable on the supply side used in this chapter was average length of stay for caesarean section by hospital district.

Table 6.1. Population size of the 20 hospital districts, Finland, 2011

Hospital district	Total population	Aged 15+	Aged 20+
01 Helsinki and Uusimaa	1 545 034	1 283 531	1 191 342
03 Southwest Finland	470 453	396 748	369 137
04 Satakunta	225 302	191 027	177 621
05 Kanta-Häme	175 230	146 168	135 512
06 Pirkanmaa	489 501	409 384	381 096
07 Päijät-Häme	213 262	180 563	167 479
08 Kymenlaakso	174 827	149 388	139 015
09 South Karelia	132 527	113 720	106 014
10 South Savo	105 450	90 658	84 620
11 East Savo	45 245	39 222	36 680
12 North Karelia	169 733	144 465	134 267
13 North Savo	248 130	209 883	194 801
14 Central Finland	274 379	229 025	212 139
15 Southern Ostrobothnia	198 671	164 481	151 840
16 Vaasa	167 489	138 584	127 882
17 Central Ostrobothnia	75 165	61 143	56 024
18 Northern Ostrobothnia	401 201	319 179	291 911
19 Kainuu	77 984	66 557	61 653
20 Länsi-Pohja	64 994	54 354	50 301
21 Lapland	118 336	100 496	93 189
All	**5 372 913**	**4 488 576**	**4 162 523**

Source: Statistics Finland (2011), www.stat.fi/index_en.html.

Figure 6.1. Map of the 20 hospital districts, Finland, 2011



Source: Ministry of Social Affairs and Health (2013).

6.4. Description of results

There are small variations across hospital districts for surgery after hip fracture, which is confirmed as a low calibration procedure, as well as for caesarean section and knee replacement (see Table 6.2). Large variations are observed for catheterisation. These procedures are also carried out in outpatient settings, where the coverage of procedure reporting vary between hospitals, which may then explain a part of the variations. Relative to surgery after hip fracture, the variations in knee arthroscopy, hysterectomy and hospital medical admissions were found to be in the middle range.

Table 6.2. Summary of results on geographic variations for selected health care procedures by hospital district, Finland, 2011

	Hospital medical admission	CABG+PTCA	Catheterisation	Surgery after hip fracture	Knee replacement	Knee arthroscopy	Caesarean section (per 1 000 live births)	Hysterectomy
Crude rate per 100 000 population	8168	246	308	95	240	318	161	227
Unweighted average rate	9505	284	378	96	253	316	167	253
Q10	7142	189	224	81	192	244	144	204
Q90	11165	371	583	111	294	377	196	319
Coefficient of variation	0.20	0.26	0.35	0.13	0.17	0.22	0.16	0.20
Systematic component of variation	8.55	11.14	22.50	1.05	3.27	4.81	2.51	5.98

Note: Unless specified, all rates are for age- and sex-standardised rates per 100 000 population.

Source: National Institute for Health and Welfare (2013).

Table 6.3 provides a useful picture for understanding trends in variation over time, with the systematic component of variation (SCV). This statistic has been adjusted to account for differences in the population structure. As can be seen from the table below, the levels of variation for surgery after hip fracture were fairly low and stable. Knee replacement and knee arthroscopy show a reduction in the SCV value over time. The rate of hospital medical admissions dropped over time, but the increase in variations does not appear to be related to population differences. Similarly, while the rate of caesarean section experienced little change over time, variations increased. Catheterisation stands out as a procedure where both the rate and variation increased over time but as mentioned earlier this could in part be due to data coverage issues.

Table 6.3. Systematic component of variation for the different health care activities, Finland, 2001-11

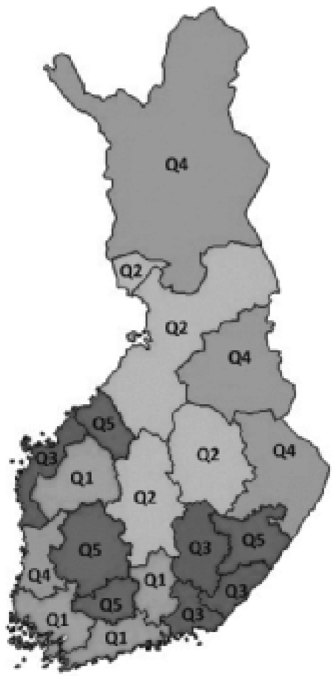
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Hospital medical admissions	2.56	2.68	2.88	2.67	4.44	3.41	3.72	5.08	6.69	7.37	8.55
Caesarean sections	1.63	1.87	3.40	1.05	1.37	1.56	1.78	2.77	1.84	2.94	2.51
Revascularisation procedures: CABG and PTCA	5.46	4.21	4.51	6.92	11.83	9.35	7.46	6.64	8.24	8.30	11.14
Revascularisation procedures: Catheterisation	14.77	12.18	12.12	10.04	10.66	18.16	13.63	16.66	16.37	14.55	22.50
Knee replacement	5.53	5.16	8.87	5.87	3.88	5.53	5.76	5.31	2.51	2.34	3.27
Knee arthroscopy	9.11	7.49	5.98	7.03	6.07	4.23	3.51	2.21	3.35	4.87	4.81
Surgery after hip fracture	1.52	0.79	0.49	0.49	0.01	1.24	0.37	0.64	1.08	1.06	1.05
Hysterectomy	3.31	4.82	5.31	4.04	3.28	4.81	3.39	3.55	5.15	6.04	5.98

Source: National Institute for Health and Welfare (2013).

Hospital medical admissions

In 2011, the highest standardised rates of hospital medical admissions in Finland were recorded for Pirkanmaa (11 773 per 100 000 population) and Kanta-Häme (11 334), compared with a national unweighted average of 9 505 per 100 000 population (Table 6.4). Admissions rates were also high in eastern Finland in 2011 (Figure 6.2).

Figure 6.2. Map of hospital medical admissions standardised rate by hospital district, er 100 000 population, Finland, 2011



Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

Table 6.4. Hospital medical admissions standardised rate, per 100 000 population, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	12195	9996	14707	1.47	0.16
2002	11926	10002	13694	1.37	0.16
2003	12633	10769	15338	1.42	0.14
2004	12590	10938	14919	1.36	0.13
2005	11482	8660	13470	1.56	0.17
2006	11537	9505	13200	1.39	0.15
2007	11261	9210	13199	1.43	0.15
2008	11022	9216	12847	1.39	0.17
2009	10310	7839	12663	1.62	0.19
2010	9323	7142	11102	1.55	0.19
2011	9505	7142	11165	1.56	0.20

Source: National Institute for Health and Welfare (2013).

The number of hospital medical admissions in the country decreased by 22% from 2001 to 2011, which associates with a decline of around 14% in the number of somatic hospital beds. At the same time, variations in admissions rates increased between hospital districts. Across hospital districts, trends in admission rates diverged substantially, from an increase to a marked decrease. However, the increase in variation was mainly due to two outlying university hospital districts (Helsinki and Uusimaa, and Southwest Finland), which had cut down their rates of medical admissions by 50%-60%. Among the other hospital districts, the variation in admission rates actually decreased.

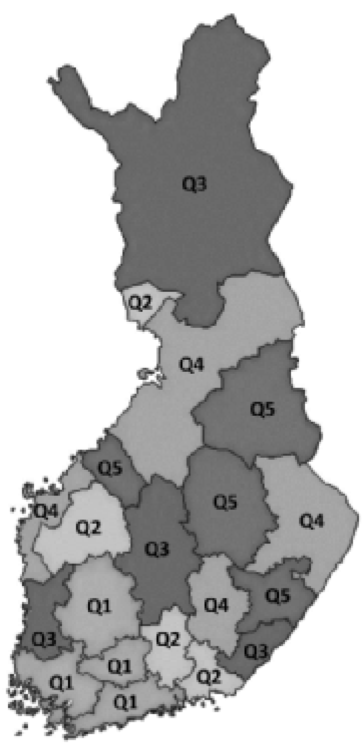
Cardiac procedures

The capacity for performing coronary angioplasties (PTCA) started to be developed later in Finland than in many other OECD countries. In 2001, less than 50% of all coronary revascularisations were PTCAs, but the proportion varied between 31% and 65% across hospital districts. By 2011, 73% of all coronary revascularisations in Finland were angioplasties. While in the study period, particularly in the early 2000s, CABGs and PTCAs were used as reciprocally substituting procedures in Finland, in this study these procedures are combined in the analysis.

CABG and PTCA

In 2011, CABG and PTCA rates were highest in the Kainuu (441 per 100 000), Central Ostrobothnia (385 per 100 000) and North Savo (369 per 100 000) hospital districts (Figure 6.3), compared with a national unweighted average of 284 (Table 6.5).

Figure 6.3. Map of CABG and PTCA standardised rates by hospital district, per 100 000 population, Finland, 2011



Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

The density rate for cardiac surgeons was below the average (0.02 per 1 000 population) in 2011 (Annex 6.A1) in all hospital districts, except North Savo (0.07 per 1 000 population). In Finland, coronary bypass operations are performed mainly in university hospitals. For example, the North Karelia, South and East Savo, and Central Finland hospital districts refer their CABG patients to the Kuopio University Hospital, which is located in the North Savo hospital district (where the density rate for cardiac surgeons is above average).

The average rate of CABG and PTCA increased notably from 218 in 2001 to 284 per 100 000 in 2011 (30% increase) (Table 6.5). Variations between hospital districts also clearly increased, especially in the years 2005, 2006 and 2011.

Table 6.5. CABG and PTCA standardised rates, per 100 000 population, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	218	141	282	2.00	0.24
2002	233	178	284	1.60	0.21
2003	268	203	342	1.68	0.22
2004	275	167	364	2.17	0.25
2005	287	168	392	2.33	0.30
2006	316	227	439	1.94	0.27
2007	276	200	366	1.83	0.25
2008	286	191	377	1.97	0.23
2009	279	186	355	1.91	0.24
2010	279	190	326	1.71	0.24
2011	284	189	371	1.96	0.26

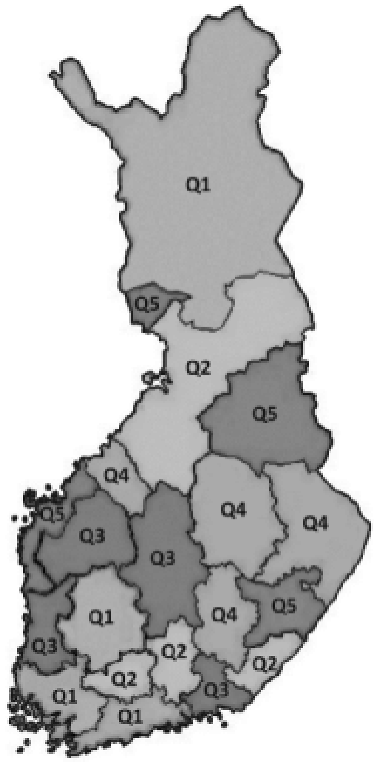
Source: National Institute for Health and Welfare (2013).

Catheterisation

Catheterisation was most frequently used in the Kainuu (623 per 100 000), Vaasa (585 per 100 000), East Savo (583 per 100 000) and Länsi-Pohja (467 per 100 000) hospital districts in 2011 (Figure 6.4). These figures were substantially higher than the national unweighted average of 378 per 100 000 (Table 6.6.).

The regional rates for catheterisations and CABG and PTCA procedures were strongly correlated, with annual correlation coefficients from 0.54 to 0.74. The density for cardiologists was the same or below the average rate in Finland (0.04 per 1 000 population) in Kainuu, East Savo and Länsi-Pohja. In the Vaasa hospital district (0.07 per 1 000) the density of cardiologists was higher than the average density rate in 2011 (Annex 6.A1). While the high density rate of cardiologists may contribute to the high catheterisation figures in the Vaasa hospital district, other hospital districts with high catheterisation rates are located in the eastern part of Finland, which had the highest regional ischaemic heart disease morbidity in the country.

Figure 6.4. Map of catheterisation standardised rate by hospital district, per 100 000 population, Finland, 2011



Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

The country average of catheterisation rates increased over the study period. However, the relative variation of catheterisation rates between hospital districts remained high in all years, and there was no distinct trend in the range of variation.

Table 6.6. Catheterisation standardised rate, per 100 000 population, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	259	168	389	2.32	0.39
2002	299	220	463	2.11	0.34
2003	353	218	505	2.32	0.32
2004	392	266	549	2.06	0.28
2005	405	274	571	2.08	0.29
2006	421	228	568	2.49	0.33
2007	417	249	568	2.28	0.29
2008	397	219	557	2.54	0.33
2009	374	215	512	2.39	0.31
2010	377	251	556	2.22	0.29
2011	378	224	583	2.61	0.35

Source: National Institute for Health and Welfare (2013).

With respect to cardiac procedures, three relevant national clinical guidelines have been issued in Finland: 1) diagnostics of myocardial infarction, 2) treatment of cardiac events including unstable angina pectoris and myocardial infarction without ST elevation, and 3) treatment of myocardial infarction with ST elevation. The guideline on diagnostics was issued in 2000 and the latest update released in 2009. The finding of ST segment elevation on an electrocardiogram in a myocardial infarction patient is considered to indicate a poorer prognosis and a need for prompt reperfusion of coronary arteries with angioplasty or thrombolytic therapy. The guideline on ST elevation infarction was issued in 2011, and the one on unstable angina pectoris and infarction without ST elevation was published in 2003 and last updated in 2009.

One potential reason for a relatively large regional variation is the existence of regional variation in the need for these procedures. Highest rates are found in eastern Finland. The east-west gradient in ischaemic heart disease mortality was already found in the 1940s and 1950s. Since the 1970s, ischaemic heart disease mortality has markedly decreased, by even as much as 80% among working-age men. However, Finland's east-west divide in ischaemic heart disease, with high morbidity in the north-east and low morbidity in the south-west, has remained (Koskinen, 1994; National Institute for Health and Welfare, 2013). Local policies may also partly account for the variations. For instance, while some university hospitals in Finland slowly started to build up capacity for catheterisations and PTCAs, some non-university hospital districts decided to invest in catheterisations quite early. Uncoordinated decisions to launch services using a new and growing technology have in part contributed to the regional variations observed in Finland.

Joint procedures

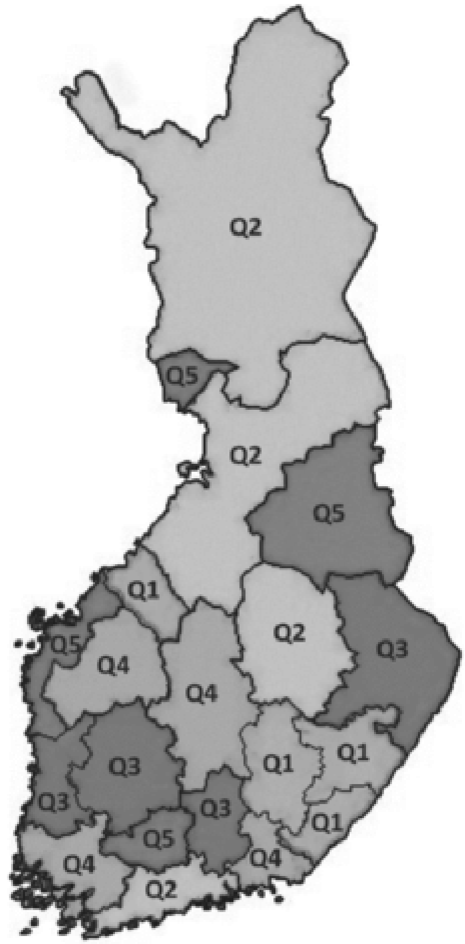
Surgery after hip fracture

Surgical procedures after hip fracture were most frequent in the Kanta-Häme (127 per 100 000) and Kainuu hospital districts (118 per 100 000) in 2011 (Figure 6.5), compared with a national unweighted rate of 96 (Table 6.7).

As expected, no major changes were found in the average rates of surgical procedures after hip fracture from 2001 to 2011, and the regional variations for this procedure have consistently been lower compared with variations in the rates of the other procedures studied.

There is a national guideline for the treatment of hip fractures published by Duodecim. It was issued for the first time in 2006, with the latest update released in 2011. In addition to advocating prompt surgical treatment, the guideline underlines the importance of control of pain, the adequate choice of surgical approach, early mobilisation, effective rehabilitation and prevention of fractures.

Figure 6.5. Map of surgery after hip fracture standardised rate, per 100 000 population, Finland, 2011



Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

Table 6.7. Surgery after hip fracture standardised rate, per 100 000 population, Finland, 2001-11

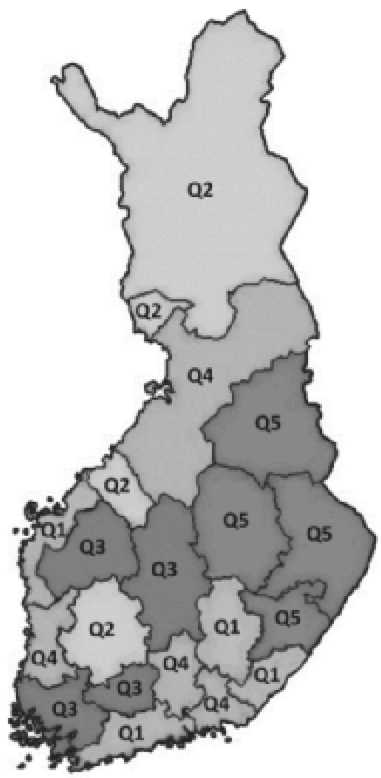
Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	97	74	115	1.56	0.15
2002	105	90	119	1.32	0.12
2003	99	88	109	1.23	0.11
2004	90	79	107	1.35	0.12
2005	91	80	100	1.25	0.10
2006	93	81	107	1.32	0.14
2007	91	81	101	1.25	0.11
2008	96	84	108	1.27	0.11
2009	98	84	114	1.37	0.14
2010	98	79	114	1.44	0.14
2011	96	81	111	1.36	0.13

Source: National Institute for Health and Welfare (2013).

Knee replacement

In 2011, knee replacements were carried out most frequently in the North Savo hospital district (365 per 100 000) as well as in other eastern parts of Finland (Figure 6.6), compared with a national unweighted average of 253 per 100 000 (Table 6.8). The density of orthopaedic surgeons in North Savo (0.10 per 1 000 population) was somewhat higher than the average in Finland (0.08 per 1 000 population). However, hospital district knee replacement rates and densities of orthopaedic surgeons were not systematically related over the study years (Annex 6.A1).

Figure 6.6. Map of knee replacement standardised rate by hospital district, per 100 000 population, Finland, 2011



Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

The average rate of knee replacements increased steadily between 2001 and 2006 and remained stable after that. The variation between hospital districts decreased slightly towards the end of the study period.

Knee arthroscopy

Knee arthroscopy was most widely used in the Kymenlaakso hospital district (521 per 100 000) (Figure 6.7), compared with a national unweighted average of 316 per 100 000 in 2011 (Table 6.9). This was despite the fact that the density for orthopaedic surgeons in Kymenlaakso was lowest in the whole country (0.02 per 1 000 population) (Annex 6.A1). The average rate of knee arthroscopies and the variation between hospital districts also started to decline after 2006.

Table 6.8. Knee replacement standardised rate, per 100 000 population, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	141	108	181	1.69	0.22
2002	158	128	196	1.54	0.23
2003	187	135	244	1.80	0.27
2004	173	129	221	1.72	0.23
2005	230	189	295	1.56	0.19
2006	254	185	314	1.70	0.23
2007	238	177	305	1.73	0.22
2008	262	202	318	1.58	0.19
2009	250	214	291	1.36	0.14
2010	252	202	290	1.44	0.15
2011	253	192	294	1.53	0.17

Source: National Institute for Health and Welfare (2013).

Figure 6.7. Map of knee arthroscopy standardised rate by hospital district, per 100 000 population, Finland, 2011

Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

In 2005, the Ministry of Social Affair and Health (2005) published criteria for access to non-emergency treatment, which also included criteria for assessing the need for knee replacement and arthroscopy. These criteria were updated in 2010 (Ministry of Social Affairs and Health, 2010). The publication lists a set of rated criteria, such as pain, clinical findings, and the ability to walk and carry out daily activities. The first version of the national clinical guideline on osteoarthritis in knee and hip joints was published in 2007 by the Medical Society Duodecim, and the updated version came out in 2012.

The guidelines and the criteria may have contributed to stabilising the rapid increase in knee replacements and evening out of regional variations but there is no strong evidence of that impact. Following the rapid increase in knee interventions by the late 2000s, Finland had reached a very high level. Another contributing factor may have been that Finnish knee replacement rates were among the highest in the OECD, which may have brought about a ceiling effect.

Table 6.9. Knee arthroscopy standardised rate, per 100 000 population, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	373	256	485	1.89	0.28
2002	372	256	504	1.97	0.27
2003	370	293	465	1.58	0.24
2004	355	241	471	1.95	0.27
2005	388	284	524	1.84	0.25
2006	395	305	519	1.70	0.21
2007	392	309	512	1.65	0.19
2008	369	303	455	1.50	0.15
2009	344	253	419	1.65	0.18
2010	321	251	359	1.43	0.22
2011	316	244	377	1.54	0.22

Source: National Institute for Health and Welfare (2013).

Gynaecological procedures

Caesarean sections

In 2011, standardised rates of caesarean sections were performed most frequently in East Savo (230 per 1 000 live births), in Kainuu (214) and Central Ostrobothnia (196) (Figure 6.8), compared with a national unweighted average of 167 (Table 6.10). However, the longest lengths of stays were found in Lapland (6.8) and in South Savo (6.2). The reason for the long average length of stay in the Lapland district may be related to the long distances between residents and the Lapland Central Hospital – for example, from Utsjoki and Kilpisjärvi the distance to the Lapland Central Hospital in Rovaniemi is over 400 km.

Figure 6.8. Map of caesarean sections age-standardised rate by hospital district, per 1 000 live births, Finland, 2011

Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

In Kymenlaakso and North Karelia, the density rates of obstetricians and gynaecologists were clearly smaller than the average rate, which was 0.24 per 1 000 women in 2011 (Annex 6.A1). In the Southwest Finland (0.34) and North Savo districts (0.33), which are also university hospital districts, the density rates were highest, but caesarean sections were performed less than average in these hospital districts (154 per 1 000 and 119 per 1 000 live births, respectively). It seems that the number of obstetricians and gynaecologists is not related to caesarean section rates. However, particularly high caesarean section rates in 2011 were displayed by districts with small central hospitals (Kainuu, South and East Savo, Central Ostrobothnia) in which many factors, such as insufficient resources for emergency duty services, may influence decisions about caesarean sections (Teperi et al., 1995).

The average rate of caesarean sections increased between 2001 and 2003 after which there were no major changes, except in 2009 when the average rate fell. Variations between hospital districts increased slightly.

Table 6.10. Caesarean sections age-standardised rate, per 1 000 live births, Finland, 2001-11

Year	Unweithed average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	162	143	184	1.29	0.14
2002	169	133	196	1.47	0.14
2003	169	134	206	1.54	0.18
2004	166	139	190	1.37	0.12
2005	167	137	192	1.40	0.13
2006	165	138	197	1.43	0.13
2007	167	143	196	1.37	0.14
2008	169	138	200	1.45	0.17
2009	163	136	187	1.37	0.14
2010	166	143	183	1.28	0.17
2011	167	144	196	1.36	0.16

Source: National Institute for Health and Welfare (2013).

Hysterectomy

In 2011, hysterectomies were performed most frequently in the Vaasa (348 per 100 000), North Karelia (324 per 100 000) and East Savo hospital districts (319 per 100 000) (Figure 6.9), compared with a national (unweighted) average of 253 per 100 000 (Table 6.11). In all these districts the density for gynaecologists was below the average rate in Finland (0.24 per 1 000 population) (Annex 6.A1).

The average rate of hysterectomies declined from 2001 to 2007, altogether by nearly 40%. The decline was slow at first but gathered pace from 2004 (Table 6.11). After 2007, there was no clear trend in overall national hysterectomy rates. Nor was any clear trend found in variations between hospital districts over the study period.

The decline in overall hysterectomy rates coincided with the publication of results from a Finnish randomised controlled trial study comparing hysterectomy and the use of a levonorgestrel-releasing intrauterine device for treating menorrhagia in the early 2000s (Hurskainen et al., 2001, 2004). The study also influenced the national clinical guideline on the treatment of excess menstrual bleeding, which underlined pharmaceutical treatments in menorrhagia. The guideline was first published by Duodecim in 2005 and updated in 2009.

Figure 6.9. Map of hysterectomy standardised rate, per 100 000 females, Finland, 2011

Note: Q = quintile with Q1 being the lowest quintile and Q5 the highest quintile.

Source: National Institute for Health and Welfare (2013).

Table 6.11. Hysterectomy standardised rate, per 100 000 females, Finland, 2001-11

Year	Unweighted average rate	Q10	Q90	Q90/Q10	Coefficient of variation
2001	438	361	508	1.41	0.17
2002	425	340	511	1.50	0.23
2003	414	335	480	1.43	0.21
2004	400	350	449	1.28	0.13
2005	327	260	405	1.56	0.19
2006	293	219	362	1.65	0.21
2007	262	207	325	1.57	0.18
2008	262	210	327	1.56	0.18
2009	245	188	315	1.68	0.22
2010	264	205	336	1.64	0.22
2011	253	204	319	1.57	0.20

Source: National Institute for Health and Welfare (2013).

6.5. Conclusions

Discussion and policy implications

In the early 1990s, the results of studies on health care variations published in Finland and elsewhere were discussed in the country's scientific and professional journals. Since the Ministry of Social Affairs and Health also considered regional variations in health care an important policy challenge, it organised a series of workshops to address practice variations and in the mid-1990s identified the control of unwarranted practice variations as a strategic goal. Although the ministry's strategy did not include any definitive intervention plan for tackling practice variations, several concrete actions were taken over the longer run. The Finnish Office for Health Technology Assessment was for example founded in 1995 as a unit in the National Research and Development Centre for Welfare and Health (STAKES). The ministry also started financial support for the production of clinical guidelines. The work on guidelines in Finland is co-ordinated by a separate office hosted by the Finnish Medical Society, Duodecim. These guidelines are national, and the specialist societies collaborate in their preparation. In the 1990s, STAKES also introduced the publication of regional statistics on hospital activities and birth interventions. Although the focus of the statistics has varied, they continue to be produced at the National Institute for Health and Welfare (THL).

The focus of policies addressing regional variations in health care began to change somewhat in the early 2000s. In particular, due to greater decentralisation after the 1993 reform of the system of government transfers to support the municipalities, disparities in regional access to care have been considered a challenge. Consequently, as a part of the National Health Care Project, the Ministry of Social Affairs and Health initiated a compilation of uniform criteria for access to non-emergency care in 2004 (Ministry of Social Affairs and Health, 2010). These criteria were produced to support the National Health Care Guarantee introduced in 2005 that defined maximum waiting times for hospital and primary care services, including dental care (Jonsson et al., 2013). The selection of criteria, which was carried out by several expert groups representing medical specialties, resulted in a set of detailed criteria for surgical and medical treatments as well as for some diagnostic procedures. This set of criteria has subsequently been updated several times. Waiting times for hospital care have been reduced, and in some cases the guarantee may also have increased surgery rates. There is no comprehensive evaluation of the policy's impact on clinical practice. In this study, the increase in knee replacement rates along with the drop in their regional variation suggest that the clinical criteria, the care guarantee as well as treatment guidelines may have had a positive impact on practice patterns.

In addition to the findings on knee operations, the trends in the hysterectomy rates suggest substantial changes in medical practices. In the 1990s, the research on regional variations in Finland demonstrated very large variations and overall rates that were internationally high not only for hysterectomies but also for lumbar disc procedures (Keskimäki et al., 1994; Seitsalo et al., 1996; Vuorma et al., 1998).

In the case of lumbar disc surgery, these results on variations and high rates prompted a debate within the orthopaedic specialty as well as a series of studies that followed up the rates, variations and outcomes of back surgery. Prominent clinicians participated in the debate and expressed their concern about high surgery rates and practice variations. It has been claimed that keeping the topic on the agenda helped to lower the rates of back surgery in general, although the relative variation across regions did not diminish (Mikkola et al., 2005).

Regarding hysterectomies, a similar reduction in the overall rates took place in the 2000s, as described in our result. Previously, Finnish medical practice regarding gynaecological disorders had been relatively prone to surgery, a trend that was reinforced by public hospital specialists' pay system, with additional payments coming from surgical procedures performed on semiprivate "pay bed" patients (Luoto et al., 1997). One factor that contributed to bringing down hysterectomy rates was a randomised multicentre clinical trial that clearly demonstrated the benefits of non-surgical treatment of menorrhagia with a levonorgestrel-releasing intrauterine device compared with hysterectomy. The first results of the study were published in the early 2000s and widely publicised (Hurskainen et al., 2001; Hurskainen et al., 2004). Clinical practice gradually started to change, and in 2005 a clinical guideline recommending hormone intrauterine device (IUD) as a treatment for menorrhagia was published. Hospital specialists' remuneration of the "pay bed" system was gradually abolished in 2004-08. While decreasing overall hysterectomy rates are well documented in the results of this current study, the lower surgery rates have not led to any smaller relative regional variation in hysterectomy rates between hospital districts.

Concluding remarks

Although Finland is a relatively small and homogeneous country, earlier research as well as the results of this country study display variations in medical practices that are comparable to those found in other countries. As the challenge of medical practice variations was recognised in Finland over 20 years ago, several measures have been introduced to curb variations, but due to lack of determined policies the impact of these measures has remained relatively weak. No clear action plan to influence the differences in practices has been adopted, and the implementation of identified policies has not been carefully followed up.

Unwarranted medical practice variations in Finland may be partly related to the structure of the health care system. Health care in Finland is strongly decentralised, with municipal organisations entrusted with decision-making powers about the provision of services. The services are also financed from multiple sources, resulting in difficulties in the co-ordination of different sectors of the health care system, such as public and private service provision (Keskimäki, 2011). The health care reform currently being prepared by the Finnish Government is aiming at a less decentralised system based on larger units to organise services, and improved stewardship and co-ordination of decision making. If the reform succeeds in achieving these goals, it is plausible that it will provide greater leverage to influence regional differences in health care resources, service provision and medical practices.

Many basic structures needed to tackle challenges in practice variations are, however, already in place in the Finnish health care system but, as already noted, they are not effectively used for improving decision making. For instance, the more systematic publication and follow-up of statistics on health care variations would be an easily implemented measure. Finland has advanced electronic hospital and ambulatory care data management systems, and comprehensive national registers are collected in health care. Data on regional differences in health care are published, but reports do not analytically focus enough on whether medical practice variations are justified or unwarranted, thereby compromising their usefulness to decision making.

Another potential measure concerning medical practice variations could be the effective implementation of the existing clinical guidelines and the detailed common criteria for access to health services. In Finland, the clinical guidelines are national, of good quality, and produced by a single organisation with the support of the national HTA agency, and they have won broad acceptance among health care professionals and providers. Besides publishing them on the Internet and in print as well as reviewing them in medical journals, there is little active implementation of the guidelines or follow-up of their use.

A similar situation applies to the common criteria for access to health services. The criteria were established for most common health interventions and service indications in a wide-based project prompted by legislation on care guarantee, and their development involved a large number of experts from different medical specialities (Ministry of Social Affairs and Health, 2010). The use of these criteria has not been effectively followed-up, and there is anecdotal evidence that they are not used in clinical decision making. Along with more efficient use of health care databases to deliver performance data for providers that is focused on practice variation, the clever use of guidelines and criteria for access to treatment could be used as ideal low-hanging fruit in terms of tackling practice variations in Finnish health care.

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ANNEX 6.A1

Density of specialists in Finland in 2001 and 2011

Table 6.A1.1. Density of specialists, Finland, 2001

	Obstetricians and gynecologists		Cardiac surgeons		Cardiologists		Orthopaedic surgeons and traumatologists		All physicians		Physicians <65 yrs in 1 Jan. 2001	
Hospital district	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	Population 31 Dec. 2000 All (n)	Population 31 Dec. 2000 Women (n)
Helsinki and Uusimaa	178	0.25	50	0.04	36	0.03	109	0.08	5635	4.05	1 390 274	722 995
Southwest Finland	69	0.3	14	0.03	7	0.02	28	0.06	1814	4.02	450 846	233 231
Satakunta	21	0.18	4	0.02	2	0.01	7	0.03	455	1.96	232 569	118 724
Kanta-Häme	11	0.13	1	0.01	3	0.02	5	0.03	346	2.09	165 307	84 980
Pirkanmaa	50	0.22	12	0.03	8	0.02	31	0.07	1630	3.65	446 603	229 576
Päijät-Häme	21	0.19	4	0.02	4	0.02	19	0.09	478	2.29	208 837	108 021
Kymenlaakso	11	0.12	1	0.01	1	0.01	5	0.03	349	1.94	179 940	91 829
South Karelia	10	0.14	1	0.01	0	0	3	0.02	270	1.98	136 299	69 170
South Savo	8	0.14	1	0.01	1	0.01	5	0.04	230	2.04	112 508	57 521
East Savo	5	0.2	0	0	1	0.02	2	0.04	140	2.83	49 489	25 412
North Karelia	13	0.15	2	0.01	4	0.02	5	0.03	356	2.02	176 187	88 700
North Savo	36	0.28	15	0.06	10	0.04	20	0.08	1005	3.96	253 759	129 112
Central Finland	21	0.16	2	0.01	2	0.01	9	0.03	583	2.19	265 683	134 874
Southern Ostrobothnia	16	0.16	3	0.01	1	0	8	0.04	392	1.95	200 766	101 452
Vaasa	17	0.21	4	0.02	4	0.02	4	0.02	370	2.29	161 231	81 469
Central Ostrobothnia	8	0.21	1	0.01	0	0	1	0.01	154	2.06	74 898	37 831
Northern Ostrobothnia	45	0.24	12	0.03	9	0.02	22	0.06	1422	3.82	372 639	185 474
Kainuu	8	0.19	1	0.01	0	0	2	0.02	169	1.97	85 736	42 919
Länsi-Pohja	4	0.12	1	0.01	0	0	2	0.03	114	1.66	68 557	34 351
Lapland	12	0.2	0	0	0	0	3	0.02	243	1.97	123 211	61 057
Ahvenanmaa	5	0.38	1	0.04	0	0	1	0.04	57	2.21	25 776	13 076
Total	**569**	**0.21**	**130**	**0.03**	**93**	**0.02**	**291**	**0.06**	**16212**	**3.13**	**5 181 115**	**2 651 774**

Source: Finnish Medical Association (2013), "Physicians in Finland. Statistics on Physicians and the Health Care System 2013", Finnish Medical Association, Helsinki; and Statistics Finland (2012).

Table 6.A1.2. Density of specialists, Finland, 2011

	Obstetricians and gynecologists		Cardiac surgeons		Cardiologists		Orthopaedic surgeons and traumatologists		All physicians		Physicians <65 yrs in 1 Jan. 2011 / Population 31 Dec. 2010	
Hospital district	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	(n)	Density/ 1 000 pop.	All (n)	Women (n)
Helsinki and Uusimaa	210	0.27	38	0.02	62	0.04	160	0.1	6644	4.35	1 528 279	788 912
Southwest Finland	83	0.34	9	0.02	17	0.04	51	0.11	2124	4.53	468 464	240 778
Satakunta	17	0.15	4	0.02	4	0.02	8	0.04	502	2.22	225 762	114 757
Kanta-Häme	17	0.19	1	0.01	5	0.03	8	0.05	424	2.43	174 555	89 195
Pirkanmaa	66	0.27	18	0.04	21	0.04	57	0.12	2245	4.62	485 911	247 651
Päijät-Häme	16	0.15	4	0.02	7	0.03	26	0.12	531	2.5	212 807	109 652
Kymenlaakso	12	0.13	1	0.01	5	0.03	3	0.02	367	2.09	175 377	89 094
South Karelia	13	0.19	1	0.01	4	0.03	8	0.06	305	2.29	132 899	67 050
South Savo	11	0.2	2	0.02	4	0.04	5	0.05	261	2.46	105 952	53 830
East Savo	4	0.17	0	0	2	0.04	1	0.02	113	2.48	45 608	23 369
North Karelia	12	0.14	1	0.01	4	0.02	9	0.05	407	2.4	169 778	85 358
North Savo	42	0.33	17	0.07	21	0.08	25	0.1	1240	5	247 943	125 639
Central Finland	23	0.17	2	0.01	12	0.04	17	0.06	737	2.69	273 637	138 450
Southern Ostrobothnia	15	0.15	3	0.02	6	0.03	13	0.07	462	2.33	198 469	99 847
Vaasa	17	0.21	3	0.02	12	0.07	7	0.04	412	2.48	166 250	82 841
Central Ostrobothnia	9	0.24	1	0.01	3	0.04	3	0.04	177	2.36	75 052	37 891
Northern Ostrobothnia	54	0.27	12	0.03	21	0.05	38	0.1	1748	4.39	398 335	197 633
Kainuu	10	0.25	1	0.01	2	0.03	2	0.03	162	2.06	78 703	39 396
Länsi-Pohja	5	0.15	1	0.02	0	0	2	0.03	122	1.87	65 287	32 620
Lapland	11	0.19	1	0.01	3	0.03	3	0.03	291	2.46	118 201	58 843
Ahvenanmaa	2	0.14	1	0.04	0	0	4	0.14	79	2.82	28 007	14 054
Total	**649**	**0.24**	**121**	**0.02**	**215**	**0.04**	**450**	**0.08**	**19353**	**3.6**	**5 375 276**	**2 736 860**

Source: Finnish Medical Association (2013), "Physicians in Finland. Statistics on Physicians and the Health Care System 2013", Finnish Medical Association, Helsinki; and Statistics Finland (2012).

Chapter 7

France: Geographic variations in health care

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In France, awareness about practice variations has been growing in recent years due to the harsh economic context and changes in regional governance. This chapter provides information on variations in the use of eight specific hospital procedures and activities across departments for 2005 and 2011. It then provides an overview of the major policy instruments used in France for tackling variations in medical practice.

The results confirm systematic variations between departments in the hospitalisation rates that are difficult to justify simply by the differences in local populations. The relative magnitude of the variations observed by procedure is coherent with the literature: it is highest in revascularisation and knee procedures and lowest for surgery after hip fracture. Cross-departmental variations for most procedures decreased between 2005 and 2011. Further work is called for to develop a better understanding of the causes and consequences of these variations in different types of care and to determine the margins for improvement in terms of equity, quality and efficiency.

7.1. Introduction

Variations in health care utilisation and medical practice were not popular subjects in France until recently. France represents a very small part in the rich body of literature on practice variation; only 1% of the articles published between 2000 and 2010 come from France (Corallo et al., 2014). A few available studies covered a limited geographic scale (a couple of regions) and very different subjects, from the thrombolytic rate in myocardial infarction (Rabilloud et al., 2001) and the management of the risk of premature delivery (Parant et al., 2008) to colorectal cancer (Phelip et al., 2004).

There is no regular monitoring and public reporting of regional variations. This chapter provides standardised information on variations in specific hospital procedures and activities in France for the first time. It covers all the cases listed in the OECD list, except for catheterisation as a diagnostic procedure, which is not identified in French hospital data, and magnetic resonance imaging (MRI) and computer tomography (CT) since it was not possible to identify the number of exams conducted in public hospitals.

Section 7.2 presents an overview of the health care system in France. The next section turns to the methods, and then the results. Data are provided for two years, 2005 and 2011, which was the latest available year at the time of this study. Financial incentives for hospitals have changed significantly since 2004/05 with the introduction of activity-based payment, which replaced global budgets in public hospitals. The new system provides a strong incentive to all hospitals to increase the number of cases treated, but hospitals' capacity and willingness to react to these incentives may differ depending on the procedure and on the level of competition in an area. The chapter compares changes in the state of the disparities from 2005 to 2011. Policies to tackle variations are presented, followed by concluding remarks.

7.2. Overview of France's health care system

Political and organisational structure

The French health care system is based on a social insurance model that guarantees universal coverage, complemented by private health insurance. Health care provision is a public/private mix: the majority of health professionals are self-employed private providers in the ambulatory sector, and there is a mixture of public and private facilities for hospital care. Patients can freely choose between public and private providers without necessarily needing a referral.

At the macro level, stewardship of the health system is shared between a strong central government and the statutory health insurance funds. The government sets out sector-level targets to limit the expenditure of the health insurance funds, determines the levels of health care provision and training, regulates care quality and defines priority areas for national programmes. The salaries and working conditions of the public hospital staff as well as the prices of diagnosis related groups (DRGs) are regulated by the government. On the other hand, the statutory health insurance funds have the leading role in defining the benefit baskets and regulating the prices of services, procedures, drugs and devices as well as the levels of patient co-payments.

In the hospital sector, until 2006 national standards, such as bed and medical equipment/population ratios, were used to arbitrate medical supply between regions, without much attention to variations in practice or consumption. The regional governance of health care has been transformed and strengthened in the last few years in France, in particular through the creation in 2010 of the Regional Health Agencies (*Agences Régionales de Santé* – ARS). The ARS are responsible for controlling health care resources and defining regional strategies for health care. This shift of responsibility towards local and regional authorities has triggered a demand for data and for an analysis of health care provision and practice patterns at the regional and local level.

Health care expenditure

Health spending accounted for 11.6% of GDP in France in 2011, more than 2 percentage points higher than the OECD average of 9.3%. France also ranks above the OECD average in terms of health spending per capita, at USD 4 118 (adjusted for purchasing power parity) in 2011, compared with an OECD average of around USD 3 300. Hospital spending in 2011 was in line with the OECD average (36%). Health spending per capita in France increased in real terms by about 2% per year on average between 2000 and 2009, but this growth rate slowed down to on average 0.7% per year between 2009 and 2011.

Health care financing

Social health insurance finances 73.5% of total health care spending. Complementary private health insurance, which covers 96% of the population, accounts for another 14.4% of spending, while direct household payments represent 7.7% (OECD, 2013). Nearly 92% of hospital spending is covered by social health insurance, while another 7.1% is paid by private complementary insurance (OECD, 2013).

Health care delivery and provider payments

Physician services and payments

Generalists are typically self-employed and paid on a fee-for-service basis, while specialists can be self-employed (40%), employed by hospitals or other institutions (47%), or have a dual practice (12%). Patients are incentivised, but not required, to choose a personal GP and obtain a referral for specialised care.

In 2011, France had 3.3 physicians per 1 000 population, slightly more than the OECD average of 3.2. France also had more generalists than average, at 47% compared to the OECD average in 2011 of 30%, though a smaller than average proportion of specialists: 52% compared to the OECD average of 62% for 2011.

Hospital services and payments

Public hospitals represent 60% of all hospitals and 65% of all acute inpatient beds (IRDES, 2013). They have the legal obligation of ensuring the continuity of care, which means providing 24-hour emergency care, accepting any patient who seeks treatment and participating in activities related to national/regional public health priorities. The private for-profit sector represents 25% of all inpatient beds, but overall accounts for 46% of surgical beds and more than 70% of ambulatory beds (places). The market share of private hospitals depends heavily on the type of hospital activity. About 56% of all surgery and one-fourth of obstetric care are provided by private for-profit hospitals.

Since 2004/05, all acute care in public and private hospitals is paid by an activity-based payment system (*tarification à l'activité* – T2A), using diagnosis related groups (DRG). Despite the existence of macro level price-volume regulation to avoid inflationary pressures linked to T2A, the number of cases treated in public hospitals has increased significantly since 2004 for all types of care, with a more striking increase in surgery, which raises questions about the pertinence of hospitalisation for some common procedures (Or et al., 2013).

The number of hospital beds in France was 6.4 per 1 000 population in 2011, significantly higher than the OECD average of 5.0. However, as in most OECD countries, the number of hospital beds per capita in France has fallen over the past 20 years, in line with a reduction in the average length of stay in hospital and an increase in day surgery (OECD, 2013).

7.3. Data and methods

Hospital database

The data used in the analysis come from the hospital episode statistics, PMSI MCO (*Programme de médicalisation des système d'informations. Médecine, Chirurgie, Obstétrique*) 2005 and 2011. This national database covers all public and private hospital stays for acute care in France. It contains information about patient characteristics, primary and secondary diagnoses, procedures, length of stay and the diagnosis related groups (DRG or GHM in French) that patients were assigned to. The analysis covers all hospitalisations in the French metropolitan area (overseas departments are excluded).

In 2011, there were about 21 million hospital cases in France. About 98% of the hospital activity was in the France metropolitan area, with about 4 million episodes taking place in Ile-de-France (the larger Paris area).

Territorial units

Metropolitan France is divided into 22 regions, which cover 96 departments, which have some degree of administrative autonomy. The departments are further divided into more than 36 500 communes (towns) of very different sizes. The average population size of the departments is about 660 000 inhabitants (but varies from 77 800 in Lozère to almost 2.6 million in Nord), while it is about 2.8 million for a region (varying from 320 000 in Corsica to more than 11 million in Ile-de-France). The territorial unit used in this chapter is the department. Admission rates are calculated according to the place of residence of the patients and analysed by "department".

The management and planning of hospital care is carried out at the regional level. Departments have a small role in assuring the provision of health and social services. But they correspond closely to the geographical boundaries of "health territories" which are defined by the ARS for organising and ensuring fair provision of health care within their regions (Coldefy and Lucas, 2012).

Selection of cases and procedures

The French patient classification system (*Groupes Homogènes de Malades* – GHM) has been modified regularly over the past ten years. The initial classification, inspired by the US Health Care Financing Groups (HCFA-DRGs), has changed three times since the introduction of activity-based payment, passing from about 600 groups in 2005 to nearly 2 300 groups, distinguishing 4 levels of case severity, in 2009. Hospital cases were grouped by v9 of the GHM classification in 2005 and by v11 (latest version) in 2011. France also has its own classification of procedures (CCAM), which did not change between 2005 and 2011. The relevant DRG and/or procedure codes for each case are identified with the help of the ATIH (Technical Agency on Hospital Information) and presented in Annex 7.A1. French DRG or diagnostic codes do not allow identifying cases solely involving catheterisation as a diagnostic procedure. All other hospital activities are covered in the chapter.

Measurement of variation

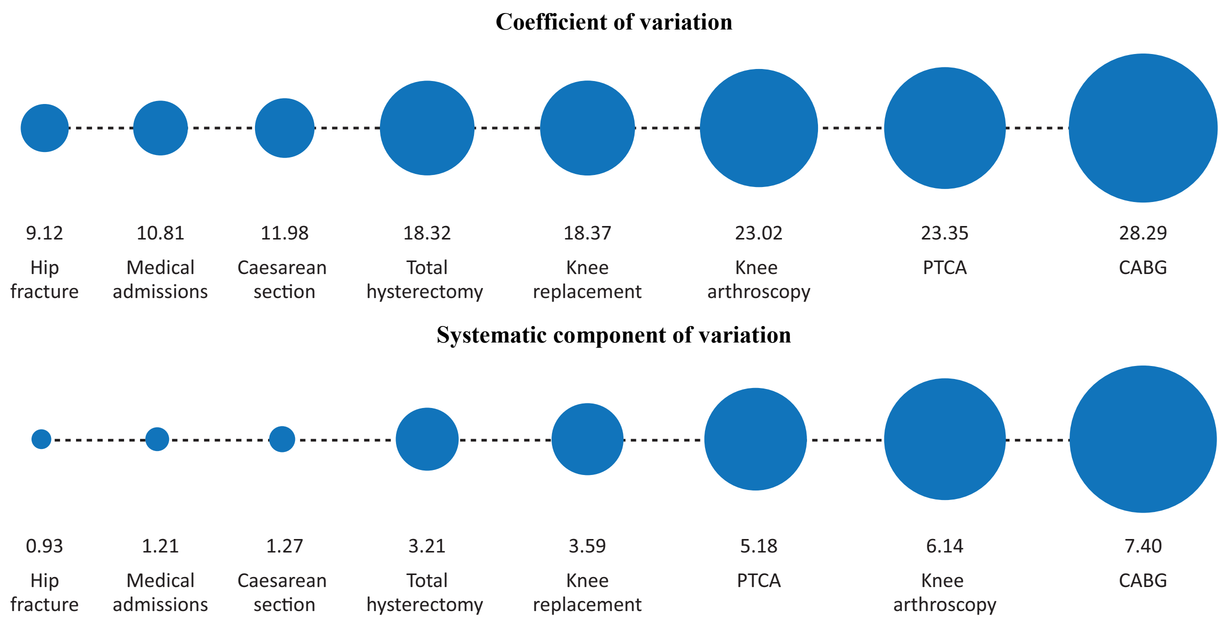
The rates are standardised using the metropolitan resident population in 2005 and 2010 published by the National Statistical Institute (Insee). In line with OECD guidelines, a range of measures are used to assess the magnitude of variations. The average standardised rate in each department is presented with the 10th and 90th percentiles, the minimum-to-maximum ratio, the coefficient of variation (CV) and the systematic component of variation (SCV).

7.4. Description of results

Overview of results

Among the cases examined in this chapter, the highest variation across departments was observed for revascularisation procedures (CAGB surgery and PTCA), followed by knee arthroscopy (Figure 7.1).

Figure 7.1. Measures of variation in hospitalisation rate, France, 2011



Note: Size of the circles are comparable for each measure (e.g. coefficient of variation) but not across measures.

Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Results are similar for different measures of variation (Table 7.1). CABG shows the highest variation, with a coefficient of variation of 28% (SCV of 7.4). PTCA and knee arthroscopy also display high geographical disparities, with three- to four-fold differences between the areas with the lowest and highest rates. Compared with high/low ratios, the

Q90/Q10 ratios are significantly lower for all of the procedures, indicating the importance of extreme values for each condition. For example, the max-min ratio for CAGB is 5.2, whereas the Q90/Q10 is about 2. As expected, the lowest inter-departmental variation is for surgery after hip fracture, followed by medical admissions.

Between 2005 and 2011, the standardised rates of hospitalisation per 100 000 population went up in all cases, except for hysterectomy and knee arthroscopy. Yet the variations across departments went down since 2005 for all procedures, except for knee arthroscopy, for which the systematic component of variation has increased. An examination of the high/low ratios in Table 7.1 suggests that most of the reduction in variation comes from an increase in surgery rates in low rate areas, thus eliminating the extremes. For all procedures (except hysterectomy), the increase in first quintile departments was greater than for the top (10th) quintile. The introduction of activity-based payment might have played a role in boosting surgery rates, especially in areas where the rates were below the national average.

Table 7.1. Variations in hospitalisation rate for selected procedures, France, 2005 and 2011[1]

	Crude rates	Standardised rates	Q10	Q90	Q90/Q10	Max/min	Coefficient of variation	Systematic component of variation
	2011							
Hospital medical admissions	8802	8 975	7 736	10 161	1.3	1.8	0.11	1.2
CABG	29	30	20	41	2.1	5.2	0.28	7.4
PTCA	271	267	192	338	1.8	2.9	0.23	5.2
Hip fracture	126	141	125	156	1.3	1.5	0.09	0.9
Knee replacement	133	136	106	166	1.6	2.8	0.18	3.6
Knee arthroscopy	213	225	157	272	1.7	3.9	0.23	6.1
Caesarean section	196	184	161	212	1.3	1.9	0.12	1.3
Hysterectomy	170	176	141	219	1.6	2.4	0.18	3.2
	2005							
Hospital medical admissions	8098	8 237	6 775	11 931	1.8	2.4	0.13	1.7
CABG	27	28	16	40.4	2.5	6.7	0.35	10.8
PTCA	225	219	158	281	1.8	5.5	0.27	6.2
Hip fracture	126	127	110	142	1.6	3.2	0.1	1.9
Knee replacement	91	93	74	116	1.6	4.5	0.2	4.2
Knee arthroscopy	227	236	181	285	1.6	3.2	0.21	5
Caesarean section	177	167	132	191	1.4	3	0.15	2.1
Hysterectomy	181	198	159	235	1.5	2.5	0.17	3.2

1. Rates are calculated for 100 000 persons, except for caesarean section (for 1 000 live births).

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Hospital/medical admissions

The average age/sex standardised rate of medical admissions was 8 975 per 100 000 population in 2011 (Table 7.2). The standardised rates varied between departments from 7 000 per 100 000 population in Loire-Atlantique to 12 400 per 100 000 population in Aisne and Haute-Marne (Figure 7.2). Overall, medical admission rates rose by 8% between 2005 and 2011. Despite the increase in average standardised rates, the variation between departments decreased considerably: the systematic component of variation went down by 29%, while the max/min ratio decreased by 21%.

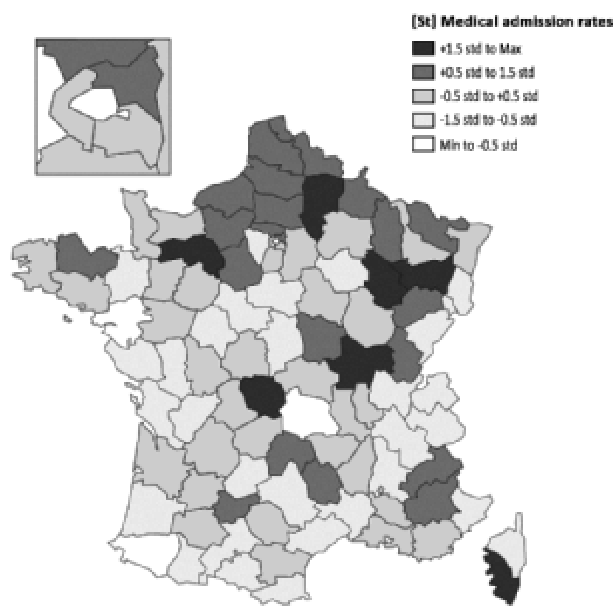
Table 7.2. Hospital medical admissions standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	4 636 602	5 019 750	8.3
Standardised rate	8 237	8 975	9
Q10	6 775	7 736	14.2
Q90	11 931	10 161	-14.8
Q90/Q10	1.8	1.3	-27.8
Minimum	5 545	7 061	
Maximum	13 522	12 440	
Max/Min	2.4	1.8	-25
Coefficient of variation	0.14	0.11	-21.4
Systematic component of variation	1.7	1.2	-29.4

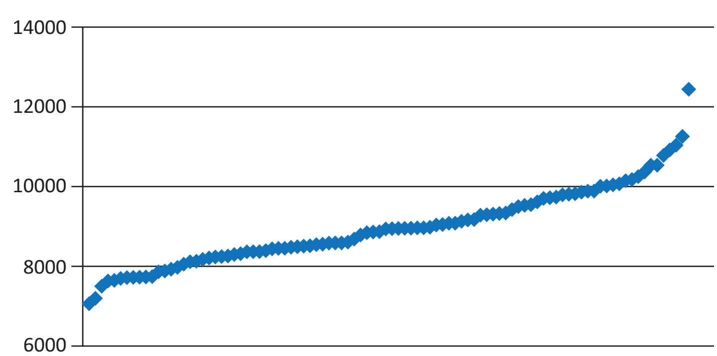
Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Figure 7.2. Variations in medical admissions across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)



Panel B. Standardised rates of hospital medical admissions in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Cardiac procedures

Coronary artery bypass graft (CABG)

The standardised rate of CABG surgery was about 30 per 100 000 in 2011 (Table 7.3). The average rate increased slightly (10%) between 2005 and 2011, but remains one of the lowest in the OECD area. Departments with high CAGB rates are concentrated in the centre of the country (Loire, Cher and Haute-Loire) and in the northeast (Meuse, Moselle and Ardennes), while the lowest rates are in the south (Alpes-de-Haute-Provence, Alpes-Maritimes, Vaucluse) where the PCTA rates are the highest (Figure 7.3).

Overall, the systematic component of variation dropped over this period, but in France the variation between departments is the highest for this procedure.

Table 7.3. CABG standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	12 686	13 902	9.6
Standardised rate	28	30	7.1
Q10	16	20	25
Q90	40	41	2.5
Q90/Q10	2.5	2	-18
Minimum	7	10	
Maximum	49	52	
Max/min	7	5.2	-25.7
Coefficient of variation	35	28.3	-19.2
Systematic component of variation	10.8	7.4	-31.5

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Figure 7.3. Variations in CABG across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)

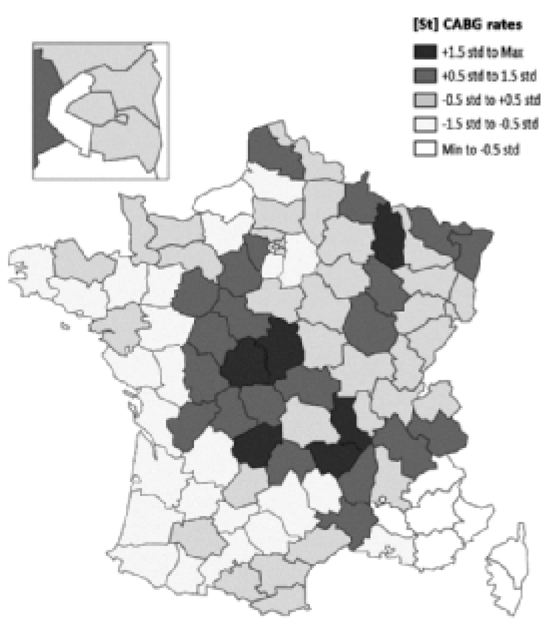
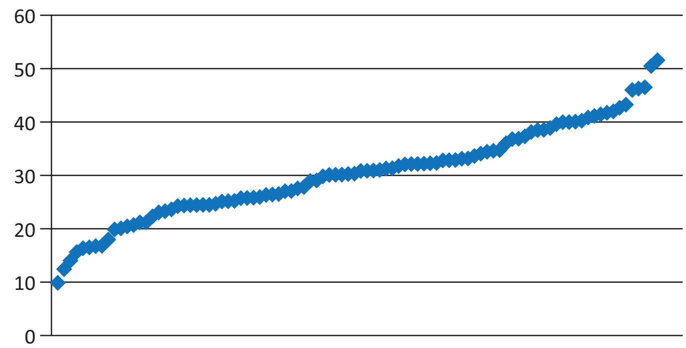


Figure 7.3. Variations in CABG across departments, France, 2011 (*cont.*)

Panel B. Standardised rates of CABG in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Percutaneous transluminal coronary angioplasty (PTCA)

Standardised rates of PTCA in 2011 for the population aged 20 and over vary from 161 per 100 000 population (in Creuse, Haute-Vienne and Mayenne) to 462 per 100 000 in Hautes-Pyrénnées (Figure 7.4). The south of the country has the highest rates, particularly in the southeast (Hautes-Pyrénnées, Pyrénnées-Orientales) and near the Mediterranean (Corse, Bouches-du-Rhone, Vaucluse and Var), while the rates in the Ile-de-France departments are close to the national average. PTCA rates have increased on average by 25% since 2005 to a level of 268 interventions per 100 000 persons in 2011. But the minimum rate of any department has more than doubled. Therefore, despite the increase in the rate of surgery, the variations between departments decreased slightly; the coefficient of variation was 0.26 in 2005 but 0.23 in 2011 (Table 7.4).

Table 7.4. PTCA standardised rate, France, 2005 and 2011

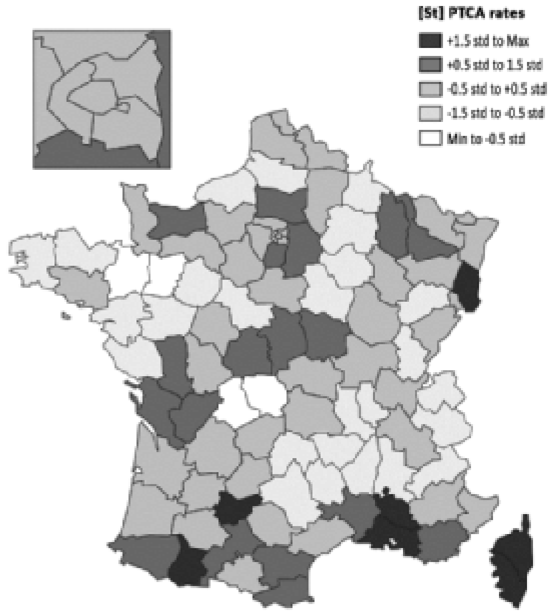
	2005	2011	Variation (%)
Number of cases	103 124	128 867	25
Standardised rate	219	268	22.4
Q10	157	192	22.3
Q90	280	338	20.7
Q90/Q10	1.78	1.76	-1.1
Minimum	70	161	
Maximum	384	462	
Max/min	5.5	2.9	-47.3
Coefficient of variation	25.6	23.4	-8.6
Systematic component of variation	6.2	5.2	-16.1

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

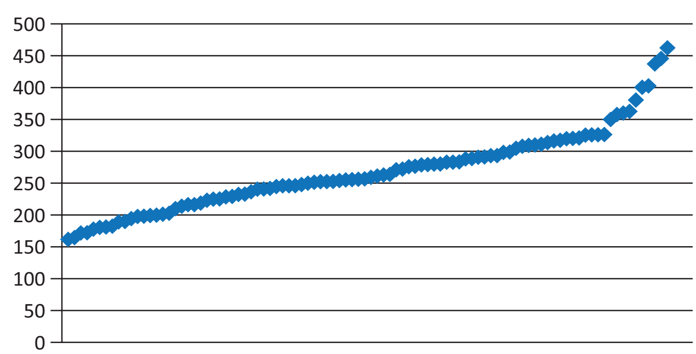
Gobillon and Milcent (2012) showed that variations in the use of revascularisation procedures are explained partly by the variations in heart mortality rates between French regions. A recent study looking into the disparities in access to care in three French regions further suggests that, after controlling for the burden of ischaemic heart disease, revascularisation rates (bypass surgery and angioplasty) are lower in low-income areas (Gusmano et al., 2014). The authors also show that the likelihood of using these services is higher for males and lower in public hospitals.

Figure 7.4. Variations in PTCA across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)



Panel B. Standardised rates of PTCA in departments



Source: Authors’ calculation based on the Hospital Episodes Statistics 2011.

Joint procedures

Surgery after hip fracture

Surgery after a hip fracture is included in the analysis for calibration purposes, as little variation is expected for this procedure (cf. Chapter 1). The average standardised rate in 2011 was 140 per 100 000 persons (Table 7.5). The rate of surgery has increased very slightly since 2005. As expected, both the coefficient of variation and the systematic component of variation were the lowest of all the procedures analysed in this chapter. Moreover, the disparities appear to decrease over time, whatever the measure used. The south of the country presented the highest rates of surgery after hip fracture (Corse, Aveyron, Gers), whereas Ile-de-France (Paris, Val-de-Marne, Seine-Saint-Denis) and Normandie had the lowest rates (Figure 7.5).

Table 7.5. Surgery after hip fracture standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	70 365	72 250	2.7
Standardised rate	127	140	10.2
Q10	110	125	13.6
Q90	142	156	9.9
Q90/Q10	1.3	1.25	-3.8
Minimum	92	114	
Maximum	163	175	
Max/min	1.8	1.5	-16.7
Coefficient of variation	10.4	9.1	-12.5
Systematic component of variation	1.9	0.93	-52.6

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Figure 7.5. Variations in surgery after hip fracture across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)

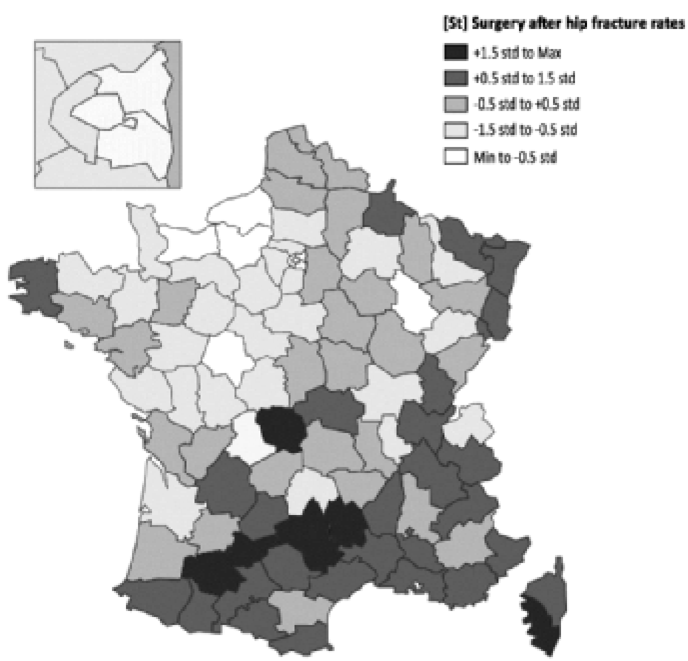
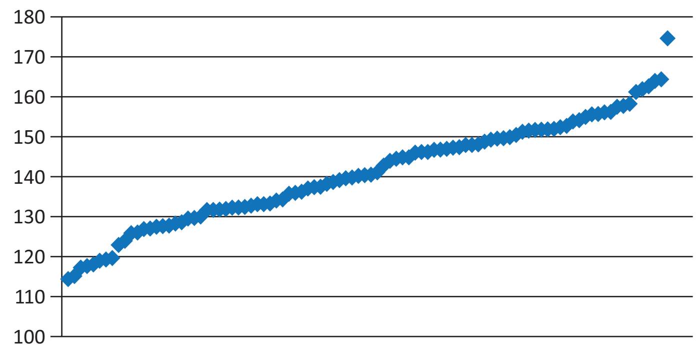


Figure 7.5. Variations in surgery after hip fracture across departments, France, 2011 *(cont.)*

Panel B. Standardised rates of surgery after hip fracture in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Knee replacement

The standardised average rate of knee replacement was about 136 per 100 000 population in 2011 (Table 7.6). While the number of knee replacements increased by almost 50% between 2005 and 2011, the variation between departments fell slightly over this period. The systematic component of variation decreased by 14% and the high/low ratio by 38%. The highest rates for knee replacement were observed in the east (Vosges, Moselle, Alsace), while Corse (81 per 100 000) and Paris (85) had the lowest rates (Figure 7.6).

Table 7.6. Knee replacement standardised rate, France, 2005 and 2011

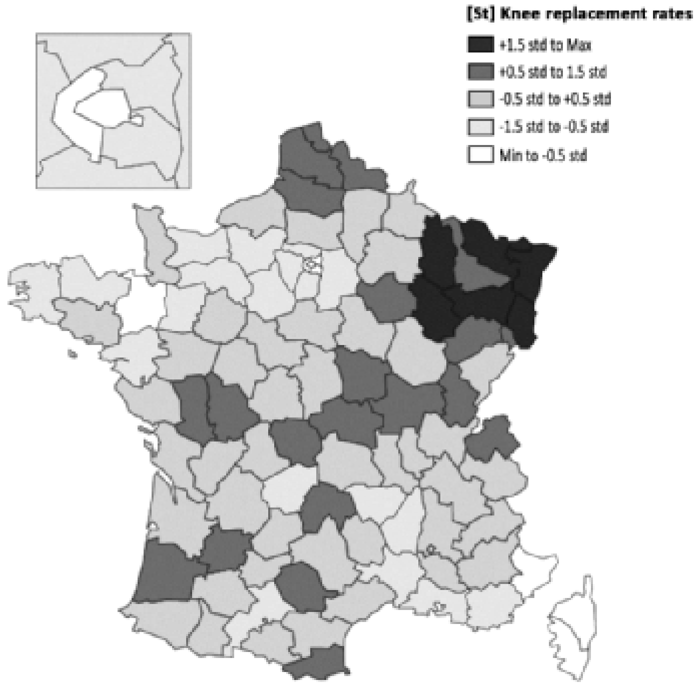
	2005	2011	Variation (%)
Number of cases	51 101	75 900	48.5
Standardised rate	93	136	46.2
Q10	74	106	43.2
Q90	116	166	43.1
Q90/Q10	1.6	1.6	0
Minimum	34	81	
Maximum	153	227	
Max/min	4.5	2.8	-37.8
Coefficient of variation	19.6	18.4	-6.1
Systematic component of variation	4.2	3.6	-14.3

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

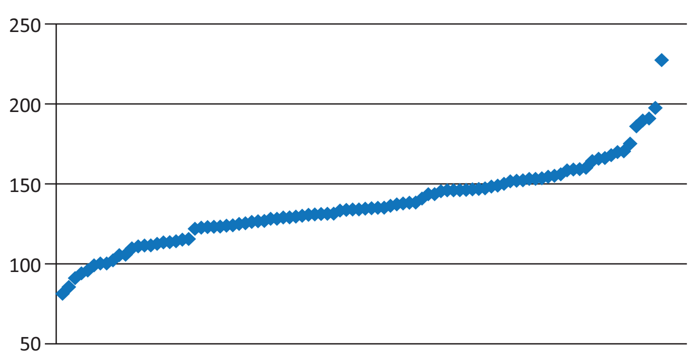
In 2013, the *Haute Autorité de Santé* (HAS) was asked by the Statutory Health Insurance Fund (CNAMTS) and the Ministry of Health to produce practice guidelines on knee replacement procedures, since CNAMTS had noticed that knee replacement surgeries were increasing rapidly (+5% in 2010 and 10% in 2011) (HAS, 2013). CNAMTS further noted that the rate of ambulatory surgery varied significantly across hospitals with 60% of surgeries being carried as day-surgery in private clinics, while only 30% in public university hospitals. There were also important variations in knee replacement rates across regions with higher rates in the North-East (consistent with our results). Variations in knee replacement rates can be partly explained by the differences in population health status, in particular in obesity rates and osteoarthritis (Chapter 1). There is at least one study in France suggesting that the prevalence of symptomatic hip and knee osteoarthritis varies significantly across regions and the highest rates are observed in Picardie and Lorraine, which are situated in north-east of France (Guillemin et al., 2010).

Figure 7.6. Variations in knee replacement across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)



Panel B. Standardised rates of knee replacement in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Knee arthroscopy

The standardised average rate of knee arthroscopy was close to 224 per 100 000 persons in 2011 (Table 7.7). There is a higher variation between departments for knee arthroscopy, a diagnostic procedure, than for knee replacement, a treatment procedure. The rate varied from 113 per 100 000 population in Paris and Hauts-de-Seine to 441 per 100 000 in Meuse, Vosges and Deux-Sèvres (east of France) (Figure 7.7). The average rate of knee arthroscopy decreased slightly between 2005 and 2011, from 236 per 100 000 population to 224 per 100 000. However, the systematic component of variation increased by 22% over this period, with a high-low ratio close to 4 in 2011.

Table 7.7. Knee arthroscopy standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	126 399	121 246	-4.1
Standardised rate	236	224	-5.1
Q10	181	157	-13.3
Q90	285	272	-4.6
Q90/Q10	1.6	1.7	6.2
Minimum	134	113	
Maximum	428	441	
Max/min	3.2	3.9	21.9
Coefficient of variation	20.6	23	11.7
Systematic component of variation	5	6.1	22

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

The rates reported here refer to arthroscopies performed in an inpatient setting (including day cases). In France, two-third of knee arthroscopies are carried out in private clinics and about 70% as day case (ambulatory). We do not have data on interventions in outpatient settings, but this does not seem to be a common practice in France as surgeons can work with a private clinics. ATIH (2014b) reported that there are significant variations in readmission rates across departments which may explain some of the variations observed.

There is a positive and significant correlation between knee replacement and knee arthroscopy, with a coefficient of correlation of 0.48.

Figure 7.7. Variations in knee arthroscopy across departments, France, 2011

Panel A. Map of standardised rates per 100 000 population (deviation to the mean)

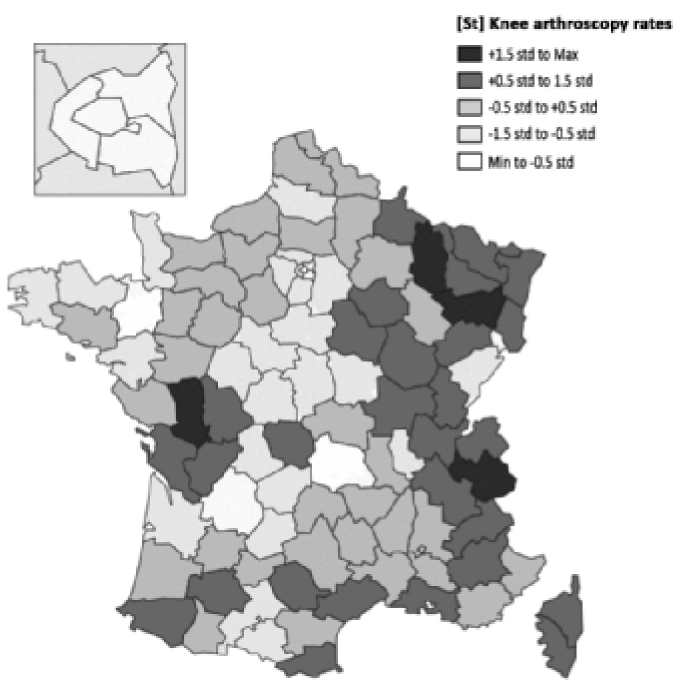
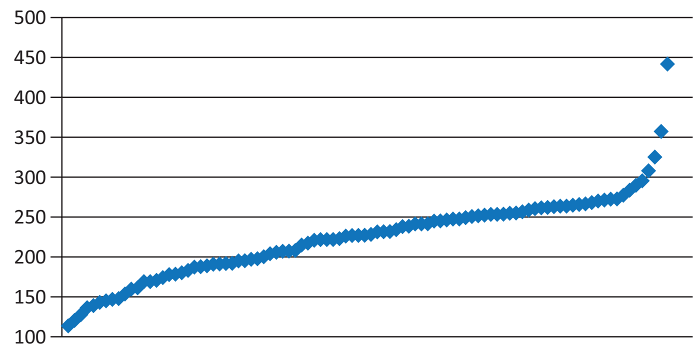


Figure 7.7. Variations in knee arthroscopy across departments, France, 2011 *(cont.)*

Panel B. Standardised rates of knee arthroscopy in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Gynaecological procedures

Caesarean section

In 2011, the average number of caesarean sections (caesarean sections) was about 184 per 1 000 live births, but the rate varied from 121 (Jura and Landes) to 235 in the top decile (Corse, Yvelines and Aube) (Figure 7.8). The majority of the departments with high rates are located near Paris and the PACA region on the Mediterranean coast (Marseille, Toulon, Nimes). The standardised caesarean section rates went up about 10% between 2005 and 2011, but the variation in the systematic component of variation decreased about 40% over this period (Table 7.8).

Table 7.8. Caesarean section standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	141 343	155 428	9.97
Standardised rate	167	184	10.2
Q10	132	161	22
Q90	191	212	11
Q90/Q10	1.4	1.3	-7.1
Minimum	84	121	
Maximum	255	235	
Max/Min	3	1.9	-36.7
Coefficient of variation	15.1	12	-20.5
Systematic component of variation	2.1	1.3	-38.1

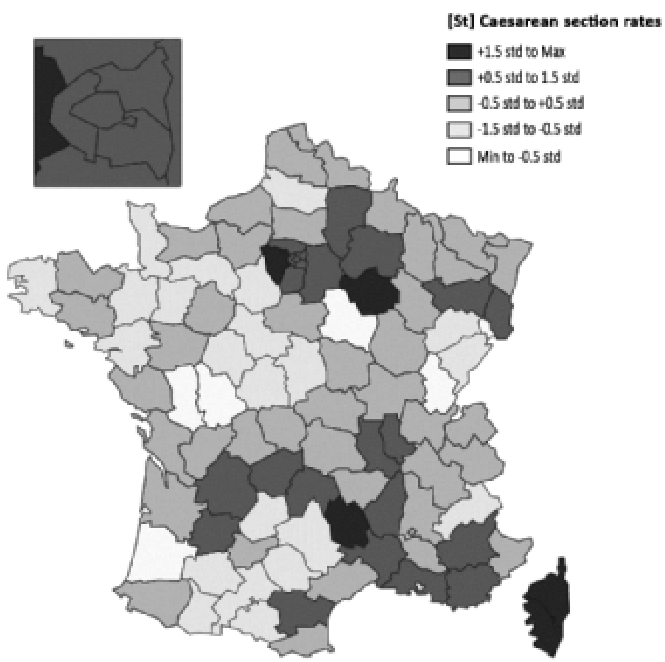
Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Caesarean sections are one of the few procedures in France for which the question of practice variation has been raised explicitly for a long time. In France, maternity wards are classified into three levels to deal with different levels of complications. The most complicated deliveries should take place in level 3 maternities, which are equipped accordingly. A study by the Health Insurance Fund in 2011 (Assurance Maladie, 2011) showed that caesarean section rates were higher in private for-profit hospitals than in public hospitals specialising in complicated cases (level 3). Other studies have confirmed the role of private providers: the probability of having a caesarean section appears to be higher in private for-profit hospitals than in public hospitals, after controlling for delivery complications (Milcent and Rochut, 2009). The Federation of public hospitals (*Fédération Hospitalière de France*) further showed that the caesarean section rates in private level 1 hospitals (dealing with non-complicated cases) were higher than level 2 maternities (FHF, 2008).

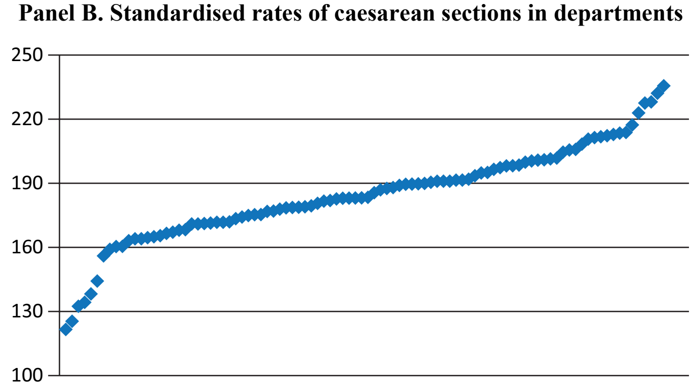
To reduce inappropriate caesarean sections, in 2012 the High Health Authority issued clinical recommendations defining the conditions of programmed (elective) caesareans (HAS, 2012). Furthermore, in recent years DRG prices for caesarean section have been adjusted slightly downwards to reduce the profit margin and discourage unwarranted caesarean sections.

Figure 7.8. Variations in caesarean sections across departments, France, 2011

Panel A. Map of standardised rates per 1 000 live births (deviation to the mean)



Panel B. Standardised rates of caesarean sections in departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

Total hysterectomy

The average standardised rate of hysterectomy per 1 000 females was 1.5 in 2011, and varied from 0.9 (Corse and Paris) to 2.2 (Haute-Vienne, Corrèze, Deux-Sèvres) (Table 7.9 and Figure 7.9). The hysterectomy rates decreased between 2005 and 2011 by almost 20%, but both the coefficient of variation and the systematic component of variation increased slightly. The difference between the areas with the highest and lowest rates was over two-fold.

Table 7.9. Hysterectomy standardised rate, France, 2005 and 2011

	2005	2011	Variation (%)
Number of cases	57 694	55 365	-4
Standardised rate	1.83	1.49	-18.6
Q10	1.4	1.2	-14.3
Q90	2.2	1.9	-13.6
Q90/Q10	1.5	1.6	6.7
Minimum	1	0.9	
Maximum	2.5	2.2	
Max/min	2.5	2.4	-4
Coefficient of variation	17.2	18.3	6.4
Systematic component of variation	3.2	3.2	0

Source: Authors' calculation based on the Hospital Episodes Statistics 2005 and 2011.

Figure 7.9. Variations in total hysterectomy across departments, France, 2011

Panel A. Map of standardised rates per 1 000 females (deviation to the mean)

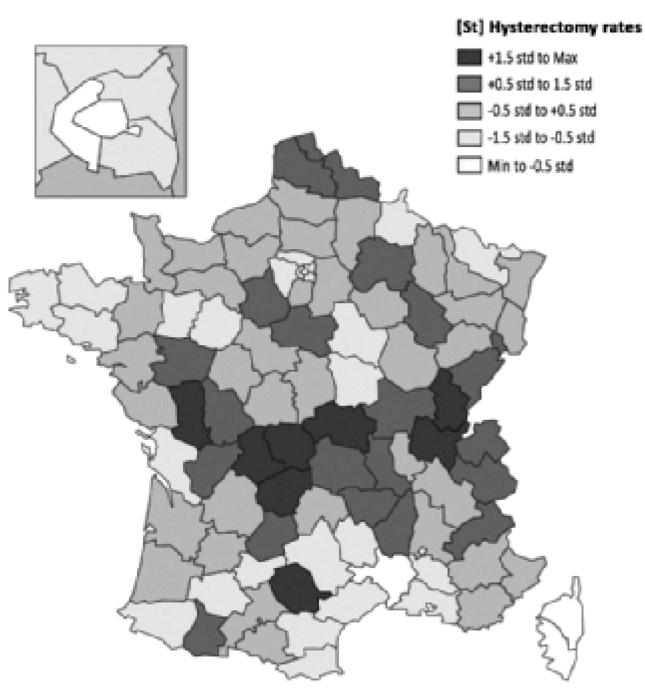
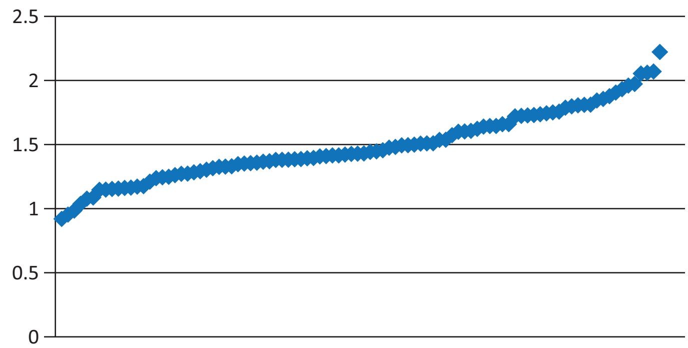


Figure 7.9. Variations in total hysterectomy across departments, France, 2011 *(cont.)*

Panel B. Standardised rates accross departments



Source: Authors' calculation based on the Hospital Episodes Statistics 2011.

7.5. Policies tackling variations in medical practice

Medical practice variations have not been high on the health policy agenda in France until recently. Historically, the Statutory Health Insurance Fund (CNAMTS) has been interested in variations between providers (doctors and hospitals) in a few fields (such as ambulatory surgery, caesarean sections and generic prescriptions), with the objective of identifying margins for improving efficiency, but not in variations between geographical areas or regions. However, an awareness of the importance of medical practice variations has been developing recently in France. There may be several reasons for this. First, in the hospital sector the introduction of activity-based payments, which provide direct incentives for increasing hospital volumes, has raised questions about the appropriateness of hospitalisation for certain procedures. A recent survey of the French Public Hospital Association (FHF, 2012) showed that, according to hospital physicians, one-quarter of the procedures and medical tests carried out in hospitals are medically unjustified. Second, the creation in 2010 of the Regional Health Agencies (ARS), which have the mission of regulating overall health care supply, including hospitals as well as long-term, social and primary care, has also triggered interest in regional variations in the utilisation of different health services. Finally, since 2009 the general economic downturn has increased the pressure to improve the efficiency of France's health sector, just as it has in many other countries. Ensuring the appropriateness of care is increasingly seen as an essential strategy for improving efficiency, while simultaneously safeguarding equity and the quality of care.

This section summarises the major approaches adopted in France for tackling variations in medical practice.

Regulation and resource allocation

In the hospital sector, traditionally most of the attention has been paid to assuring a fair distribution of resources between regions, which is in turn expected to assure an adequate utilisation of services. Hospital planning has been quite centralised and rigid until 2003, with national standards, such as bed/population ratios and medical equipment/population ratios, used to arbitrate the medical supply between regions. Strategic Regional Health Plans (SROS) were used for ensuring an equitable distribution of acute care resources and for controlling hospital care expenditures at the regional level.

But the use of quotas in hospital planning was abolished in 2003. Hospital planning has been simplified gradually by reinforcing the role of the regional agencies in controlling local hospital activities while taking into account local health needs. The introduction of DRG-based payments from 2004/05, thereby increasing hospital competition, has triggered questions about the appropriateness of some forms of care, but it has also contributed to improving hospital data and boosting interest in the analysis of variations in hospital utilisation.

Currently the regulation of hospitals focuses on activity rather than on bed supply. One major regulatory tool is to link authorisation to minimum activity thresholds to ensure quality of care. There are volume norms for cardiac surgery, obstetrics services, cancer care, etc. Furthermore, at the regional level, the ARS directly monitors hospital activity in order to identify hospitals that have significantly high/low levels of activity/growth within the region. Since 2011, the Ministry of Health in collaboration with the HAS, the CNAMTS and the ATIH, has been working to provide guidance to ARS to help them to monitor and reduce variations in medical and surgical procedures. A list of 32 topics (including cholecystectomy, cataract, hysterectomy, hip replacement, etc.) are defined as priority based on three criteria: strong growth rate in the past three years, high variations between/within regions and/or potentially harmful consequences for patients. Caesarean section was the first topic tackled both at the national and regional level. Within a framework of a national pilot project, 200 maternity wards have volunteered to examine their practice and reduce caesarean section rates. The ARS can also set targets and sign contracts with hospitals to encourage good practice. For example, in Alsace hospitals are asked to limit the number of caesarean sections to 20% of total deliveries.

Public reporting

France has been lagging behind in monitoring and publicly reporting information on variations both across regions/territories and across providers. To date, France still does not have an atlas showing systematically variations in practice.

In 2013, the Technical Agency on Hospital Information (ATIH) began to publish reports comparing regional variations in hospital activity (ATIH, 2013a and 2014a). The reports compare variations in hospitalisation rates by type of hospitalisation (ambulatory cases versus overnight stays) and trends in overall activity volumes across regions. ATIH also provides more detailed descriptive analyses of variation for selected procedures (priority topics) for helping ARS to monitor and study the variations in their region (ATIH, 2013b). But there is no systematic and standardised information on the variations in specific diagnostic or treatment procedures across regions/providers accessible by the general public and that can be used to provide feedback to providers or to patients.

Clinical guidelines

Clinical guidelines have not been very popular in France until now; most doctors claim that either they are not aware of their existence or they feel unconcerned (Degos et al., 2008). In addition, many doctors believe that the state (or the insurance fund) should not interfere with medical practice and that pushing for cost-effectiveness is contrary to medical ethics (Durieux et al., 2000). In the 1990s, attempts to introduce mandatory practice guidelines in order to avoid inappropriate ambulatory prescriptions have been unsuccessful, following strong resistance from physicians.

Several attempts were made in the 2000s to reinforce practice guidelines and good practice commitments, mostly within the framework of national conventions between the Health Insurance Fund and physicians. Most of the attention was on ambulatory prescriptions and prevention. In 2012, HAS, the health authority responsible for developing clinical guidelines in France, was given the mission of working on recommendations to ensure appropriate hospital utilisation. In 2013, the health authority began to develop guidelines on appropriate conditions for five common (high volume) procedures: appendectomy, tonsillectomy, carpal tunnel surgery, planned caesarean sections and knee replacement.

It is too early to predict the extent to which these guidelines will be effectively followed in practice. Further effort would also be necessary to identify the most effective implementation strategies. The more active involvement of the medical profession in developing and implementing care standards may increase their acceptance.

Payment incentives

In the hospital sector, DRG tariffs are used to regulate hospital activity. The payment policy is concerned mostly with incentivising the development of ambulatory surgery and decreasing caesarean section rates. The prices of ambulatory stays are aligned with non-complicated overnight stays for most common procedures in order to encourage hospitals to invest in ambulatory surgery. As for caesarean sections, tariffs for uncomplicated programmed caesarean sections have been kept relatively low in recent years to make sure that the profit margins for this operation are low. There are no other financial incentives for supporting good practice or sanctioning unjustified hospitalisations.

In the ambulatory sector a pay-for-performance (P4P) scheme, initially targeted generalists then extended to all physicians, has been in place since 2009/10 with the objective of reducing variations in practice in selected areas such as diabetic treatment, vaccination, generic prescription and computer use in consultation.

7.6. Conclusions

This chapter has provided new systematic evidence on regional variations in hospital utilisation in France for two years: 2005 and 2011.

The results confirm that there is no French exception: there are systematic variations between departments in the rate of hospitalisations that are difficult to justify simply by the differences in local populations. The relative size of the variations observed per procedure is consistent with the literature: the variation is highest for revascularisations and knee procedures and lowest for surgery after hip fracture. We also observed that cross-departmental variations for most procedures decreased over the period 2005 to 2011. The reduction in variations appears to be associated with a relatively stronger increase in activity in low-rate departments over this period. This may be partly explained by the introduction of activity-based payments in hospitals, but also by the initiation of volume thresholds for some procedures.

As underlined by the OECD and many others in this book, the first step in addressing the issue of the appropriateness of care is to ensure the routine monitoring, analysis and publication of variations in health care use. The next step is to develop a better understanding of the causes and consequences of these variations for different types of care and to determine the margins for improvement with respect to equity, quality and efficiency. It would be equally important for France to work out and push effective policy levers for supporting good medical practice.

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ANNEX 7.A1

French procedure codes used for the study

Hospital medical admissions

All cases except for those with C or K at the third place in the GHM code. The GHM with Z for CMD 14 and 18 are not included but those with CMD 20, 23 and 25 are included.

Caesarean section

JQGA002 JQGA004 JQGA003 JQGA005

CABG

GHM 05C04, 05C05, 05K06, 05K13 combined with the following codes:

DDMA025 DDMA015 DDMA023 DDMA017 DDMA032 DDMA011 DDMA029 DDMA018 DDMA038 DDMA021 DDMA026 DDMA020 DDMA031 DDMA006 DDMA033 DDMA008 DDMA022 DDMA005 DDMA034 DDMA009 DDMA030 DDMA003 DDMA035 DDMA013 DDMA036 DDMA012 DDMA028 DDMA007 DDMA024 DDMA019 DDMA027 DDMA016 DDMA037 DDMA004

Dilatation of coronary vessels

DDAF001 DDAF006 DDAF004 DDAF003 DDAF010 DDAF008 DDAF007 DDAF009 DDPF002 DDFFF002 DDFF0004

Knee replacement

NFKA009 NFKA007 NFKA008 NFKA004 NFKA003 NFKA005 NFKA001 NFKA002 NFLA002 NFLA001 NFMA006

Knee arthroscopy

NFFC004 NFFC003 NFQC001

Hysterectomy

JKFC005 JKFA018 JKFA026 JKFA015 JKFA025 JKFA002 JKFA013 JKFC003 JKFA006 JKFA005 JKFA028 JKFA021 JKFA007 JKFA004

Surgery after hip fracture

GHM 08c47 and 08c49 with diagnostic S72.0xx, S72.1xx, S72.2xx.

Chapter 8

Germany: Geographic variations in health care

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This report documents geographic variations in health care use in Germany, for a number of hospital-based activities (medical admissions, caesarean sections, coronary procedures, knee replacements and hysterectomies), across Länder and across Spatial Planning Regions. It complements information from other contemporary work. Although possible explanations for variation beyond demographics are drawn from existing research (e.g. need and supply-side factors), a substantial amount of variation is still unexplained and thus possibly unwarranted, given current knowledge. It is therefore recommended that research should continue, alongside the engagement of stakeholders, including those responsible for health care decision making in various contexts. In particular it is recommended that sustained efforts be undertaken to strengthen the evidence base regarding the appropriateness of interventions, thus providing more reliable information for necessary discussions between payers/purchasers, providers and patients. Considerable effort going beyond a more sophisticated analysis of variation is therefore needed to promote evidence-based changes that would either reduce variation or inspire trust that variation in health care use is warranted because it reflects patient needs and has health benefits.

8.1. Introduction

In the quest for quality, effectiveness and efficiency in health care delivery, the subject of potentially unwarranted medical practice variation has recently received growing attention in Germany. A number of projects and researchers are currently working on topics directly or indirectly addressing medical practice variation. Probably the most visible results were produced and disseminated within the framework of the "Faktencheck Gesundheit" (Initiative for High-Quality Healthcare) project of the Bertelsmann Foundation (2011). Regional variations were analysed regarding e.g. caesarean sections (Kolip, 2012), prostatectomies, CABG, inpatient treatment for depression, and diabetes, some of which are also included in this study. Some regional variations in health outcomes, e.g. the proportion of hospital deaths in those aged 75 or older (Nolting et al., 2012), are also included. Possible reasons for over- or underuse are briefly discussed, and it is highlighted that most variation found is currently unexplained, and that this is a reason for concern.

The "Versorgungsatlas" (health care atlas) project of the "Zentralinstitut für die kassenärztliche Versorgung" (Institute of Statutory Health Insurance Physicians) conducted a number of analyses of regional variation, predominantly regarding outpatient care-related activities (e.g. antibiotic drug prescriptions, the prevalence of depression, utilisation of preventive screening and utilisation relating to GP office visits) (Zentralinstitut für die kassenärztliche Versorgung, 2010). Also, in a recent issue of the annual German "Krankenhausreport" (hospital report) (Klauber et al., 2012), regional variations in the use of health services were identified. Regional differences in the utilisation of knee and hip implants (Schäfer, 2012), hysterectomies (Geraedts and Malik, 2012) as well as back surgery (Fürstenberg et al., 2012) were analysed in detail. The results showed regional differences of up to a factor of 2.6 for hip implants and hysterectomies and up to a factor of 4.8 for specific type of back surgery involving implants. Other recent publications and reports found variation in the diagnosis of attention deficit and hyperactivity disorder (Grobe, 2013), as well as in hospitalisations (Augurzky et al., 2012). Some results of mandatory quality assurance schemes are reported on the level of states (AQUA, 2012b). Variations in health care spending (Göpffarth, 2011; Latzitis et al., 2011) and avoidable mortality (Gaber and Wildner, 2011; Sundmacher, 2012), and small area variations in morbidity (Kroll and Lampert, 2011) have also been recently analysed. The results showed different levels of variation and variable explanatory power of factors believed to be of relevance for the rates observed.

This chapter presents the results for Germany for a set of selected health care procedures and activities. Section 8.2 provides an overview of the German health care system. The following two sections present the methodology used and the results. The chapter concludes with observations on the German findings and conclusions that should be drawn from them.

8.2. Overview of Germany's health care system

Political and organisational structure

The German health care system is based on compulsory health insurance and a public/private mix of providers. About 90% of the German population are covered by statutory health insurance (SHI), while the other 10% are covered by other systems (e.g. civil servants) or by private health insurance.

The Federal German Government is responsible for legislation and health care reforms. Other responsibilities within the system of self-administration are shared by different actors and federal and regional bodies. The regional governments (Länder) are responsible for the planning of hospital capacities and the financing of hospital investments, whereas running costs are covered by health insurances (and to a small extent by other financiers). The planning of physician and specialist numbers in outpatient care is delegated to the Federal Joint Committee (G-BA).

The range of benefits covered by SHI is defined in general terms by law. The Federal Joint Committee, which consists of representatives from the SHI, hospitals, physicians and dentists, issues directives for the benefit catalogue and makes decisions on the services to be reimbursed by the SHI. Private health insurers generally cover a more or less similar basket of services, though they are allowed to extend or reduce benefits. The Federal Joint Committee defines the standards of quality assurance for in- and outpatient care. National patient advocacy groups that represent patient interests or facilitate self-help for people in Germany who are chronically ill or have disabilities are entitled to take part in discussions and submit petitions.

Health care expenditure

Health spending accounted for 11.3% of Germany's GDP in 2011, 2 percentage points higher than the OECD average of 9.3% (OECD, 2013). Germany spent USD 4 495 per person on health care in 2011 (adjusted for purchasing power parity), which is about a third higher than the OECD average. Hospital spending accounted for about 30% of current health expenditure in 2011, as the OECD average. Health spending per capita in Germany grew, in real terms, at a relatively modest rate of around 2% per year on average between 2000 and 2009. In contrast to other European countries that have been hard-hit by the economic and financial crisis, where health spending has been cut in recent years, spending in Germany continued to grow at a rate of 2.5% in 2009/10, but slowed to 1.6% in 2010/11.

Health care financing

Social security funds (including SHI, long-term care insurance, pensions, unemployment and accident insurance) are predominantly financed by payroll-based contributions and partly by taxes. Social security funds (mainly SHI) cover 70% of health spending, private health insurance 9.7% (for basic or secondary coverage), and households' direct payments 12.4%. About 21% of the German population has subscribed to private health insurance for complementary or supplementary coverage.

Health care delivery and provider payments

Physician services and payments

Primary care and ambulatory specialised care are delivered mainly by self-employed physicians and specialists affiliated with social health insurance. These physicians are paid by a mixed system, which includes elements of capitation and fee-for-service. Physicians working in hospitals are predominantly employed and salaried.

In 2011, Germany had 3.8 physicians per 1 000 population, above the OECD average of 3.2. In 2011, there were more generalists in Germany, at 42%, than the OECD average of 30%, though a slightly lower proportion of specialists, at 58%, compared to the OECD average of 62% in 2011.

Hospital services and payments

Hospital services are delivered by three types of hospitals: public hospitals (40% of beds), private not-for-profit hospitals (30% of beds) and private for-profit hospitals (30% of beds). Hospital services are predominantly reimbursed by the German diagnosis related groups System (G-DRG) (Kumar and Schoenstein, 2013; OECD Health Systems Characteristics Survey, 2012).

Germany traditionally has one of the highest levels of hospital beds per capita amongst the OECD countries, with 8.3 beds per 1 000 population in 2011, compared to the OECD average of five beds per 1 000 population.

8.3. Data and methods

The following health care activities and procedures were included in the analysis: hospital medical (not surgical) admissions, coronary artery bypass grafts (CABG), coronary angioplasties (PTCA), surgery after hip fracture, knee replacements, caesarean sections, and hysterectomies.

Data were obtained from the "DRG Statistik" of the German Federal Statistics Office (Destatis, 2011). Procedure codes and other characteristics for selection were mapped according to the OECD project guidelines.

Data from the DRG statistics are the basis for all primary analysis in the current project regarding health care activities/procedures. The German DRG System (Institut für das Entgeltsystem im Krankenhaus, 2011), basically covers all non-psychiatric cases treated in German hospitals, regardless of the patient's insurance status (in particular including patients with statutory as well as private health insurance). In addition to diagnostic and procedure codes, each case of hospitalisation/hospital episode is associated with information on patients and hospitals, case complexity and other information. In this study, only information on the patient's age and sex, diagnostic and procedure codes are used. Medical activities/procedures in the German coding system were mapped to conform to the ICD-9-CM definitions. The definitions used in the present analysis are listed in Annex 8.A1.

Figures were obtained separately for the years 2009, 2010 and 2011 on the county/district-level [*kreisfreie Städte* (towns) and *Landkreise* (counties)]. County data were aggregated to the larger territorial units based on the patient's place of residence. All regional analyses were conducted based on the two levels of territorial units suggested for Germany in the current context: the 16 German Länder (states) and the 96 Spatial Planning Regions (*Raumordnungsregionen*). The latter are of a functional nature for regional planning purpose but do not correspond to any administrative or (regional) political body. The planning of hospital capacity and regulation of hospitals are handled by ministries (of health) and Länder governments (Busse and Riesberg, 2004).

Population figures (resident population in Germany) were obtained from the The Regional Database Germany "Regionaldatenbank Deutschland" (Regionaldatenbank Deutschland, 2011). The German resident population at the end of 2010 was used. Population data were obtained on the county level and then aggregated to the SP regions and states. It should be noted that definitions used here are not directly comparable to the ones collected as part of the data collection for OECD Health Statistics (OECD, 2013). National aggregate data will therefore not be directly comparable.

8.4. Description of results

Overview of results

Table 8.1provides an overview of the observed variation between the 96 Spatial Planning Regions *(Raumordnungsregionen*) in Germany. The German resident population of 2010 (population at the end of 2010) was used in the calculations.

Table 8.1. Overview of variation in medical activities/procedures across Spatial Planning Regions, Germany, 2011

	Hospital medical admissions (per 100 000 pop.)	CABG (per 100 000 pop.)	PTCA (per 100 000 pop.)	Surgery after hip fracture (per 100 000 pop.)	Knee replacement (per 100 000 pop.)	Cesarean sections (1 000 live birth)	Hysterectomies (per 100 000 female pop.)
Crude rate	13 342	66	358	196	215	314	330
Standardised rate [median]	13 359	67	344	190	218	323	340
Standardised rate (Q10)	11 213	45	261	167	180	266	290
Standardised rate (Q90)	15 856	87	460	215	271	359	410
Coefficient of variation	**0.13**	**0.24**	**0.22**	**0.11**	**0.16**	**0.13**	**0.14**
Systematic component of variation	**1.79**	**5.74**	**4.74**	**1.11**	**2.91**	**1.63**	**2.29**

Note: Unless specified, all rates are for age/sex standardised rates per 100 000 population.

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

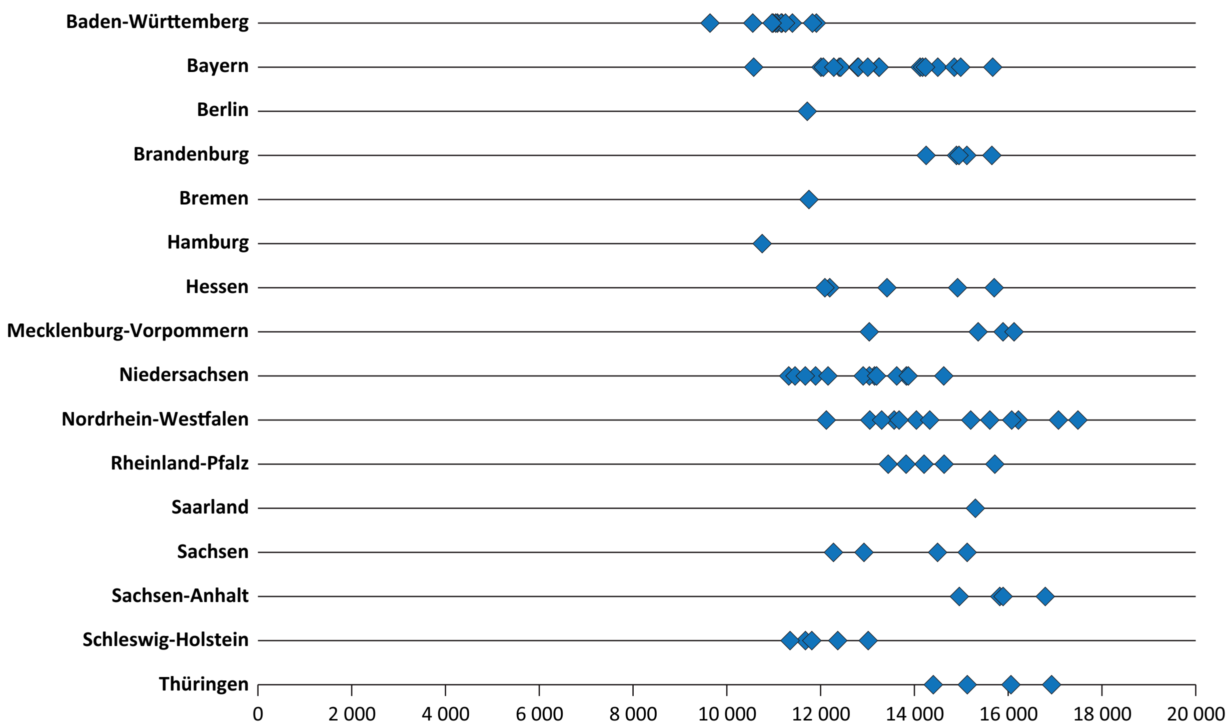
The rates for coronary intervention (PTCA) and coronary bypass surgery (CABG) exhibited the most variation, with less variation for knee replacement and hysterectomy. Hospital medical admissions and caesarean sections displayed a small amount of variation across geographic areas. The variation is lowest in hip fracture surgery cases, as expected, as this intervention was selected as a low-variation calibration procedure.

There is consistency in the ranking of procedures according to degree of within-country variation as measured by the coefficient of variation (CV) and the systematic component of variation (SCV). Using these measures, no major differences were observed in variations for two earlier years (2009 and 2010) in comparison to 2011. The correlation between the variation statistics (CV) for 2009 and 2011 (2009 and 2010 in the case of caesarean sections) is generally high,[1] suggesting stability in the rates of variation over time.

Hospital medical admissions

Standardised rates of hospital medical admissions by Spatial Planning Regions/*Raumordnungsregionen* and states/Länder in 2011 have a coefficient of variation of 0.13 and 0.12, respectively (Figure 8.1 and Table 8.2).

Figure 8.1. Hospital medical admission standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.2. Summary statistics in hospital medical admission standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011

Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	13 359	11 213	15 856	0.13	1.79
16 states/*Länder*	13 342	11 347	15 363	0.12	-

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Interpretation is difficult, as a large variety of cases and conditions account for the non-surgical hospital admissions. The comparatively low variation relative to the other health care activities and procedures is therefore also difficult to assess and to interpret.

Recent analysis of variation of avoidable hospitalisations regarding asthma, COPD, hypertension and heart failure between German states/Länder revealed variations between states in the range of 11.8 to 24.8 for asthma hospitalisations and from 129 to 283 for COPD hospitalisations per 100 000 using age-adjusted data from 2009 (Weyermann et al., 2012). Similarly, admission rates for hypertension and heart failure were found to range between 99 and 331 and between 190 and 370 respectively per 100 000 population (Drösler et al., 2012).

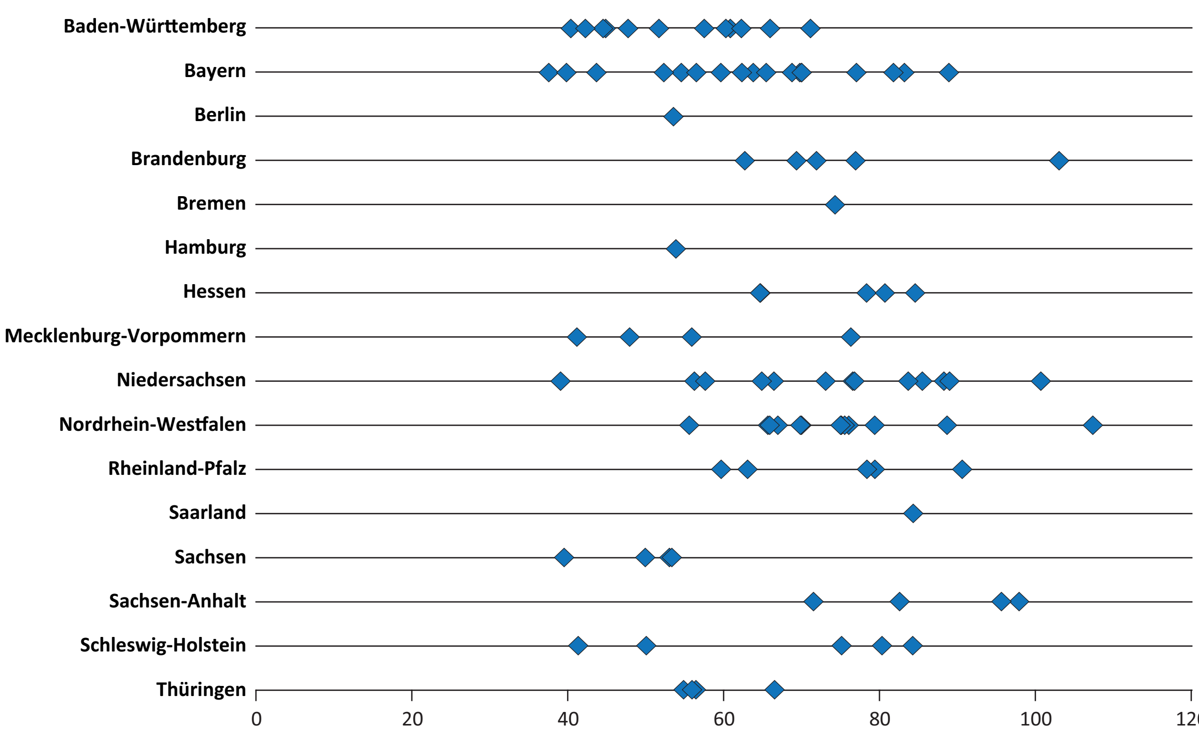
A complex relationship between physician density and a broader range of potentially avoidable hospitalisations in men was found by Sundmacher and Busse (2012). The relationship was generally non-linear. While in the range of comparatively low physician densities the rates of potentially avoidable hospitalisations decreased with increasing physician density, this trend was reversed in higher ranges of physician densities: here more physicians were associated with higher numbers of potentially avoidable hospitalisations. In some cases, analysis of different types of avoidable hospitalisations associated with different medical specialties revealed other forms of (non-linear) relationships between physician density (in the respective specialty) and potentially avoidable hospitalisations.

Cardiac procedures

Coronary bypass (CABG)

CABG standardised rates by Spatial Planning Regions/*Raumordnungsregionen* and states/Länder in 2011 have a coefficient of variation of 0.24 and 0.17, respectively (Figure 8.2 and Table 8.3).

Figure 8.2. CABG standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.3. Summary statistics in CABG standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011

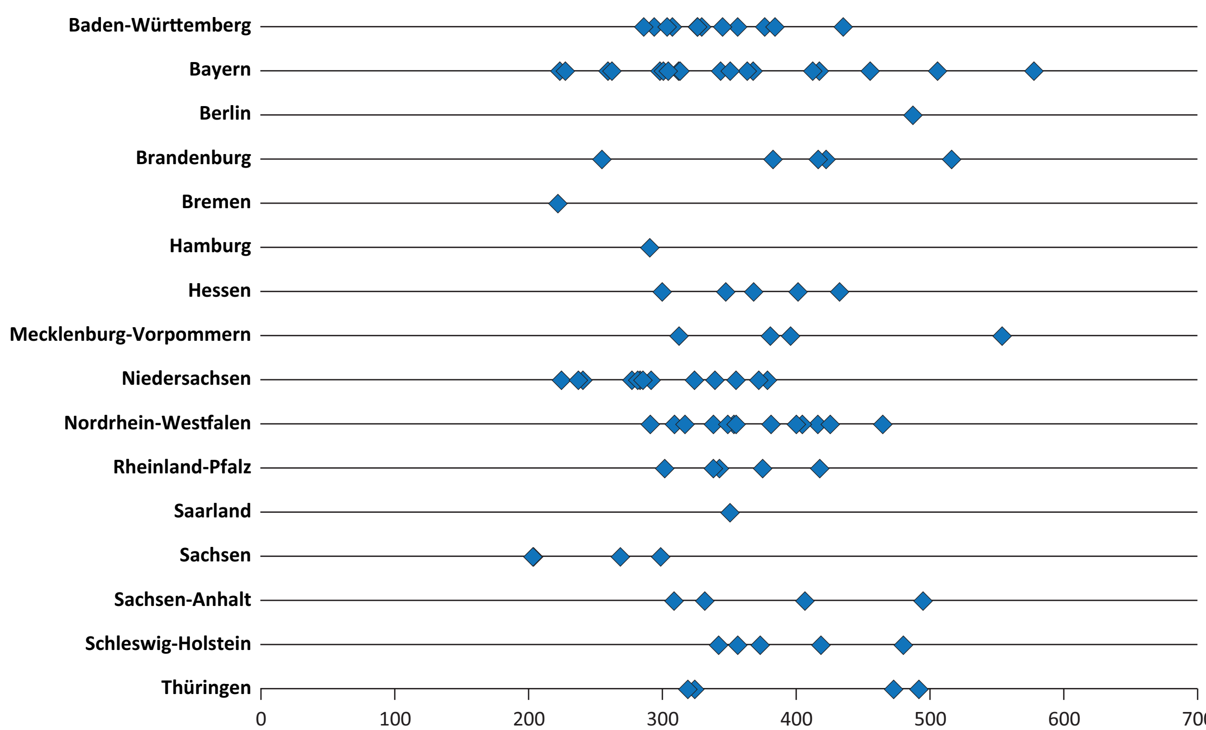
Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	66.5	44.7	86.9	0.24	5.74
16 states/*Länder*	68.2	53.7	79.0	0.17	-

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Coronary angioplasty (PTCA)

PTCA standardised rate by Spatial Planning Regions/*Raumordnungsregionen* and states/Länder in 2011 had a coefficient of variation of 0.22 and 0.19, respectively (Figure 8.3 and Table 8.4).

Figure 8.3. PTCA standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.4. Summary statistics in PTCA standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011

Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	344	261	460	0.22	4.74
16 states/*Länder*	363	270	413	0.19	-

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

The level of variation between states and Spatial Planning Regions for these two procedures is higher than in any of the other health care activity/procedures included in this study. The difference between overall variation comparing territorial levels of analysis is moderate and in the expected direction (where a somewhat higher variation is observed at the smaller unit of analysis). Variation within the Länder can differ considerably across Spatial Planning Regions (e.g. comparing Bayern with Baden-Württemberg or Nordrhein-Westfalen, Figure 8.3).

The relationship between the rates of CABG and PTCA could be negatively correlated as one intervention might be a substitute for the other. On the other hand, the rates could be positively correlated, suggesting differing rates of overall "treatment intensity" in different regions. In this study, no significant correlation (r^2=0.02) across Spatial Planning Regions was found. While this might, at least in part, result from not including outpatient PTCA procedures, it also contributes to the perception that variation is substantially unexplained.

The appropriateness of invasive cardiovascular interventions (PTCA, CABG and carotid endarterectomies) in 121 German hospitals (but including only 361 patients) was studied in 2000/01 (Gandjour et al., 2003). The authors observed a less than 10% rate of overt overuse. Equally if not more important, close to 25% or more of the procedures were deemed of uncertain appropriateness (43% of PTCA and 23% of CABG procedures). The authors noted certain limitations regarding the selection of hospitals and patients but concluded that the true rate of inappropriateness is likely higher. In its annual report in 2001, a committee comprised of high-ranking health care experts appointed by the Federal Government, had voiced its concern regarding the overuse of coronary interventions and the policy implications of provider incentives and provider structure (SVR, 2001). High variations in Germany for revascularisation procedures were also confirmed in a recent report on a number of medical conditions (Nolting et al., 2012).

The appropriate level of revascularisation procedures and interventions (i.e. the "right rate") is not easily identified due to the continuous development of new procedural variations and products (e.g. drug-eluting stents of various kinds, drug-eluting balloons, new procedural variations of CABG,) and also by the related issue of a "moving boundary" between indications for drug therapy, PTCA or CABG depending on patient and disease characteristics (e.g. multi-vessel disease and co-morbidities) (Jones, 2012). In a published joint opinion of German interventional cardiologists as well as heart surgeons (Ruß et al., 2009) the authors tried to specify treatment indications that were not addressed in detail in the major German guideline on CHD (German Interdisciplinary Guideline) (Nationale VersorgungsLeitlinien, 2009).

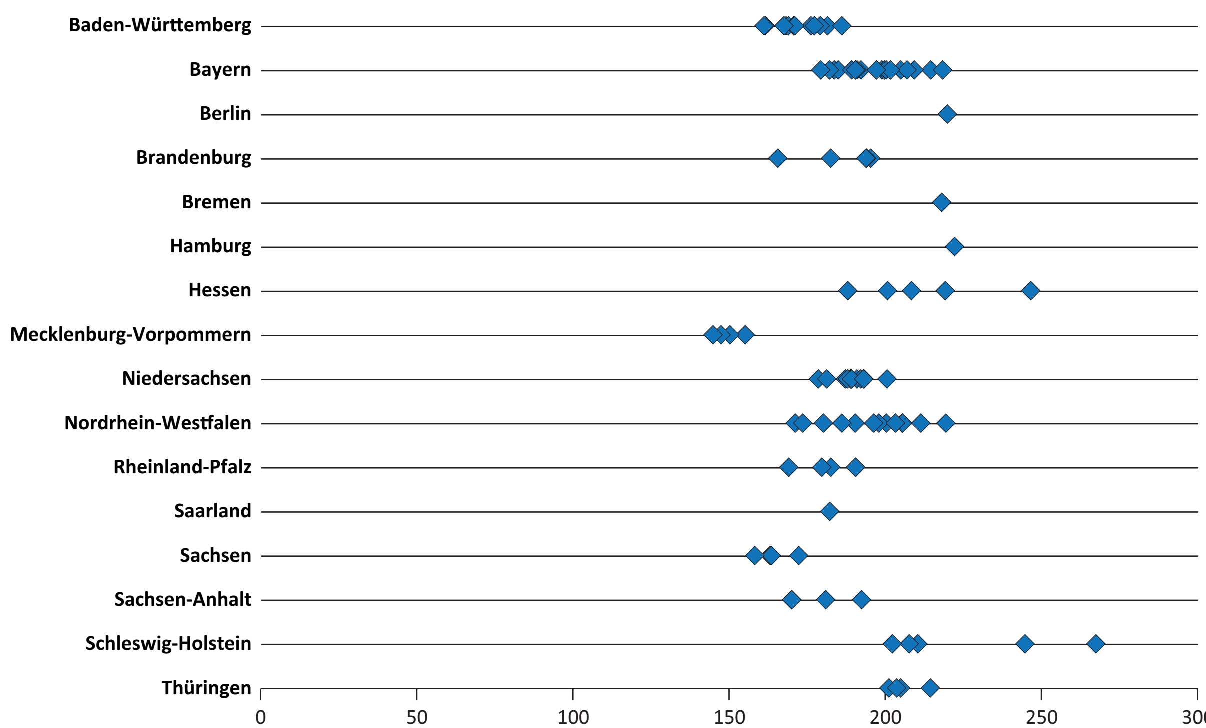
The lack of current in-depth investigation into this topic compared to about a decade ago (SVR, 2001; Gandjour, 2003), the very intense process of innovation in new technologies and the continued need for coronary heart disease treatment in an aging population suggest that it is urgent to address medical practice variation in this area in Germany (and likely in other countries as well). The problem may be of particular significance in Germany, however as high rates of cardiac interventions in international comparison are unexplained by ischaemic heart disease rates.

Joint procedures

Hip fractures

Surgery after hip fracture standardised rate by Spatial Planning Regions/*Raumordnungsregionen* and states/Länder in 2011 shows a similar level of variation at the spatial planning regions level and at the Länder level (CV of 0.11) (Figure 8.4, Table 8.5).

Figure 8.4. Surgery after hip fracture standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), “DRG Statistik”, available at www.destatis.de; and Regionaldatenbank Deutschland (2011), “The Regional Database Germany”, available at www.regionalstatisk.de/genesis/online.

Table 8.5. Summary statistics in surgery after hip fracture standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011

Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	190	167	215	0.11	1.11
16 states/*Länder*	192	169	221	0.11	-

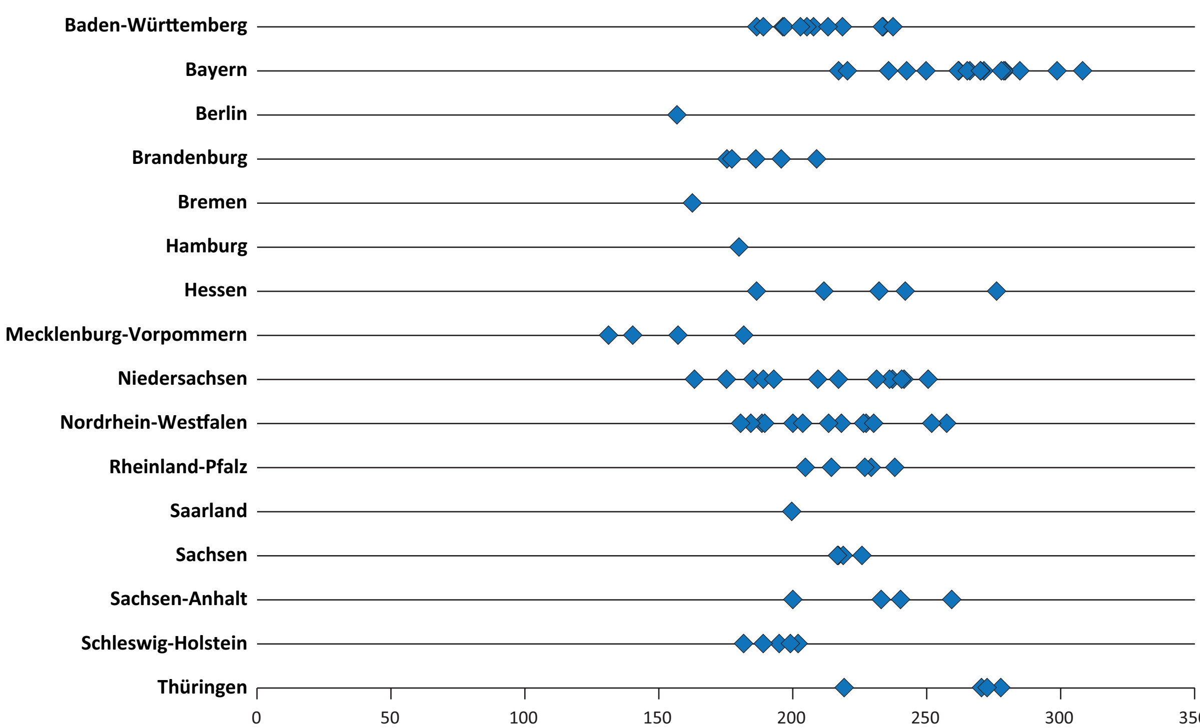
Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

The overall variation is relatively small, which confirms this procedure as low-variation for calibration purposes, reflecting incidence.

Knee replacement

Knee replacement standardised rate in 2011 shows similar levels of variation at the spatial planning regions level and at the Länder level with a CV of 0.16 and 0.15, respectively (Figure 8.5, Table 8.6).

Figure 8.5. Knee replacement standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.6. Summary statistics in knee replacement standardised rate per 100 000 population by Länder and Spatial Planning Regions, Germany, 2011

Territorial level	Standardised rate (media)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	218	180	271	0.16	2.91
16 states/*Länder*	207	164	243	0.15	-

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

The variation in the frequency of knee replacement between states and Spatial Planning Regions is higher than in some of the other activities in the current analysis, but lower than in coronary heart disease-related procedures. The results exhibit a north-south gradient, with higher rates observed in the south of Germany, in particular in Bayern (Bavaria). This finding was confirmed by other recent publications (Schäfer et al., 2012; Nolting et al., 2012, pp. 44-45). In a limited analysis (Schäfer et al., 2012) of broad regional clusters (east, west, northwest, some larger "Länder" such as e.g. Nordrhein-Westfalen, Bayern, Baden-Württemberg), the variation of knee replacement rates is largely unexplained in terms of morbidity as the variation of the prevalence of osteoarthritis was found to be small in comparison.

Gynaecological procedures

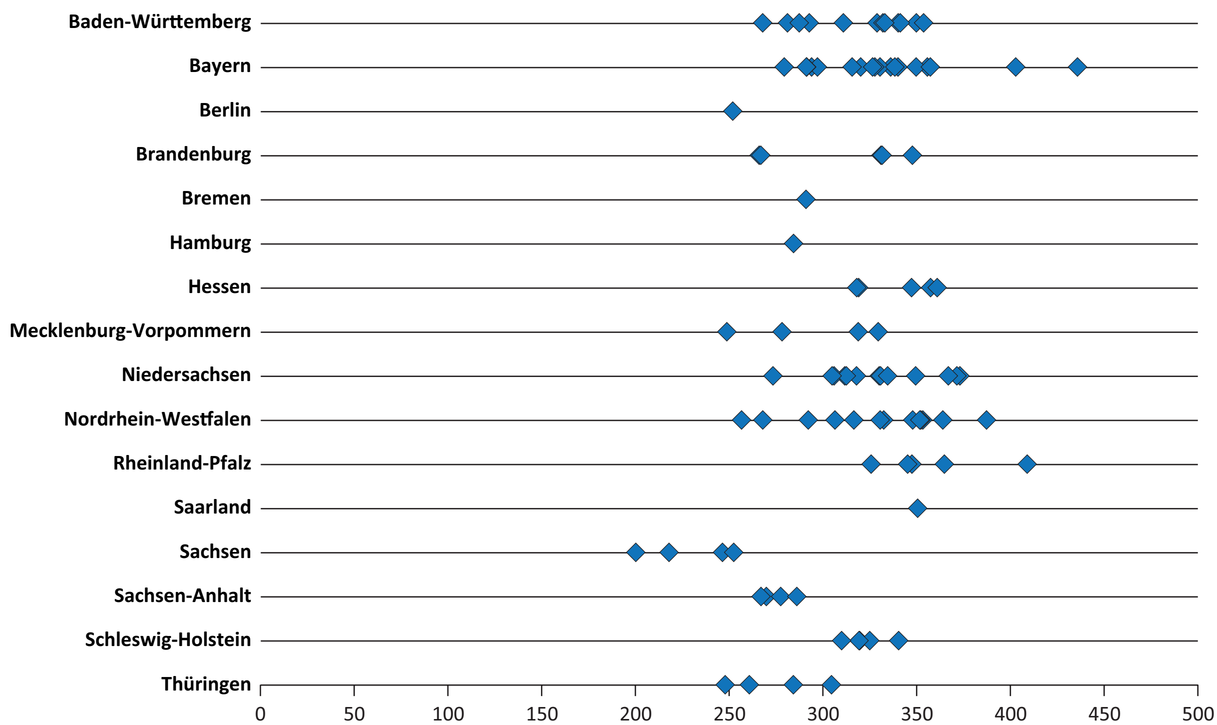
Caesarean sections

Caesarean sections standardised rate by Spatial Planning Regions/*Raumordnungsregionen* and states/Länder in 2010 shows a similar level of variation across Spatial Planning Regions (CV of 0.13) and Länder (CV of 0.11) as shown in Figure 8.6 and Table 8.7.

While there is comparatively little numerical variation in the rates between states (and to lesser degree between Spatial Planning Regions) relative to the other procedures/medical activities in the current analysis, some regional distribution is clearly visible: rates are higher in the west of Germany than in the east. While this particular finding was noted, no thorough investigation has been conducted as the health policy discussions so far have focussed on other factors and in particular on the overall trend of increasing rates.

The rate of caesarean sections has also increased over the years, resulting in rates of up to 30% and more overall in Germany today (compared to about 16% in 1990 and 21% in 2000) (Kolip et al., 2012). Many factors are considered in the report by Kolip et al. (2012): changing risk profiles, increased birth weight, multiple birth, changes in perceived risks and other attitudes of mothers and carers, socio-demographic factors, planned vs. unplanned caesarean sections, gestational age, midwife services during pregnancy, and process factors like the day of birth, incentives for hospitals, etc. While no overall model was used to explain the regional variation observed, different factors were explored using different data sources and approaches. For instance, the age of mothers, service utilisation during pregnancy, midwives, socio-demographic factors, attitude towards technology use, or the desire for an "elective" procedure without clinical indication made little or no significant contribution to explaining the variation in caesarean section rates.

Figure 8.6. Caesarean section standardised rate per 1 000 live births by Länder and Spatial Planning Regions, Germany, 2010



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.7. Summary statistics in caesarean section standardised rate per 1 000 live births by Länder and Spatial Planning Regions, Germany, 2010

Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	323	266	359	0.13	1.63
16 states/*Länder*	309	260	343	0.11	-

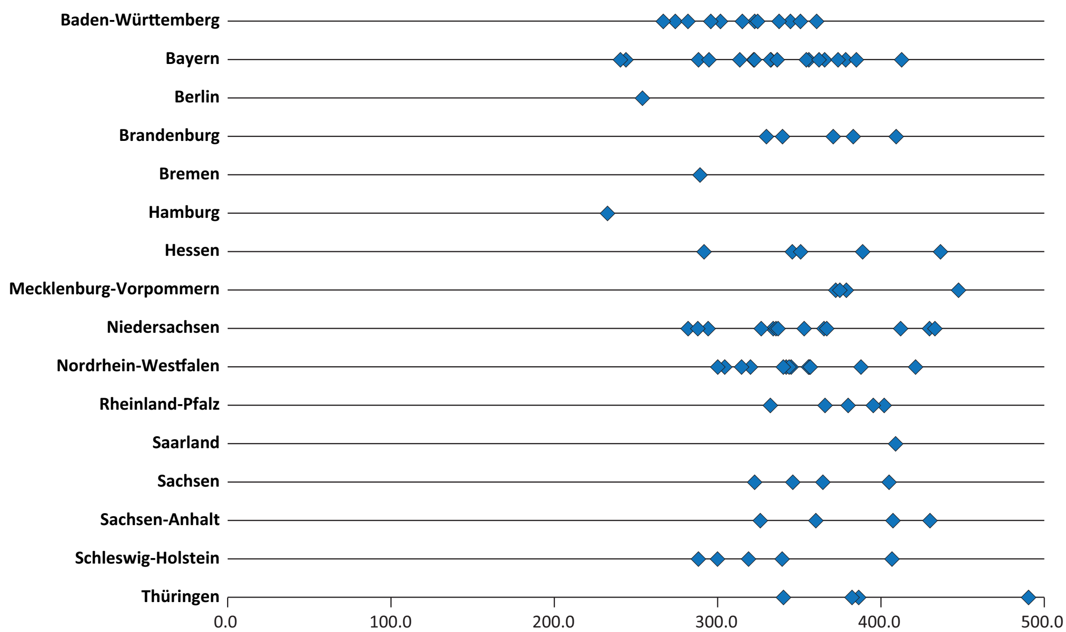
Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

However, regional variation was larger for planned (primary) interventions (Kolip et al., 2012). Primary interventions were found to be unevenly distributed among the days of the week. These findings seem to suggest that there may be certain advantages in planning ahead for primary caesarean sections. With changes in the risk attitudes of mothers/parents and carers, supported by procedural and associated economic considerations, there may have been an overall shift in attitude in favour of caesarean sections in many cases (Kolip et al., 2012). A range of possible interventions are recommended, from the drafting of more explicit guidelines (which might also reduce the fear of litigation and the extent of "defensive" medical practice, Kolip et al., 2012, p. 94) to better education of carers and changes in reimbursement structures.

Hysterectomies

Hysterectomy standardised rates in 2011 have similar levels of variation at the spatial planning level and at the Länder level (CV of 0.14 and 0.15 respectively) (Figure 8.7 and Table 8.8).

Figure 8.7. Hysterectomy standardised rate per 100 000 females by Länder and Spatial Planning Regions, Germany, 2011



Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

Table 8.8. Summary statistics in hysterectomy age-standardised rate per 100 000 females by Länder and Spatial Planning Regions, Germany, 2011

Territorial level	Standardised rate (median)	Standardised rate (Q10)	Standardised rate (Q90)	Coefficient of variation	Systematic component of variation
96 Spatial Planning Regions	340	290	410	0.14	2.29
16 states/*Länder*	340	280	390	0.15	-

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de; and Regionaldatenbank Deutschland (2011), "The Regional Database Germany", available at www.regionalstatisk.de/genesis/online.

The variation observed between states and Spatial Planning Regions is thus higher than in some of the other activities included in the current analysis, but lower than the variation in coronary heart disease-related procedures and at about the same level as the variation observed in hospital medical admissions and caesarean sections.

Empirical work has found in a detailed analysis of regional hysterectomy rates and underlying conditions, including malignant conditions, that some surgical approaches were still in use in 2005/06 although clinical evidence suggests their inferiority (Stang et al., 2011).

Geraedts and Malik (2012) included other gynaecological surgery for benign conditions in the analysis of regional rates of hysterectomies and the regional density of gynaecological hospital beds. Some positive correlation was observed only when the entire German territory was disaggregated into a comparatively small number of areas (approximately 20 areas) of about roughly the same size in terms of population, i.e. not corresponding to administrative territories. The correlation virtually disappeared, however, when a larger number of areas (from 50 to 100 areas) were used. These results as well as the result of the present analysis where variation of hysterectomy rates for Spatial Planning Regions was even a little lower than the rate of variation between states, raise questions about the impact of the type of territorial unit used in variation analysis.

In Germany, the rate of hysterectomies is monitored in the mandatory external quality assurance scheme of German hospitals (Nolting et al., 2012). The results from the German mandatory hospital quality reporting scheme collect quality indicators on hysterectomy (AQUA, 2012a; AQUA, 2012b). While results have repeatedly addressed considerable problems regarding proper indication, no particular action has occurred besides discussions of quality results regularly held at the Länder level.

8.5. Conclusions

The results of the project show that within-country variation in the frequency of a number of medical activities exists in Germany and that it is currently unexplained. This confirms the results already obtained in other German studies and, in particular, the results published by the "*Faktencheck Gesundheit*" project and in the "*Krankenhausreport*". The variation in the selected procedures is higher than in hip surgery, which was included for calibration purposes, and is highest in coronary interventions (PTCA and CABG).

An the important question regarding the results of the current project is whether the variation found to exist is unwarranted and whether further action is needed. Considerable current scientific work regarding the influence of need/demand side, supply side and other (mostly regional and socio-demographic factors) has been done regarding the medical activities included in the present analysis. Robust relationships that might either explain the variation satisfactorily or suggest clear-cut actions to address the causes of "unwarranted" variation did not to seem to have emerged, however.

Further investigation into the possible explanations for variation (in particular need-based reasons such as regional differences in the prevalence or incidence of underlying conditions), and discussion and engagement with stakeholders relevant at the various decision-making levels and processes involved, should both take place and should not be treated as mutually exclusive. The example of caesarean sections illustrates the complexity of the issues. Practice variation analysis often cannot, by and of itself, resolve the question of whether a particular intervention rate is appropriate and warranted. A variety of factors, ranging from highly personal motivations, social and cultural backgrounds, medical beliefs and experiences of (different) provider groups to the medical evidence base and secular trends and reimbursement conditions – and the interactions of all these – may all contribute to the overall rise in caesarean sections as well as to their regional variation. No single study could hope to create an all-encompassing "solution". Rather, it will be continued engagement and discussion and additional research on certain issues that might allow a resolution.

While the development of methods for variation research should also continue, one major obstacle to effective policy action regarding unexplained variation is that it is often difficult to assess scientifically whether a medical activity is appropriate. The latter crucially depends on the quality of evidence supporting its use. The better the available evidence regarding specific patient groups and indications for appropriate or inappropriate use of the medical activities – the easier it would be to describe a clear route for policy action. It is especially important to have a sufficient evidence base regarding the question in which cases, for which patients, they actually are useful. If this is uncertain, other factors beyond patient benefit may drive variation figures.

A number of institutions at the federal level in Germany are engaged in activities that could inform variation analysis and help to determine a more targeted use of interventions and thus contribute to reducing unexplained variation.

The Federal Joint Committee (G-BA), composed of representatives of statutory health insurance, doctors, hospitals and patients, is entrusted with decision making regarding the benefits catalogue (of statutory health insurance, which covers about 90% of the population in Germany) as well as with mandatory programmes for quality improvement. It is supported by at least two independent scientific institutions: the Institute for Quality and Efficiency in Health Care (IQWiG) and the AQUA Institute. The IQWiG is predominately commissioned to carry out Health Technology Assessments (on existing technologies as well as new interventions). The AQUA Institute is being commissioned to develop quality improvement schemes, which is especially relevant in the current context since it works on the development of indicators of appropriateness ("quality of indication"). The work of both institutes depends highly on the quality of the available evidence base. Strengthening this evidence base will contribute to reasonable medical decisions and will improve the "quality of indication" as well as patient care.

Hospital care policy is currently agreed to be an important topic on the national health policy agenda (Kumar and Schoenstein, 2013). A scientific report mandated by federal law to resolve issues in the DRG payment system and in particular to investigate the overall rise in the number of hospital episodes observed in recent years will be available in 2014. After this study has been conducted, it will be possible to assess the potential impact of its findings with regard to medical practice variation.

In summary, the conclusion here is that possibly "unwarranted" medical practice variation does exist in Germany regarding at least the health care activities/procedures included here. This merits further joint action and investigation into the causes and nature of this variation. To the extent such approaches are successful, it could be expected either that the observed variation in this study is reduced in the future, or that it is increasingly found to be warranted in terms of the needs or benefits for patients.

Note

1. CABG (R2=0.80), PTCA (R2=0.75), HIP (R2=0.69), HYST (R2=0.81), KNEE (R2=0.87), MED (R2=0.98), CES (R2=0.87 – 2009/2010 values). The correlation between the 2009 and 2010 figures (results not shown) is generally in the same order of magnitude or higher.

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ANNEX 8.A1

Definition of medical activities/procedures in terms of German DRG data

Description	**Short**	**Definition in DRG data**
Hospital medical admissions	h_med	All cases of partition "M" (medical) and "A" (other) - exluding cases in partition "O" (surgical)
Caesarean sections	c_sect	All cases with at least on procedure code from: 5-740 klassiches Sectio caesarea (classical c-section), 5-741 Sectio caesarea suprazervikal und korporal (c-section supracervical/b. of uterus), 5-742 Sectio caesarea extraperitonealis (eccyesis), 5-744 Operationen bei Extrauteringravidität(c-section in EUG), 5-749 Andere Sectio caesarea (other c-section)
Coronary bypass	CABG	All cases with at least on procedure code from: 5-361 Anlegen eines aortokoronaren Bypass (CABG); 5-362 Anlegen eines aortokoronaren Bypass durch minimalinvasive Technik (CABG minimal invasive)
Coronary angioplasty	PTCA	All cases with at least on procedure code from: 8-837 Perkutan-transluminale Gefäßintervention an Herz und Koronargefäßen (PTCA)
Knee replacement	knee	All cases with at least on procedure code from: 5-822 Implantation einer Endoprothese am Kniegelenk (implantation of knee endoprothesis); 5-823 Revision, Wechsel und Entfernung einer Endoprothese am Kniegelenk (revision, exchange or removal of knee endoprothesis)
Surgery after hip fracture	hip	All cases with primary diagnosis (ICD-10 GM): S72 Fraktur des Femurs (fracture of femur), excluding those with an additional diagnosis of V99 Transportmittelunfall (transport accident) or W49 Exposition gegenüber mechanischen Kräften unbelebter Objekte (Exposure to inanimate mechanical forces) or W64 Exposition gegenüber mechanischen Kräften belebter Objekte (Exposure to animate mechanical forces) Note: W49 and W64 differ between WHO-ICD-10 and ICD-10-GM: in the WHO-version they are only residual categories, while in the GM-version they cover all exposures to (in-)animate mechanical forces.
Hysterectomy	hyst	All cases with at least one procedure code from: 5-682 Subtotale Hysterektomie (subtotal H.), 5-683 Total Hysterektomie (total H.), 5-685 Radikale Hysterektomie (radical H.)

Source: Destatis (2011), "DRG Statistik", available at www.destatis.de (ICD-10-GM, OPS-coding-system).

Chapter 9

Israel: Geographic variations in health care

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Medical variations between geographical areas in Israel have been widely discussed in the last years, especially regarding accessibility to medical services in the periphery of the country. However, this is the first report that focusses on a selected set of hospital interventions and procedures. The interventions with the lowest variation across districts were hospital medical admissions, PTCA and surgery after hip fracture, while the highest variation was for knee arthroscopy, with a 4.5-fold variation between the districts with the lowest and the highest rate. Regarding cardiac revascularisation procedures, the trend over time in PTCA rates varied across districts, with PTCA rates increasing in some districts (the Northern and Southern districts) while decreasing in others. This trend is attributed to a vast investment in manpower and infrastructures in the periphery. More generally, one of the main findings of this report is that the Israeli periphery (the Northern district in particular) tends to have higher rates of hospital medical admissions and surgical activities for many of the procedures reviewed in this report. This phenomenon is not attributed to a specific policy and needs to be further investigated.

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.

9.1. Introduction

Medical variations between geographical areas in Israel have been widely discussed in recent years, especially with regard to accessibility to medical services in the country's periphery. Israel is divided into districts, among them the Northern and Southern districts, which are considered the periphery. The characteristics of these districts have been widely described (also in English) by the Israeli Central Bureau of Statistics (2014). Several reports have been issued in the past few years that have influenced specific budget allocations to try to narrow these variations. New MRI units have been installed in the periphery, and a new medical school in the Galilee was established. The recent work agreement signed between the Israel Medical Association and the Ministry of Finance included financial incentives to physicians willing to work in these districts and specifically in the fields of shortages (anaesthesiology and surgery).

The question has also been investigated in the academic literature in recent years, including a review of medical practice variations between the years 1998 and 2008 (Ministry of Health and CBS, 2012 and 2014). However, unlike the current report, this earlier review did not consider surgical procedures.

This chapter presents the results on geographic variations in Israel over a 12-year period (between 2000 and 2011), and for the first time includes variations in surgical procedures. The next section provides an overview of the country's health care system. The following section describes the methods, followed by a presentation of the results and some conclusions.

9.2. Overview of Israel's health care system

Political and organisational structure

In Israel, the Ministry of Health has overall responsibility for the planning, organisation and delivery of health services. A national health insurance (NHI) system provides universal coverage of health services. Israeli citizens and permanent residents can enrol with any one of four not-for-profit competing health funds, which are mainly financed from general taxation. The current framework for Israel's health system was largely based on the 1995 National Insurance Law (Rosen and Merkur, 2009).

Health care expenditure

Total health spending accounted for 7.7% of Israel's GDP in 2011, below the OECD average of 9.3%, (OECD, 2013a). Israel also ranks below the OECD average in terms of health spending per capita, with spending of USD 2 239 in 2011 (adjusted for purchasing power parity), compared with an OECD average of around USD 3 300. Health spending per capita in Israel increased in real terms at an annual average of 1.7% between 2000 and 2011. The share of hospital spending was in line with the OECD average, at 26% for 2011.

Health care financing

The national health insurance system is financed from general taxation and payroll taxes, and accounted for 62% of health spending in 2011 (OECD, 2013a). The health funds are funded on a per-capita basis, adjusted for age. Services outside the NHI are financed from private out-of-pocket (OOP) payments and private health insurance (PHI). In 2011, 80% of the population had some form of private health insurance, which was predominantly supplementary and duplicate. OOP payments accounted for 25% of health spending and PHI for 10% in 2011.

Health care delivery and provider payments

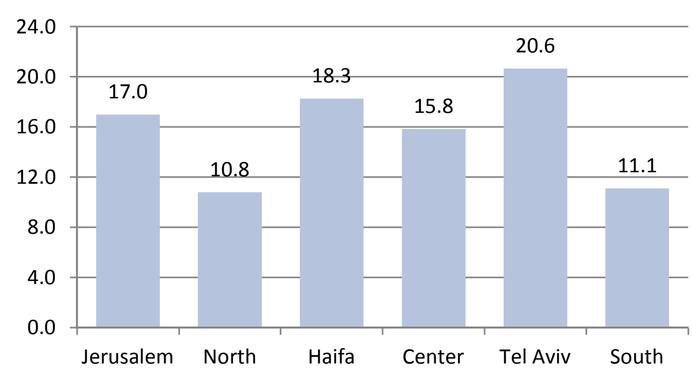
Physician services and payments

Physicians provide primary care services in public clinics which also employ other health professionals. Outpatient specialist services are provided mainly in public multi-specialty clinics. General practitioners (GPs) and specialists are predominantly publicly employed and remunerated on a salary basis (OECD Health Systems Characteristics Survey, 2012).

Israel had 3.3 physicians per 1 000 population in 2011, which is similar to the OECD average of 3.2 per 1 000 (OECD, 2013a).

Across geographic areas (districts) the distribution of doctors and nurses varies with a greater number of doctors and nurses in districts such as Tel Aviv and Haifa. Staff availability in the periphery for both community and hospital care (e.g. physicians, nurses, dentists, paramedics, specialists) is lowest in the Northern and Southern districts (Figures 9.1 and 9.2). Physician availability varies three-fold between the North and South on the one hand and Tel Aviv on the other (OECD, 2012a).

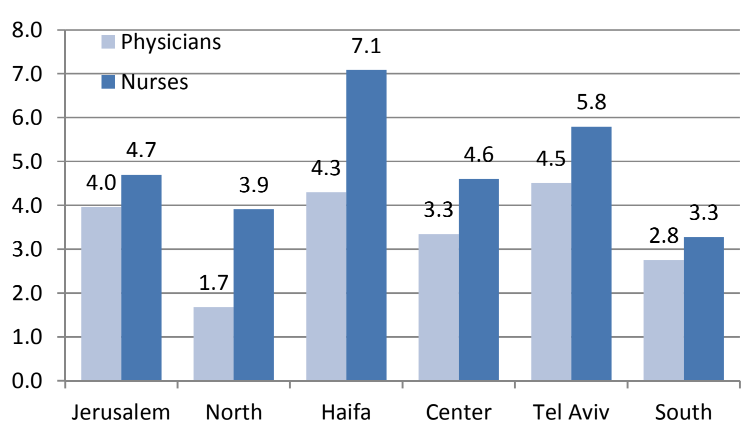
Figure 9.1. Health care professionals per 1 000 persons by district, Israel, 2009-11 (average)



Note: Total includes physicians, nurses, dentists, paramedical workers and other medical workers.

Source: Ministry of Health (2013), "The Medical Workforce 2012" [in Hebrew], based on the Labour Force Survey, Israel Central Bureau of Statistics. Health Information Division, Jerusalem.

Figure 9.2. Physicians and nurses per 1 000 persons by district, Israel, 2009-11 (average)



Source: Ministry of Health (2013), "The Medical Workforce 2012" [in Hebrew], based on the Labour Force Survey, Israel Central Bureau of Statistics. Health Information Division, Jerusalem.

Hospital services and payments

The Ministry of Health owns and operates about half of all hospital beds, while the largest health fund operates a third of the beds, and the rest are run by profit and not-for-profit hospitals (Rosen and Merkur, 2009). Hospitals predominantly receive payments based on a procedure or service plus per diem charges (OECD Health Systems Characteristics Survey, 2012).

The number of hospital beds in Israel in 2011, excluding beds in nursing home facilities, was 3.3 per 1 000 population, which is lower than the OECD average of 5.0 beds. As in most OECD countries, the number of hospital beds per capita has fallen slightly over time. The number of acute care hospital beds is lower in Israel than in most OECD countries.

There are geographical variations in health care infrastructure. For instance, the ratio of acute care, long-term care, emergency care and delivery beds, MRI and CT machines, and dialysis stations is lower in the periphery relative to the other regions, especially in the South (Table 9.1).

Table 9.1. Health care infrastructure by district, Israel

	Health care facilities 2009						
Variable	National	South	North	Tel Aviv	Centre	Haifa	Jerusalem
Delivery room beds/100 000 women aged 15-44	14.7	9.9	12.8	18.5	13	16.6	23.7
Delivery room beds/1 000 live births	1.5	0.9	1.4	2	1.4	2	1.8
Operating rooms/100 000	5.8	3.3	4	8.4	5.5	6.9	8.6
Recovery room beds/100 000	10.2	4.4	8	15.4	9.7	15.3	12.7
Emergency dept beds/100 000	14.9	9	14	15	13.9	19.3	24.9
Dialysis stations/100 000	15.4	13.6	14.3	18.8	12.2	21.5	19.7
Inpatient beds: acute/100 000	193.2	138.4	148.3	250.3	201.2	258	223

Source: Ministry of Health (2010), *Health in Israel: Selected Data 2010*, Ministry of Health, Jerusalem.

9.3. Data and methods

The data presented in this report is based on the National Hospital Discharges Database (NHDD) maintained by the Division of Health Information in Israel's Ministry of Health. The database is continually updated, with hospitals providing the information electronically on a monthly or quarterly basis. The database includes all acute care hospitals (private and public), as well as some of the psychiatric and long-term care facilities. Only acute care hospitals were included in this study.

The database contains records of each individual hospitalisation. Patients' identity numbers are encrypted to allow follow-up studies, but prevent identification of individuals to protect patient privacy. The database includes demographic and hospitalisation data. The demographic data include age, gender and residence (village/town/city code), as well as the patient's health fund provider. The hospitalisation data include general information such as admission type (planned or urgent, i.e. via the emergency room), discharge type (home, transfer to other facility, left against medical advice, or died), detailed information on the departmental level such as date of admission and discharge from each department, and the diagnoses listed and procedures performed in each case, which are coded according to the ICD-9-CM classification. In addition, financial information is provided for each hospitalisation: who pays (health insurer, or private) as well as the reimbursement tariff for the hospitalisation. Tourists and other non-residents were excluded from the analysis. The calculation of caesarean section rates was validated against the National Perinatal Database.

The data are presented according to the seven districts in Israel. The location was determined by the location, patients' residence, and not the providing hospital location, since often the services are provided in regions other than the region of residence.

The discharges are shown for the years 2000 and 2011, and rates have been age- and sex-standardised in most cases, based on Israel's population in 2008. The identification of procedures based on the guidelines for this study (see Annex 9.A1).

9.4. Description of results

Overview of results

The results show that in 2011 the degree of variation across the seven districts in Israel was the lowest for hospital medical admissions, followed by PTCA and surgery after hip fracture (Table 9.2). The highest variation was for knee replacement (with a 2.4-fold variation between the lowest and highest districts).

Table 9.2. Summary of results of variations across nine health care procedures, by district, Israel, 2011

	Hospital medical admissions	CABG	PTCA	Surgery after hip fracture	Knee replacement	Caesarean section (per 1 000 live births)	Hysterectomy
Crude rate at national level	11 878	49	301	111	45	185	106
Unweighted average of standardised rate across the seven districts	11 842	50	293	108	44	183	110
Coefficient of variation across the seven districts	0.12	0.27	0.12	0.14	0.28	0.18	0.23
Ratio (Maximum value/ Minimum value)	1.3	2	1.4	1.4	2.4	1.6	2.1

Note: Unless specified, all rates are age/sex standardised per 100 000 population.

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Looking at trends over time, knee replacement showed the highest increase at a national level between 2000 and 2011, with the age-standardised rate rising from 29 to 44 per 100 000 population (an increase of over 50%). This growth was particularly rapid in the Northern district and the Jerusalem district, which had the highest knee replacement rate in 2011.

Caesarean section rates also increased in all districts between 2000 and 2011, but the increase was particularly marked in the northern part of Israel (the Northern district and Haifa district).

Hospital medical admissions decreased at least slightly in most districts, with the highest rates consistently in the Northern and Southern districts.

CABG rates decreased sharply across the country between 2000 and 2011, with the age-standardised rate dropping by over 50% (from 110 to 50 per 100 000 population). CABG rates decreased substantially in all districts. PTCA rates increased during 2000-05 in some districts (the Northern and Southern districts), and since 2005 it decreased in most districts. The reasons for these different trends in PTCA rates across districts are unclear. The rate was lower in the periphery in the beginning of the decade and increased to above the national level in the last few years. One explanation may be related to a relocation of cardiac personnel to perform such cardiac procedures for people with ischaemic heart disease from the centre to the two periphery districts (see section on revascularisation procedures). Another reason is the large allocation of budgets in order to narrow the gap between the centre of Israel and weak infrastructure in the provision of cardiac catheterisation in the periphery. These changes were in part response to the high policy importance placed on the access to fast treatment for acute myocardial infarction in the early 2000s.

Hospital medical admission

As in many other OECD countries (OECD, 2013b), the average standardised rate of hospital medical admissions in Israel generally decreased between 2000-11, by 8% on average across the seven districts while the coefficient of variation was remained fairly stable (Table 9.3).

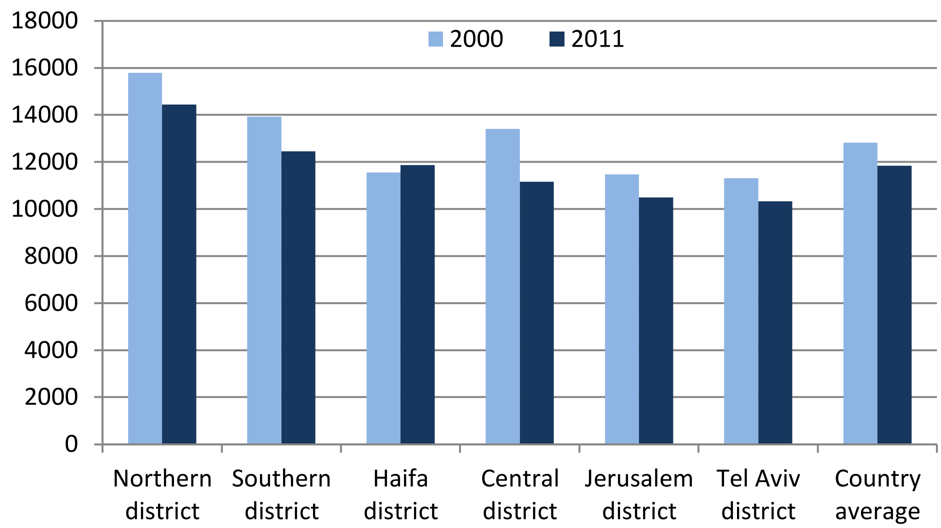
In 2011, the admission rates across the seven districts showed a 1.3-fold variation between the extremes, ranging from 10 326 discharges per 100 000 population (Tel Aviv district) to 14 434 discharges per 100 000 population (Northern district) (Figure 9.3). The periphery of Israel (the Northern and Southern districts) generally had the highest rates of medical admissions, in both 2000 and 2011.

Table 9.3. Summary statistics of hospital medical admissions standardised rate per 100 000 population, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	12 817	15 799	11 316	1.4	0.13
2001	12 759	16 020	11 367	1.4	0.13
2002	12 615	15 585	11 245	1.4	0.12
2003	12 614	15 457	11 456	1.3	0.11
2004	12 507	15 129	11 624	1.3	0.10
2005	12 538	15 356	11 561	1.3	0.11
2006	12 642	15 221	11 536	1.3	0.10
2007	12 446	15 312	11 287	1.4	0.11
2008	12 400	15 115	11 039	1.4	0.11
2009	12 214	14 763	10 577	1.4	0.12
2010	12 182	14 478	10 715	1.4	0.10
2011	11 842	14 434	10 327	1.4	0.12

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.3. Hospital medical admissions standardised rate per 100 000 population, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

The supply of health services is lower in these two districts with a lower density of hospital beds, physicians and nurses (OECD, 2012a). The age-adjusted mortality rate is higher (Goldberger and Haklai, 2012) as well, reflecting relatively poorer health and lower socioeconomic status. Health status varies across districts: Arabs, poor socio-economic status groups and lower education level; and those living in the north and south periphery experience poorer health than Jews, higher socio-economic status groups and those living in the Centre. These characteristics are often correlated: for example, Arabs are more likely than Jews to be both poor and live in the periphery (OECD, 2012a). Other country chapters found that higher rates of hospitalisation among lower socioeconomic groups could be attributed to a lack of proper community and primary care services where patients are hospitalised for conditions that could be more appropriately treated in ambulatory care (see also chapter on Canada).The last health survey has shown that in the Northern district there was a higher rate of visits to primary care physicians (Ministry of Health and the Central Bureau of Statistics (2013).

The Ministry of Heath has published yearly reports on medical admission rates among different regions. These reports inform several policies such as the allocation mostly in the periphery districts of an additional 739 hospital beds (acute beds) between the years 2009-13 (Ministry of Health, 2012a and 2013b). One third of the new hospital beds were allocated to the Northern and Southern districts (26% of the population), one third to the Jerusalem district (15% of the population) and one third to Haifa, Tel Aviv and the Central districts (54% of the population). The Ministry of Health policy together with all the health funds was also to add emergency centres into the hospitals and in the community in the Northern and Southern districts (Ministry of Health, 2013c).

Revascularisation procedures

Coronary artery bypass graft (CABG)

As in most other OECD countries, the average standardised rate of CABG decreased sharply (by over 50%) in Israel from 2000 to 2011 (110 to 50 per 100 000 population) (Table 9.4). This as a growing share of people suffering from ischaemic heart disease were being treated through less invasive procedures such as coronary angioplasty (PTCA) and other procedures. This trend has also been reported in the United States (Epstein, 2011) and other countries. Variations across geographic areas increased (coefficient of variation rose from 0.10 to 0.27).

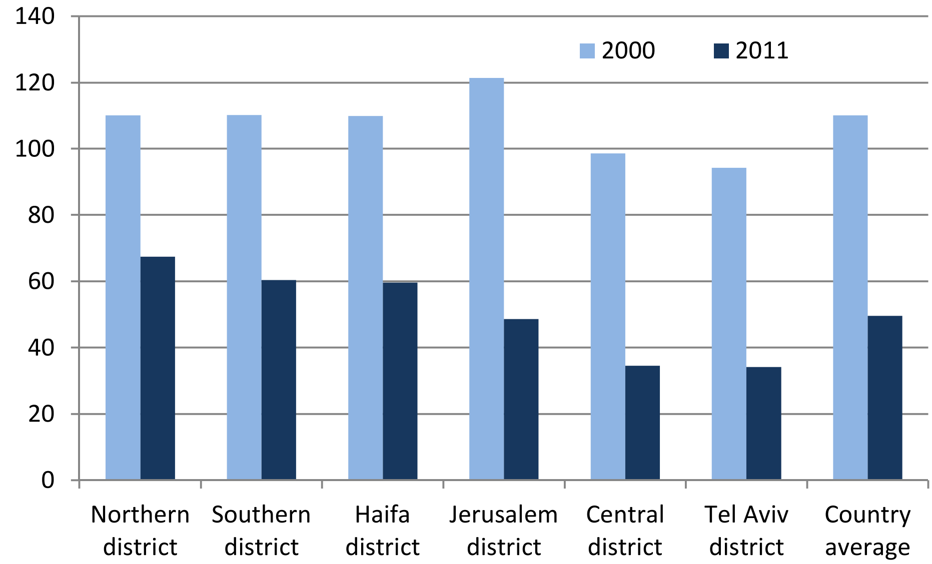
Nonetheless, CABG rates across Israel's seven districts in 2011 showed a two-fold variation between the lowest and highest districts, ranging from 34 CABG per 100 000 population (Tel Aviv district) to 67 per 100 000 (Northern district) (Figure 9.4).The Northern and Southern districts had the highest CABG rates, but also the highest coronary angioplasty (PTCA) rates (see next section), indicating that the total volume of revascularisation procedures was much higher in these two districts than in the rest of the country.

Table 9.4. Summary statistics of CABG standardised rate per 100 000 population, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	110	126	94	1.3	0.1
2001	115	128	105	1.2	0.09
2002	113	129	94	1.4	0.1
2003	93	112	73	1.5	0.14
2004	92	124	68	1.8	0.24
2005	80	120	54	2.2	0.26
2006	77	106	65	1.6	0.18
2007	71	101	55	1.8	0.22
2008	68	94	55	1.7	0.22
2009	61	81	37	2.2	0.26
2010	55	73	39	1.9	0.23
2011	50	67	34	2	0.27

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.4. CABG standardised rate per 100 000 population, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Percutaneous transluminal coronary angioplasty (PTCA)

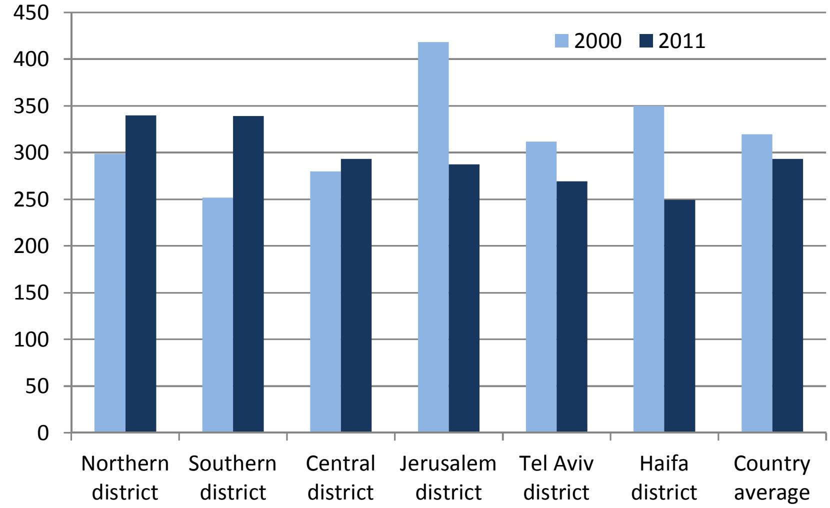
From 2000 to 2011 the PTCA average standardised rate fell by 8%, from 320 to 293 per 100 000 population (Table 9.5). The rates across the seven districts in 2011 showed a 1.4-fold variation, ranging from 249 discharges per 100 000 population (Haifa district) to 340 per 100 000 (Northern district) (Figure 9.5). PTCA rates increased in the Southern district and Northern district by 34% and 14%, respectively.

Table 9.5. Summary statistics of PTCA standardised rate per 100 000 population, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	320	418	252	1.7	0.17
2001	361	414	289	1.4	0.13
2002	383	442	322	1.4	0.12
2003	401	448	355	1.3	0.09
2004	371	449	283	1.6	0.16
2005	369	445	300	1.5	0.15
2006	323	411	259	1.6	0.17
2007	313	350	261	1.3	0.11
2008	314	353	286	1.2	0.07
2009	323	367	296	1.2	0.08
2010	316	352	279	1.3	0.09
2011	293	340	249	1.4	0.12

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.5. PTCA standardised rate per 100 000 population, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

The rise in PTCA rates is the result of a policy decision in resource allocation, by adding hospital beds for cardiology in the Northern and the Southern districts by increasing and expanding catheterisation units (Ministry of Health, 2014). In addition, programs to attract skilled medical personnel through financial grants, a shift in the number of health professionals and specialists working in the centre of Israel to the Northern and Southern districts were implemented.

Joint procedures

Surgery after hip fracture

The average standardised rate of admissions for surgery after hip fracture decreased by 10% between 2000 and 2011, from 120 to 108 per 100 000 population (Table 9.6). This reduction is also reported in other countries (Cooper et al., 2011). This reduction was observed in most (but not) all districts as reflected in the coefficient of variation which fluctuated during this study period.

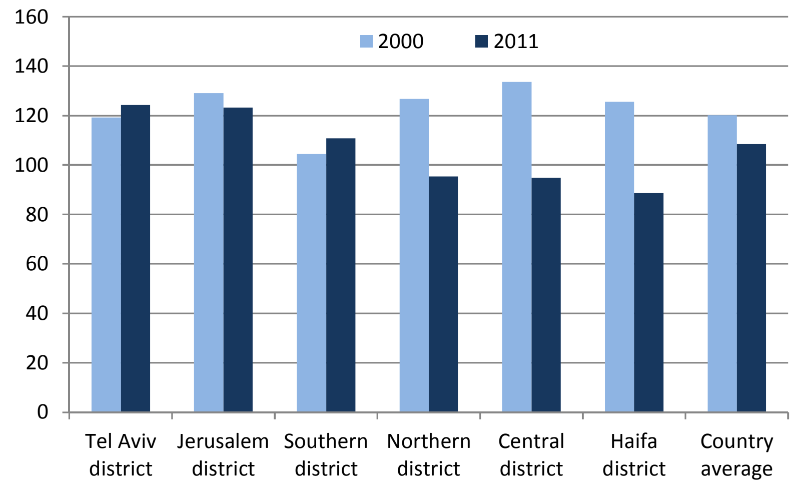
Table 9.6. Summary statistics of surgery after hip fracture standardised rate per 100 000 population, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	120	134	103	1.3	0.1
2001	113	131	96	1.4	0.11
2002	104	124	88	1.4	0.13
2003	107	145	87	1.7	0.2
2004	104	125	75	1.7	0.16
2005	98	117	70	1.7	0.18
2006	110	142	82	1.7	0.21
2007	108	135	82	1.6	0.18
2008	99	139	73	1.9	0.22
2009	104	127	81	1.6	0.19
2010	116	178	85	2.1	0.27
2011	108	124	89	1.4	0.14

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

The rates across Israel's seven districts in 2011 showed a 1.4-fold variation between the lowest and highest districts, ranging from 89 discharges per 100 000 population (Haifa district) to 124 discharges per 100 000 population (Tel Aviv district) (Figure 9.6).

Figure 9.6. Surgery after hip fracture standardised rate per 100 000 population, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

In response to clinical data that emphasised the benefits of having surgery in the first 48 hours after a hip fracture occurred, the Ministry of Health introduced in 2004, a payment reform and clinical guidelines to treat patients with a certain time limit (Ministry of Health, 2013d). The policy added a top-up payment to the hospital if the surgery took place in the first 48 hours after arrival into the hospital. Hospitals were penalised and an amount was deducted if the surgery took place after 48 hours. Research that was conducted following the new policy showed a significant improvement in survival, especially among males aged 65-74. In addition this policy resulted in both a reduction in waiting times and length of stay (Peleg, 2011).

Knee replacement

As in most other OECD countries, the average standardised rate of knee replacement increased greatly between 2000 and 2011 in Israel, by over 50%, from 27 to 44 per 100 000 population (Table 9.7), although it remains below the rates in most other OECD countries (OECD, 2013b). The coefficient of variation fluctuated but remained relatively high throughout the study period.

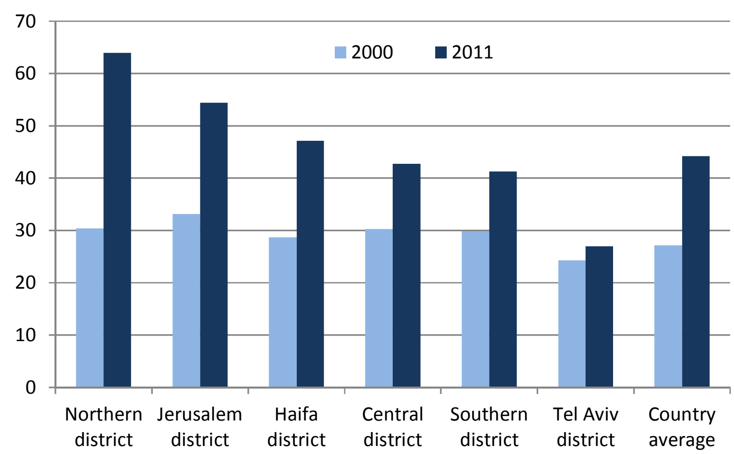
In 2011, the rates across the country's seven districts showed a 2.4-fold variation between the lowest and highest districts, ranging from 27 discharges per 100 000 population (Tel Aviv district) to 64 per 100 000 (Northern district) (Figure 9.7).The Northern district saw a dramatic rise in rates, more than doubling between 2000 and 2011. The data are based on the patient's residence not according to where treatment occurred. The large increase observed could also be attributed to a greater number of patients living in the Northern district having received their treatment in Haifa or other districts.

Table 9.7. Summary statistics of knee replacement standardised rate per 100 000 population, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	27	33	14	2.4	0.24
2001	41	51	27	1.9	0.21
2002	38	50	24	2.1	0.24
2003	39	51	28	1.9	0.2
2004	46	54	39	1.4	0.13
2005	45	57	35	1.6	0.2
2006	43	53	35	1.5	0.15
2007	45	57	35	1.6	0.19
2008	44	62	31	2	0.26
2009	43	62	28	2.2	0.26
2010	48	73	33	2.2	0.26
2011	44	64	27	2.4	0.28

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.7. Knee replacement standardised rate per 100 000 population, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Gynaecological procedures

Caesarean section

The average age-standardised rate of caesarean sections increased by 17% in Israel between 2000 and 2011, from 156 to 183 per 1 000 live births (Table 9.8). This trend rise has also been observed in nearly all other OECD countries (OECD, 2013b). Variation across geographic areas remained fairly stable except in 2011 observed in Haifa district.

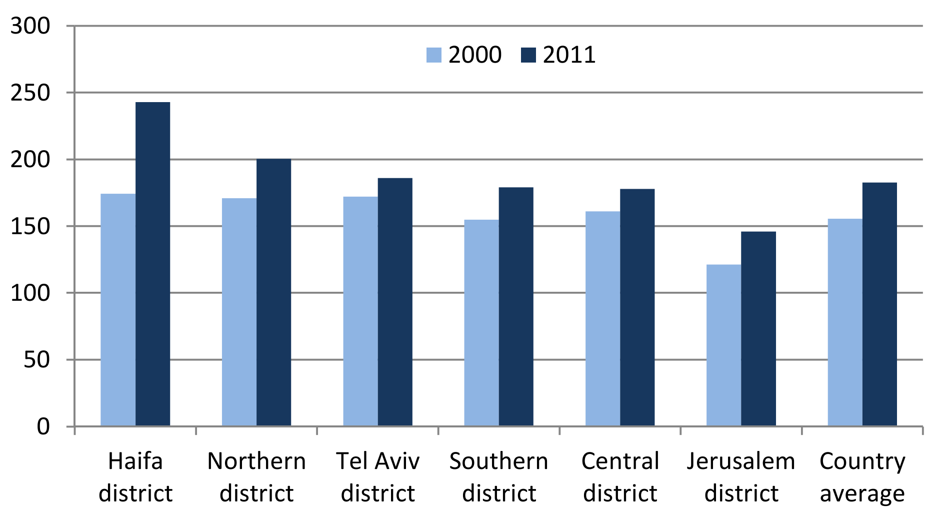
In 2011, caesarean section rates across the seven districts showed a 1.6-fold variation between the lowest and highest, ranging from 148 per 1 000 live births (Jerusalem district) to 242 per 1 000 live births (Haifa district) (Figure 9.8). The northern part of Israel (the Haifa district and the Northern district) had the highest rates of caesarean sections. However, while the rate continued to increase in the Haifa district throughout the past decade, it started to decrease in the Northern district since 2008.

Table 9.8. Summary statistics of caesarean section age-standardised rate per 1 000 live births, Israel, 2000 and 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	156	174	121	1.4	0.13
2001	166	183	138	1.3	0.1
2002	173	192	147	1.3	0.1
2003	173	194	148	1.3	0.11
2004	176	202	144	1.4	0.12
2005	183	217	152	1.4	0.13
2006	177	199	147	1.4	0.11
2007	182	205	149	1.4	0.11
2008	190	244	152	1.6	0.15
2009	188	227	152	1.5	0.13
2010	183	215	150	1.4	0.13
2011	183	243	146	1.7	0.18

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.8. Caesarean section age-standardised rate per 1 000 live births, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Hysterectomy

The average age-standardised rate of hysterectomies decreased by over 30% between 2000 and 2011 in Israel, falling from 153 to 110 per 100 000 females (Table 9.9). This reduction was not uniform across all districts as the coefficient of variation fluctuated during the study period. This trend has been observed in other OECD countries and may in part reflect the adoption of less invasive treatments in some geographic areas more than others (see Chapter 1).

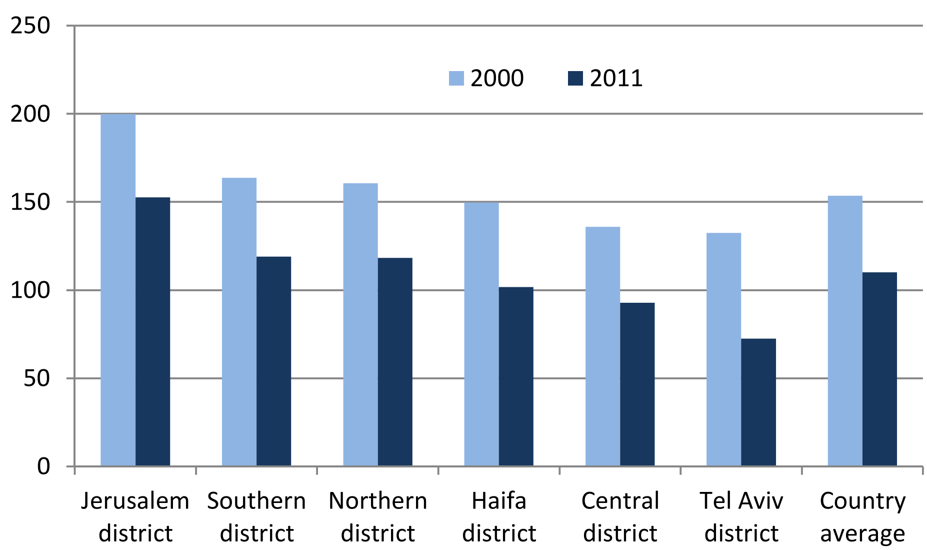
The rates across the seven districts in 2011 showed a 2.1-fold variation between the lowest and highest districts, ranging from 72 hysterectomies per 100 000 females (Tel Aviv district) to 152 (Jerusalem) (Figure 9.9).

Table 9.9. Summary statistics of hysterectomy age-standardised rate per 100 000 females, Israel, 2000 to 2011

	Average	Maximum	Minimum	Ratio (Max/Min)	Coefficient of variation
2000	153	200	132	1.5	0.16
2001	175	207	152	1.4	0.11
2002	168	194	147	1.3	0.1
2003	154	168	129	1.3	0.09
2004	161	196	128	1.5	0.18
2005	140	188	113	1.7	0.18
2006	126	158	110	1.4	0.15
2007	120	151	86	1.8	0.23
2008	124	161	93	1.7	0.17
2009	125	169	96	1.8	0.2
2010	120	149	88	1.7	0.18
2011	110	152	72	2.1	0.23

Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

Figure 9.9. Hysterectomy age-standardised rate per 100 000 females, by district, Israel, 2000 and 2011



Source: Authors' estimates based on National Hospital Discharges Database (NHDD), Israeli Ministry of Health.

9.5. Conclusions

For most of the health care services and procedures studied in this report, the general trends in health care activities and procedure rates at the national level in Israel over the past ten years have been similar to those observed in many other OECD countries. There has been a general reduction in hospital medical admissions, in surgery after hip fracture and in hysterectomy rates. There has been a substantial increase in knee replacement and caesarean section rates. Part of the reduction observed for hospital medical admissions and surgery after hip fracture may in part be due to specific policies such as public reporting (hospital medical admissions); and clinical guidelines and payment reform (for surgery after hip fracture).

The trends regarding cardiac care procedures are mixed and difficult to interpret. On the one hand, as in many other OECD countries, there has been a sharp decline in CABG rates in Israel, as a higher share of people with ischaemic heart disease were treated with less invasive procedures. On the other hand, the national standardised rate of coronary angioplasty (PTCA) also decreased between 2000 and 2011, which is not consistent with the trend observed in most other OECD countries.

But the reduction in PTCA rates was not general across all districts. PTCA rates increased in the Northern and Southern districts while it fell sharply in some others. The rise in PTCA rates in these two districts may be due in part to a relocation of cardiac-related services from the centre of Israel to these areas. There were large infrastructure investments and grants offered to skilled and experienced cardiac personnel. This policy attracted skilled medical personnel, a shift in the number of health professionals and specialists working in the centre of Israel to the Northern and Southern districts, an increase in the opening and expansion of catheterisation units and an increase in cardiology hospital beds in these districts since the beginning of the last decade.

More generally, further investigation is needed on the higher rates observed in the Northern district: it has the highest hospital medical admission rates, CABG rates, PTCA rates and knee replacement rates, and the second highest caesarean section rates. Some factors that might explain differences include higher population morbidity and a lack of adequate community services. This may be partially explained by the lower socio-economic status and lower education level of this region, with the resulting higher mortality rate and consumption of hospital services. In addition, health surveys have shown a significantly higher rate of diabetes in the Northern district that can explain general morbidity. As to utilisation of primary care, surveys have shown a higher rate of primary care visits in the Northern district (Ministry of Health and the Central Bureau of Statistics, 2013). However, there is no evidence that currently confirms these findings. Currently research is underway.

The trend in revascularisation procedures, however, is more specifically attributed to explicit policy decisions regarding the reallocation of cardiac care services across districts. Further investigation is necessary to better understand these observed trends.

The Ministry of Health, following a governmental policy, is continuing to strengthen the periphery by adding hospital beds and qualified personnel (residents and experts), improving infrastructure and by adding quality measurements. One area includes imaging tests. The Ministry of Health identified a severe gap in MRI devices in the periphery by measuring the distance between patients and available equipment. This policy led to the allocation of five out of the eight MRI machines to these areas during 2010-14 (Ministry of Health, 2012b). The Ministry of Health will further investigate these trends in geographic variations in the use of hospital services across Israel and try to determine the factors that may explain these differences.

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ANNEX 9.A1

ICD-9-CM codes used for different procedures

Procedures	ICD 9-CM codes
Coronary bypass	36.1x
Cardiac catheterisation	37.21,37.22,37.23 (without PTCA and stenting during the same hospitalisation)
PTCA and stenting	00.66,36.01,36.02,36.05,36.06,36.07,36.09,36.34,37.34
Hip fracture	820.x,733.14 excluding E800-E849.9
Hysterectomy	68.3-68.7,68.9
Knee replacement	00.80-00.84,81.54,81.55
Knee arthroscopy	80.26 and 80.6
Caesarean section	74.0-74.2,74.4,74.99

Chapter 10

Italy: Geographic variations in health care

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This chapter outlines variations for nine health care activities and procedures carried out in Italy for the timeframe 2007-11. During the study period, national and median provincial rates declined for almost all procedures, except for caesarean rates and knee replacements. The coefficient of variation remained generally stable, with the exception of a decrease in hospital medical admissions and increase in catheterisation and knee arthroscopy. However, the gap between the highest and lowest rates, except for hospital medical admissions, generally widened, showing that extreme values are still present and shall raise the concern of policy makers. The increased implementation of programmes on quality monitoring (National Outcomes Programme, Griglia LEA) and efficiency (Recovery Plans) may have contributed to the steady reduction in overall rates, such as the declining caesarean section rates observed in southern regions in 2012. However, targeted action is still needed to reduce the high level of variation found to persist across the country.

1. The analysis and presentation of this report was undertaken in April 2013 as a joint collaboration between the Italian Ministry of Health (Ministero della Salute) and the National Agency for Regional Health Services (AGENAS), as part of the activities of the OECD "Medical Variation Project".

10.1. Introduction

In Italy, the quality and efficiency of health care is known to vary between different areas of the country, and most importantly between the north and south, which may represent a potential determinant of significant cross-regional patient flows, particularly to receive high-level care in tertiary hospitals (France et al., 2005; Relazione sullo stato sanitario del Paese 2009-2010, 2011). In recent years, the regional health departments have increasingly considered the evaluation of the quality of care and outcomes as a fundamental tool to improve the effectiveness of policy making (Quaderni AGENAS, 2008; Carinci et al., 2012; Nuti et al., 2011; Nuti, Vainieri and Bonini, 2010; Greco et al., 2008; Carinci et al., 2007; Agenzia Sanitaria Regionale Emilia Romagna, 2010; Piano Regionale per la Salute e il Benessere Sociale 2011-2013, 2011). In some cases, this is done directly by the regional health departments, while in others regional agencies for health have been specifically founded to provide technical and scientific support for the regional health departments and the local health authorities or ASLs (*Azienda Sanitaria Locale*) (Agabiti et al., 2010). However, the latest trends on cost containment, particularly following the spending reviews conducted during the last two years, led to the closure of some of the earliest undertakings of this kind (e.g. in the regions Friuli and Veneto).

In the context of increased efforts to monitor quality, the analysis of geographical variation has been extensively covered by specific chapters of regional/national reports in Italy. The participation of Italian authorities in the OECD Medical Practice Variation Project is a tangible proof of the growing interest in this topic as it relates to health system evaluation and performance.

This chapter presents the results for Italy for nine health care activities and procedures selected. Section 10.2 provides an overview of the Italian health care system. Section 10.3 turns to the study and describes the methods and data used. Section 10.4 presents the results followed by a conclusion and policy implications in Section 10.5.

10.2. Overview of Italy's health care system

Political and organisational structure

Italy is a parliamentary republic and a member state of the European Union that is located in southern Europe and bordered by France, Switzerland, Austria and Slovenia. It includes the Mediterranean islands of Sardinia and Sicily and many smaller islands, and is composed of 20 regions, with a total population in 2011 of 60.6 million.

In Italy, the National Health Service (*Servizio Sanitario Nazionale* – SSN) is structured around three different levels: national, regional and local. Under the Italian Constitution, responsibility for health care is shared by the state and the 20 regions, of which one (Trentino-Alto Adige) is divided into two autonomous provinces (Trento, Bolzano). The state has exclusive power to set the "essential levels of care" (*Livelli Essenziali di Assistenza* – LEA), a basic benefits package that must be available to all residents throughout the country, and it is responsible for ensuring the general objectives and the fundamental principles of the national health care system. Patients are required to pay for any services not covered by the benefits package. The LEAs are defined in terms of a positive list – containing services that the SSN is required to provide uniformly in all regions and a negative list, which excludes categories of defined services based on various criteria, including proven clinical ineffectiveness. The regions can also provide non-LEA services to their residents if they can finance them from their own income.

The regions have legislative, executive (technical support) and evaluation functions; they are mandated to offer the benefits package with resources determined by the state (Fattore et al., 2013; Torbica and Fattore, 2005). They also have considerable autonomy to organise the delivery of health services. The regions work with a network of ASLs, which are managed by a Chief Executive Officer (CEO) appointed by the Governor of the region (Lo Scalzo et al., 2009; Commonwealth Fund, 2012). Local health authorities provide primary care, secondary care, public health, occupational health and health care related to social care.

The regional governments work mainly through their departments of health to outline three-year regional health plans. These plans rely on the National Health Plan and on assessed regional health care needs to establish strategic objectives and initiatives, together with financial and organisational criteria for managing health care organisations.

The regional health departments are also responsible for the following: allocating resources to various ASLs and hospital trusts (AOs); applying national framework rules to define the criteria for authorising and accrediting public and private health care settings in the region; technically co-ordinating health care activities through a Standing Conference for Regional Health and Social Care Planning; monitoring the efficiency, effectiveness and appropriateness of the services provided by accredited public and private organisations; defining the geographical boundaries of health districts inside each ASL; appointing the general managers of ASLs and AOs; and defining a regulatory framework governing how the general directors of hospitals and ASLs exercise autonomy in the strategic planning process.

Health care expenditure

Total health spending accounted for 9.2% of Italy's GDP in 2011, slightly below the OECD average of 9.3% (OECD, 2013a). Italy also ranks below the OECD average in terms of health spending per capita, with a rate of USD 3 012 in 2011 (adjusted for purchasing power parity), compared with an OECD average of around USD 3 300. Health spending per capita in Italy grew, in real terms, by an average of 1.6% per year between 2000 and 2009, but spending fell by 0.4% on average between 2009 and 2011.

Health care financing

The SSN provides universal coverage and health care services free of charge at the point of use (Lo Scalzo et al., 2009). The system is financed through taxation (corporate tax and income tax) at the national and regional levels, along with fiscal horizontal equalisation to address regional disparities. Regional budgets are allocated based on the population size and age structure. The regions are responsible for any deficits incurred, but in practice the central government bails out the regions, subject to conditions requiring cost containment measures and additional regional fiscal revenues (Fattore et al., 2013; Torbica and Fattore, 2005). The government accounted for 78% of health financing in 2011 (OECD, 2013a).

The regions are allowed to introduce out-of-pocket payments (OOP) for accessing specialist care, pharmaceuticals and diagnostic procedures, but less so for accessing inpatient care in either public or private facilities (Commonwealth Fund, 2012). In 2011, OOP accounted for 18% of total health spending, but private health insurance for only 1% (OECD, 2013a). A small proportion of the population use private health insurance (15%) to have greater choice of public and private providers, to cover services not included in the SSN benefit package list, and to benefit from amenities offered in private facilities (Commonwealth Fund, 2012).

Since 2007 the financial crisis increased the pressure on the sustainability of the SSN. The Ministry of Finance and the Ministry of Health increased their collaboration to monitor regional functions at all levels. Tight deadlines have been imposed to all regions to ensure the operation of LEAs and the achievement of health spending targets. In the period from 2007 to 2010, regional recovery plans (Piani di Rientro) were adopted for ten overspending regions (Abruzzo, Calabria, Campania, Lazio, Liguria, Molise, Piedmont, Puglia, Sardinia and Sicily). So far, only one region (Liguria) closed the "recovery plan" with a balanced budget (Ferrè et al., 2012).

Within the Directorate General of Health Planning at the Ministry of Health, the "SiVeAS" (*Sistema Nazionale di Verifica e Controllo sull'Assistenza Sanitaria*) supports the realisation of recovery plans through three levels of intervention in target regions: a) approval of agreements towards set targets; b) co-ordination of core technical support teams in the regions ("Nuclei"); and c) monitoring implementation and achievement of set targets (including the provision of LEAs, levels of appropriateness and costs).

Health care delivery and provider payments

Physician services and payments

General practitioners (GPs) and paediatricians provide primary and community care. GPs act as gatekeepers and have incentives to prescribe and refer as needed. While patients can choose their GPs (including private accredited providers), physicians are allowed a maximum number of patients (1 500 for GPs and 800 for paediatricians) (Lo Scalzo et al., 2009). GPs mainly operate in group practices (OECD Health Systems Characteristics Survey, 2012).

Payments to GPs and paediatricians are divided into three parts: a fixed per-capita payment, a fee-for-service (FFS) for specific treatments and an additional component that rewards cost containment (Toniolo et al., 2012; OECD Health systems Characteristics Survey, 2012). Some regions (Emilia Romagna) have introduced pay-for-performance measures that are related to managing patients with chronic conditions (Elovainio, 2010).

Specialists in the public sector work out of multi-specialty clinics where they are paid a combination of salary and fee-for-service. Outpatient care is typically organised through local health authorities. Specialists working in public hospitals are paid on a salary basis. They may have a private practice outside of their contracted hours and are obliged to give a proportion of the income they earn from private practice to the hospitals for the use of hospital facilities (Toniolo et al., 2012).

Italy had 4.1 physicians per 1 000 population in 2011, well above the OECD average of 3.2. About 23% of the workforce was designated as generalist in 2011, compared with the OECD average of 30%. Specialists accounted for 77%, above the OECD average of 62%.

Hospital services and payments

Public, private not-for-profit and private for-profit hospitals offer secondary services. A portion of hospital funding comes from a DRG-based prospective payment system but another portion is administered separately for certain functions (e.g. emergency departments, teaching programmes) (OECD Health systems Characteristics Survey, 2012).

Patients can choose to receive treatment from hospitals within their own ASL or through a provider in another ASL (within the same region or in another region). Thus, ASLs have to pay for the treatment provided to their residents by providers located in other regions or ASLs and, in turn, they receive payments for the health care provided to patients coming from other regions.

In 2011, hospital care was provided by 1 534 hospitals, public and private, as ASLs can contract out services based on efficiency criteria. The number of hospital beds in Italy was 3.4 per 1 000 population in 2011, less than the OECD average of 5.0 beds. As in most OECD countries, the number of hospital beds per capita has fallen over time. This decline has coincided with a reduction of average length of stays in hospitals and an increase in the number of surgical procedures performed on a same-day (or ambulatory) basis.

Quality monitoring and outcomes evaluation

A number of activities are underway relating to the evaluation of quality of care and outcomes.

Since 2005, the national outcomes project or the Programma Nazionale Esiti (PNE), co-ordinated by the National Agency for Regional Health Services (*Agenzia Nazionale per i Servizi Sanitari Regionali* – AGENAS) in collaboration with the Ministry of Health, the regions and autonomous provinces (Amato et al., 2013) has published the annual results for a wide range of outcomes indicators by hospital/ASL/province. They are directly available to policy makers and health professionals on a website, accessible through user credentials. The programme features a series of events and regional workshops organised throughout the country, through which the assessment of the results is shared with relevant stakeholders in order to provide the tools required for the realisation of a continuous cycle of quality improvement for decision makers in the regions.

Another example is the evaluation process is organised by the regions and autonomous provinces, who adopt different approaches of performance evaluation from a broader perspective (Carinci et al., 2012). Since 2008, a common national overarching scheme has been provided by the "Griglia LEA", which has a multidimensional set of indicators included in a broad national evaluation system, monitoring the provision of LEA in Italian regions on an annual basis under the banner of SiVeAS (Ministero della Salute, 2014). The Ministry of Health provides recommendations and highlights critical areas in need of improvement, with the aim of guiding policy actions to be implemented locally. The system of indicators is also used to support the monitoring of SiVeAS in regions undergoing recovery plans. In addition, every year the Italian Ministry of Health releases the Hospital Discharges Report (Rapporto annuale sui ricoveri ospedalieri 2011, 2012), presenting a detailed descriptive analysis of the distribution of discharges by major diseases and by region, that is routinely published on the website of the Ministry of Health and is widely used by regions to optimise the supply of acute care.

Other relevant national reports published each year by academic departments include the "Osservasalute" by Università Cattolica del Sacro Cuore (De Belvis et al., 2011), and the "Rapporto Sanità CEIS" by Università Tor Vergata (CEIS, 2012), including results on the variability of a range of epidemiologic, quality and efficiency indicators in Italian regions and autonomous provinces, which are widely publicised and discussed particularly by networks of health professionals.

Building upon the increasing interest in performance evaluation at all levels, the Italian Ministry of Health and AGENAS have strengthened their activities in this field, covering different dimensions, with an eye towards the creation of a national framework for performance evaluation (Di Stanislao and Carinci, 2012; Piano Sanitario Nazionale, 2010; Lega and Vendramini, 2008). This is reflected in the official handling of the public disclosure of information on the performance of health systems, in particular the approval, by the Conference of the State and the Regions (January 2013) of a decree for the institution of a "Portal for the Transparency of Health Services" (Conferenza Stato Regioni, 2013), on which evaluations of the quality of care and performance are to be officially disclosed to the public on a regular basis, starting in 2014.

10.3. Data and methods

The definitions used for the calculation of target health care activities and procedures are summarised in Annex 10.A1. The database used for the calculation of numerators for hospital discharges is the National Database of Hospital Discharges, maintained by the Ministry of Health as an official data collection of hospital discharge abstracts submitted by law by all Italian regions (*Scheda di Dimissione Ospedaliera* – SDO). The national data collection has been defined by law since 28 December 1991 and is archived every year by date of discharge. Since 2001 the National Database includes a unique patient code for the Italian citizens and registered foreigners. This code includes personal patient information, such as date of birth and place of residence (council, province, region), which is essential for reimbursement purposes. The patient code is anonymised in the historical National Database. The error rate of the miscoding the patient is 0.04% (40 per 100 000 cases) (*Rapporto Annuale sui Ricoveri Ospedalieri 2011*, 2012). The database includes case mix classification based on ICD-9-CM (International Statistical Classification of Diseases, 9th Revision, Clinical modification) 2002 and Diagnosis related group (DRG v.19 for 2006-2008), ICD-9-CM 2007 and DRG v.24 since 2009. It includes one Principal Diagnosis and one Main Procedure (including Date of Intervention) and up to five Secondary Diagnoses and five Secondary Procedures.

In 2011, the SDO database included a total of N=7 458 840 Inpatient Discharges and N=1 534 Hospitals. For the present analysis, a valid code of sex and age, and a non-missing code for the province of residence were extracted for the five-year timeframe 2007-11. The assignment of each record to a specific year was based on the date of discharge (uniform criterion adopted across the country for the national discharge database). Outpatient episodes were also included to take into account day surgeries for PTCA, catheterisation and knee arthroscopy. Diagnosis codes for accidents ("E codes") were used only for 2011, given that they were officially introduced in 2010.

The population for denominators was directly extracted from open data available from the official website the National Institute of Statistics (ISTAT), including the general population and the results of the annual survey on live births by mother age. Age bands were correctly classified to match the OECD project guidelines.

The provinces have been used in Italy as the target geographical level chosen for the identification of base territorial units (equivalent to the Nomenclature of Territorial Units for Statistics, NUTS3). Provinces were also aggregated into regions (NUTS2).

It was considered appropriate to select provinces as the territorial level because they correspond directly to the policy level of the local health authorities (ASL). Recent regional reforms have continuously modified (and continue to do so) the geographical structure of local health care authorities, whose territory in most cases now corresponds to that of provinces. The structure of the provinces has been fairly stable over time, with the exception of three new provinces created in 2010 (Monza e della Brianza, Fermo, Barletta-Andria-Trani). In 2010-11, a total of N=110 provinces were operational across the country, with a population ranging between 57 965 and 4 194 068 (median = 377 796). However, in our analysis the province of Monza e della Brianza had to be excluded in 2010, due to a (biased) small number of discharges recorded in the SDO database. Subjects with an invalid code for the province of residence (i.e. not matching any of the official ISTAT province codes) were systematically excluded from the analysis. Summary statistics are based on the OECD project guidelines.

10.4. Description of results

Overview of results

Table 10.1 provides a summary of the results in 2011 for the nine health care activities and procedures. The results indicate a low variation for hospital admissions, hysterectomies and surgery after hip fracture, but larger variations were observed particularly for caesarean sections, CABG and diagnostic tests.

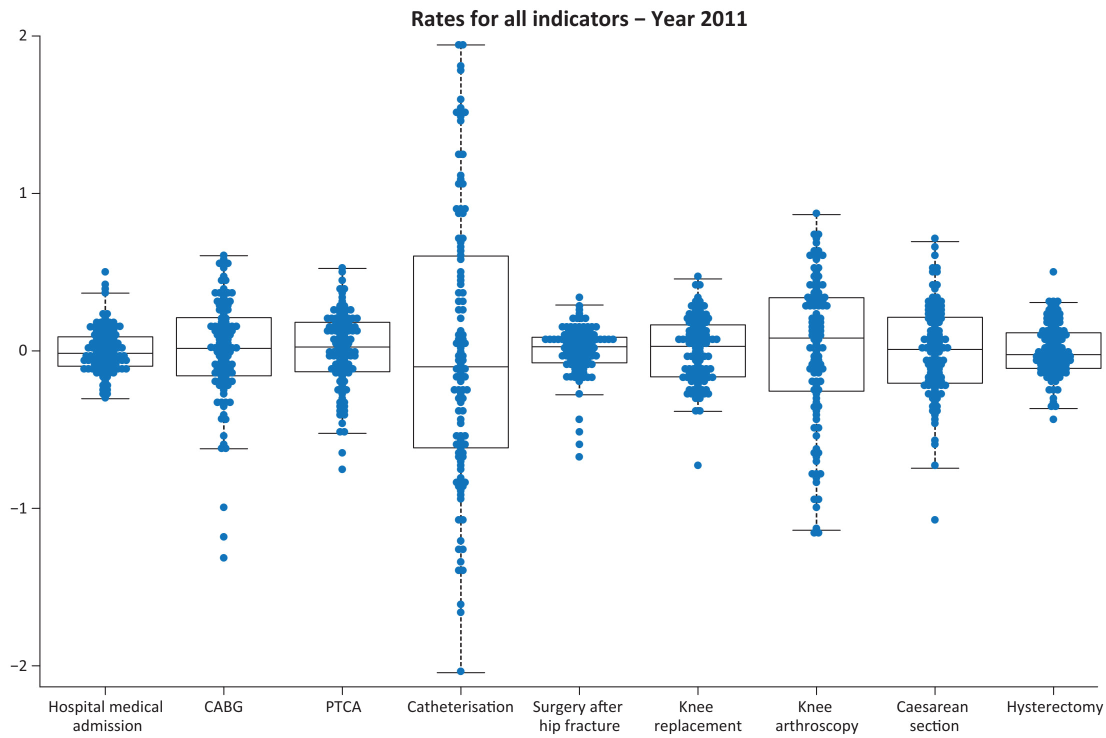
Table 10.1. Summary results for selected indicators of geographical variation in health care, Italy, 2011

Procedure	Hospital medical admission per 100 000 pop.	CABG per 100 000 pop.	PTCA per 100 000 pop.	Catheterisation per 100 000 pop.	Surgery after hip fracture per 100 000 pop.	Knee replacement per 100 000 pop.	Knee arthroscopy per 100 000 pop.	C -section per 1 000 live births	Hysterectomy per 100 000 women
Crude rate	7 403	47	228	91	156	122	249	369	230
Unweighted average rate	7 518	47	212	92	156	125	265	346	230
Q10	6 426	32	146	24	131	94	118	234	190
Q90	8 803	65	265	221	180	157	429	461	280
Coefficient of variation	0.15	0.30	0.23	1.01	0.14	0.20	0.42	0.29	0.17

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.1 compares the variation across provinces for all health care activities and procedures included in this study. The rates of utilisation at the provincial level are normalised using a log scale. Hospital medical admissions, hip fractures and hysterectomies indicate (regardless of the average level) a high degree of similarity between different provinces. Wide "arms" show where a higher number of provinces present similar values. Extreme upper and lower points represent outliers, as in the case of surgery after hip fracture, where several rates are particularly low. Knee interventions and PTCA present a moderately higher variability, while CABG and caesarean sections a markedly higher one. An extremely high variability, with elongated shapes, is indeed shown for arthroscopies and, above all, catheterisation.

Figure 10.1. Turnip charts of log-standardised rates for all health care procedures and activities, by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Hospital medical admissions

In 2011, the national rate for hospital medical admissions was 7 403 per 100 000 population (Table 10.2). The rates across provinces showed a two-fold variation between the extremes, ranging from 5 490 discharges (Biella, Piemonte) to 12 039 discharges per 100 000 (Foggia, Puglia).

From 2007 to 2011, the national rate of hospital medical admissions decreased by over 14%, consistently over time and across provinces, with a decrease in the coefficient of variation (CV) from 0.20, down to a level of 0.15.

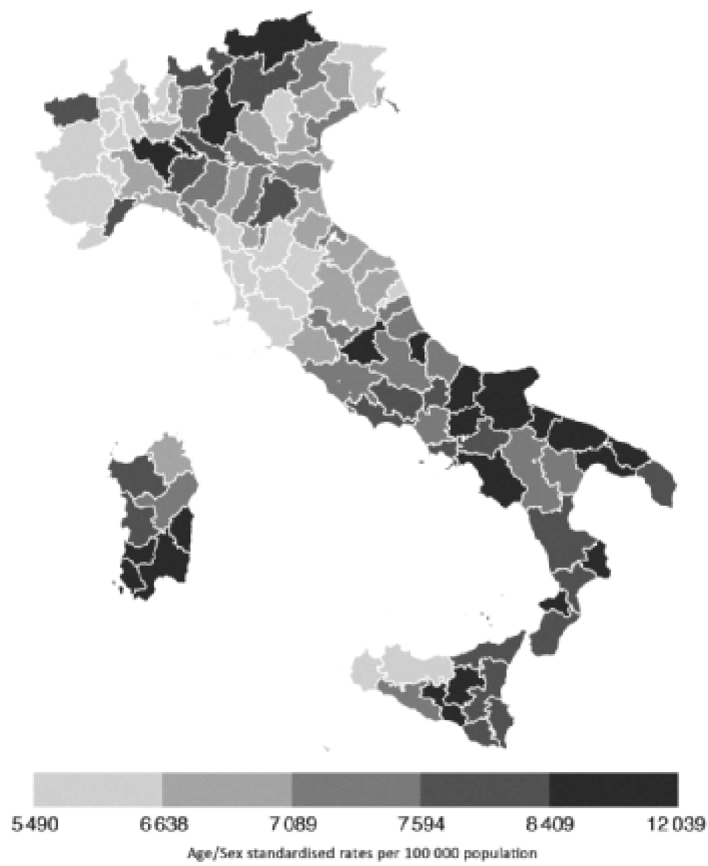
Table 10.2. Hospital medical admissions standardised rate per 100 000, Italy, 2007-11

Year	Italy		Distribution of standardised rates by province				Ratio (province)
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum
2007	4 387 424	8 635	8 246 (5 995-14 328)	6 824	10 924	0.20	2.40
2008	4 290 066	8 370	8 094 (5 698-13 148)	6 713	10 466	0.18	2.30
2009	4 131 946	8 005	7 736 (5 582-12 789)	6 599	9 849	0.16	2.30
2010	4 033 389	7 886	7 739 (5 710-13 062)	6 578	9 600	0.16	2.30
2011	3 858 186	7 403	7 325 (5 490-12 039)	6 426	8 803	0.15	2.20

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

The age-standardised median was higher in men (7 817) than in women (6 831) per 100 000 and less variable (CV of 0.14 vs. 0.17, respectively). The geographical distribution showed higher values in the Central North and in the South (Figure 10.2).

Figure 10.2. Map of hospital medical admission rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

The low rates and average level of variation observed for hospital medical admissions, coupled with a marked, constant decline over the five years of observation, confirms the effect of multiple efforts at all levels including the Appropriateness Operational Plan to reduce the level of inappropriate hospital discharge rates in Italian hospitals.

Cardiac procedures

Coronary bypass (CABG)

In 2011, the national rate for discharges involving a coronary artery bypass graft was 47 per 100 000 population (Table 10.3). The rates across provinces showed an almost seven-fold variation, ranging from 12 discharges per 100 000 population (Rimini, Emilia-Romagna) to 82 discharges per 100 000 (Lecco, Lombardy).

From 2007 to 2011, the national coronary bypass rate decreased by almost 19%, consistently over time. However, the CV increased (from 0.28 to 0.30), as did the median and highest length of stay (15.1 to 15.6 days and 23.1 to 32.4 days).

Table 10.3. Coronary bypass (CABG) standardised rate per 100 000, Italy, 2007-11

Year		Italy	Distribution of standardised rates by province				Ratio (province)	Control variable
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum	LOS by province Median (range)
2007	27 995	58	58 (17-99)	38	77	0.28	5.80	15.10 (9.60-23.10)
2008	27 083	56	55 (19-91)	35	75	0.28	4.80	15.50 (8.60-22.60)
2009	25 346	52	51 (23-94)	32	74	0.31	4.10	15.30 (9.00-23.70)
2010	24 495	51	50 (16-91)	31	70	0.32	5.70	15.40 (9.00-26.20)
2011	23 158	47	46 (12-82)	32	65	0.30	6.80	15.60 (9.70-32.40)

LOS: Length of stay.

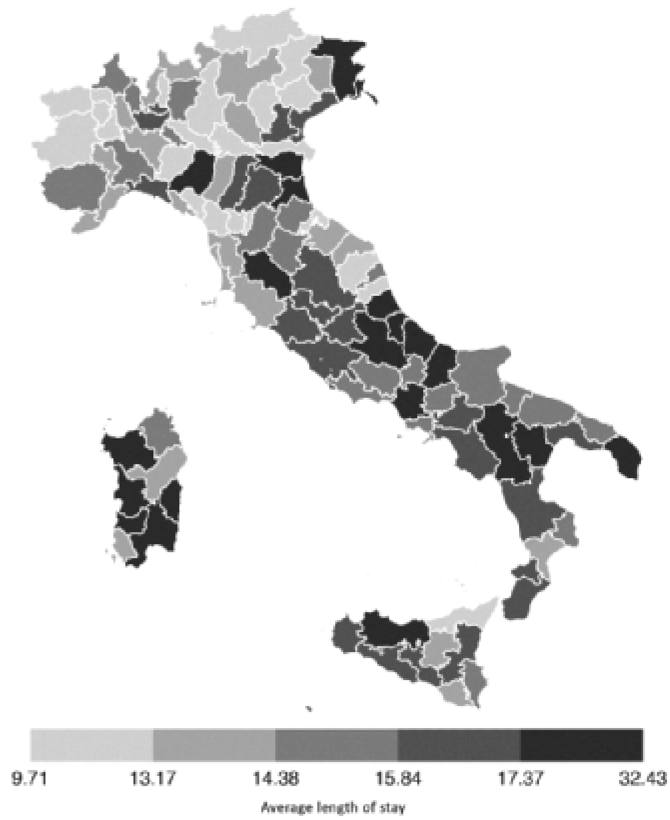
Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

In 2011, the age-standardised median was much higher in men (74) than in women (20) per 100 000, but with similar variation across provinces (CV of 0.30 vs. 0.34, respectively). Higher values were sparsely scattered (Figure 10.3), with a lower frequency in the North-East, Emilia-Romagna, Umbria, Basilicata and the Islands. The average length of stay was lower in the upper north (Figure 10.4).

Figure 10.3. Map of coronary bypass (CABG) rate by province, Italy, 2011

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.4. Map of average length of stay for coronary bypass (CABG) by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Coronary angioplasty (PTCA)

In 2011, the national rate for discharges involving coronary angioplasty procedures was 228 per 100 000 population (Table 10.4). The rates across provinces showed over a three-fold variation (3.6), ranging from 97 discharges per 100 000 population (Viterbo, Lazio) to 348 discharges per 100 000 (Cremona, Lombardy).

From 2007 to 2011, the national rate of coronary bypass decreased by nearly 9%. However, the CV was stable (0.24 to 0.23).

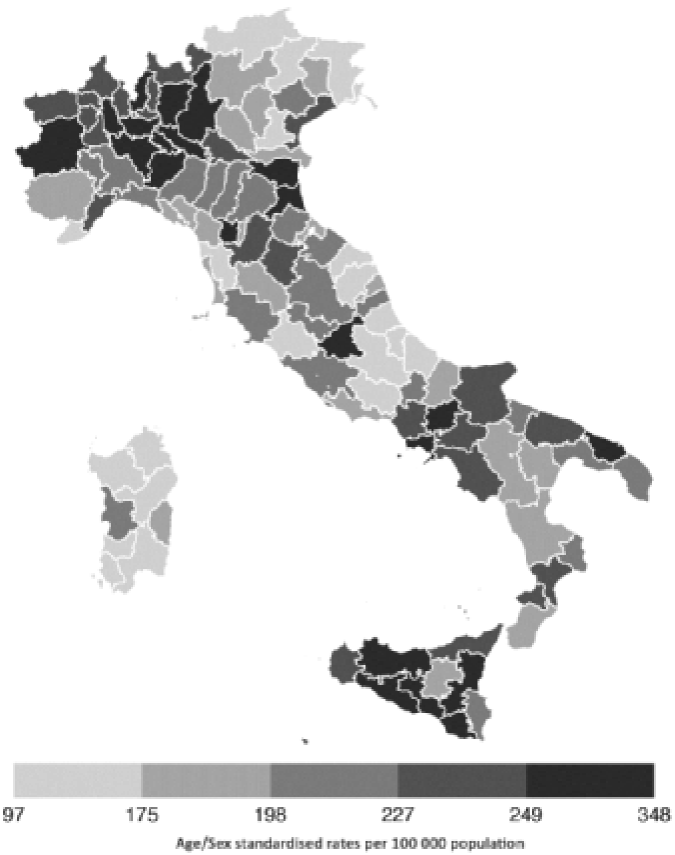
Table 10.4. Coronary angioplasty (PTCA) standardised rate per 100 000, Italy, 2007-11

Year	Italy		Distribution of standardised rates by province				Ratio (province)
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum
2007	117 297	245	226 (109 - 335)	158	302	0.24	3.10
2008	119 575	248	229 (117 - 365)	157	296	0.24	3.10
2009	111 723	230	210 (118 - 345)	139	285	0.25	2.90
2010	115 727	240	218 (107 - 356)	140	294	0.25	3.30
2011	111 994	228	211 (97 - 348)	146	265	0.23	3.60

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

In 2011, the age-standardised median was much higher in men (361) than in women (105) per 100 000, but with variation across provinces (CV of 0.23 vs. 0.24, respectively). Higher values were in the North-West and the South (Figure 10.5). There was a moderate portion of excess variation in several provinces, some very highly populated.

Figure 10.5. Map of coronary angioplasty (PTCA) rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Catheterisation

In 2011, the national rate for discharges involving catheterisation procedures was 91 per 100 000 population (Table 10.5). The rates across provinces showed a huge variation, higher than 53-fold, ranging from 8 discharges per 100 000 population (Medio Campidano, Sardinia) to 434 discharges per 100 000 (Pordenone, Friuli Venezia Giulia) (Figure 10.6).

From 2007 to 2011, the national rate of catheterisation decreased by nearly 11%, markedly from 2008 to 2009. The coefficient of variation, already extremely high in 2007 (0.91), continued to increase, up to 1.01, while the ratio between extremes increased by 50% (from 35.6 to 53.9).

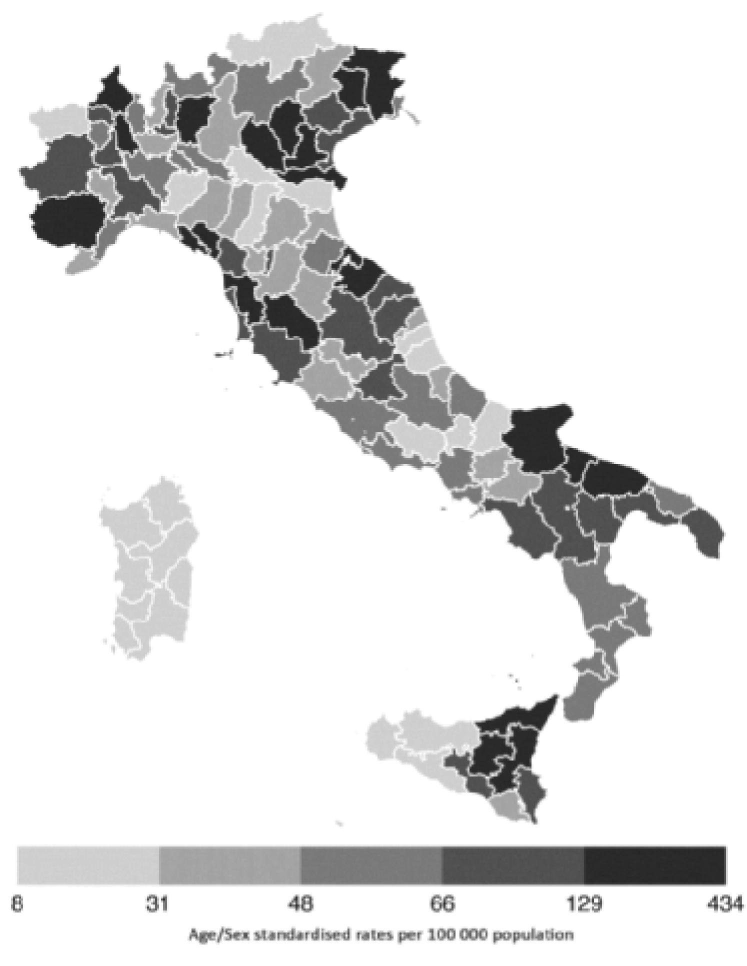
In 2011, the age-standardised median was higher in men (123) than in women (61) per 100 000 and more variable (CV of 1.26 vs. 0.92, respectively). There was a lower frequency in Emilia-Romagna and Sardinia. Extreme outliers are present in the upper end of the distribution.

Table 10.5. Catheterisation standardised rate per 100 000, Italy 2007-11

Year		Italy	Distribution of standardised rates by province				Ratio (province)
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum
2007	48 606	102	64 (14 - 513)	26	248	0.91	35.60
2008	47 843	99	62 (6 - 505)	25	253	0.94	81.50
2009	43 776	90	52 (11 - 418)	23	220	0.98	37.50
2010	44 024	91	50 (7 - 444)	21	208	1.01	63.30
2011	44 607	91	56 (8 - 434)	24	221	1.01	53.90

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.6. Map of catheterisation rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

The very low rate observed for catheterisation, and the very high variability across provinces, should be taken with caution. We envisage that, to a certain degree, the definitions applied by the OECD may not directly apply to the coding practices existing in Italy. Indeed, it is possible that some fraction of catheterisation procedures may be absorbed by other revascularisation practices, for which the inclusion of catheters is treated as part of the same intervention.

Joint procedures

Surgery after hip fracture

In 2011, the national rate for discharges involving surgery after hip fracture was 156 per 100 000 population (Table 10.6). The rates across provinces showed an almost three-fold variation, ranging from 79 discharges per 100 000 population (Barletta-Andria-Trani) to 218 discharges per 1 000 (Prato, Tuscany). From 2007 to 2011, the rate of surgery after hip fracture remained stable, but the coefficient of variation increased slightly, from 0.12 to 0.14, as did the ratio between the maximum and minimum value (2.1 to 2.8). The average length of stay decreased from 15.0 to 14.2 days, with a consistently very high variability across provinces (approximately 15 days difference).

Table 10.6. Surgery after hip fracture standardised rate per 100 000, Italy, 2007-11

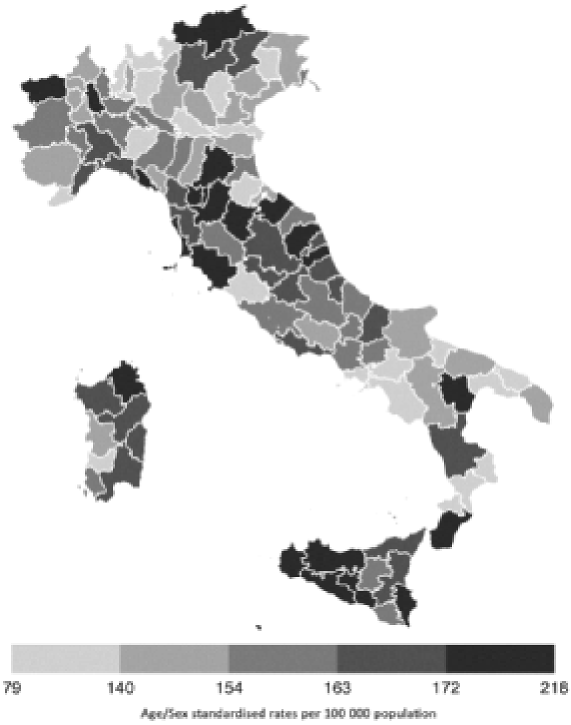
Year		Italy	Distribution of standardised rates by province				Ratio (province)	Control variable
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum	LOS by province Median (Range)
2007	79 784	157	157 (100-213)	132	175	0.12	2.10	15.00 (10.00-25.30)
2008	82 154	160	157 (99-204)	139	182	0.11	2.10	15.10 (9.80-24.70)
2009	82 436	160	158 (107-205)	138	183	0.11	1.90	14.80 (9.80-26.50)
2010	86 156	168	166 (123-240)	141	186	0.12	2.00	14.60 (9.00-25.60)
2011	81 470	156	159 (79-218)	131	180	0.14	2.80	14.20 (8.90-23.70)

LOS: Length of stay.

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

In 2011, the age-standardised median was remarkably higher for women (228) than for men (82) per 100 000 with less variation across provinces (CV of 0.14 vs. 0.18, respectively). The geographical distribution showed more frequent higher values in the North West, Trentino Alto Adige, the North Centre, Calabria and the Islands (Figure 10.7). In 2012, the rate of interventions performed within 48 hours substantially improved across the country, particularly in Sicily (Ministero della Salute, 2014).

Figure 10.7. Map of surgery after hip fracture rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.8. Map of average length of stay for surgery after hip fracture by province, Italy, 2011

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Knee replacements

In 2011, the national rate for discharges involving a knee replacement was 122 per 100 000 population (Table 10.7). The rates across provinces showed a variation of over three-fold, ranging from 59 discharges per 100 000 population (Isernia, Molise) to 194 discharges per 100 000 (Prato, Tuscany).

From 2007 to 2010, the rate of knee replacements increased by over 8%, stabilising in 2011. The coefficient of variation remained constant at around 0.20, while the ratio between the maximum and minimum value increased from 2.8 to 3.3. In five years, the length of stay decreased by one day on average.

Table 10.7. Knee replacement standardised rate per 100 000, Italy, 2007-11

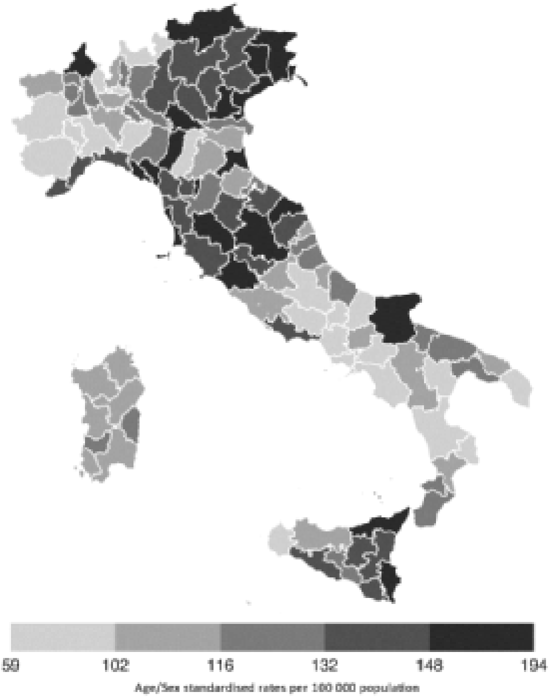
Year	**Italy**		**Distribution of standardised rates by province**				**Ratio (province)**	**Control variable**
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum	LOS by province Median (range)
2007	56 907	112	117 (64-178)	85	142	0.20	2.80	10.40 (5.90-17.50)
2008	59 802	117	121 (63-188)	91	148	0.20	3.00	10.10 (5.70-15.70)
2009	60 521	117	120 (55-179)	87	152	0.22	3.20	10.00 (5.40-15.90)
2010	62 700	123	125 (58-189)	93	158	0.20	3.30	9.70 (5.80-15.20)
2011	63 337	122	126 (59-194)	94	157	0.20	3.30	9.40 (5.10-14.90)

LOS: Length of stay.

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

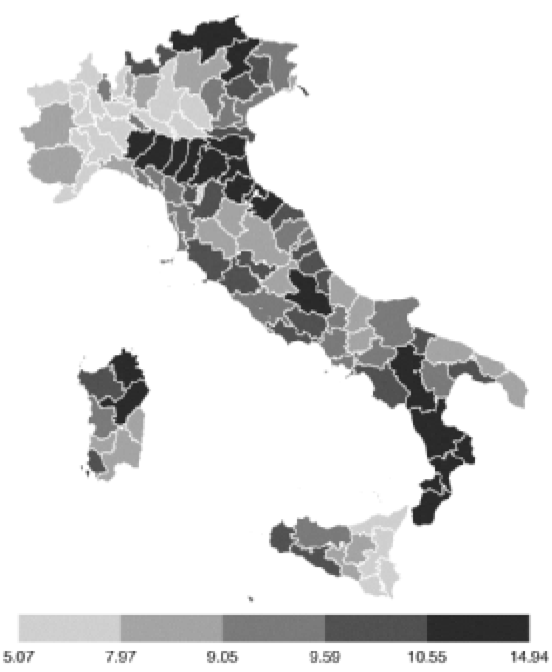
In 2011, the age-standardised median was remarkably higher in women (168) than in men (78) per 100 000 with less variation across provinces (CV of 0.19 vs. 0.28). Higher values were in the North-East, Centre and Sicily (Figure 10. 9). There were some notably low outliers in highly populated areas (Torino, Naples, Milan, Rome). The average length of stay was generally lower in the North-West and Sicily (Figure 10.10).

Figure 10.9. Map of knee replacement rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.10. Map of average length of stay of knee replacement by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Knee arthroscopy

In 2011, the national rate for discharges involving knee arthroscopy was 249 per 100 000 population (Table 10.8). The rates across provinces showed a variation of nearly eight-fold, ranging from 74 discharges per 100 000 population (Vibo Valentia, Calabria) to 570 discharges per 100 000 (Gorizia, Friuli) (Figure 10.11).

From 2007 to 2011, the rate of knee arthroscopies sharply decreased, by over 27%, starting from 2010. The coefficient of variation also increased from 0.33 to 0.42, as well as the ratio between the maximum and minimum value (almost doubled from four-fold to nearly eight-fold).

Table 10.8. Knee arthroscopy standardised rate per 100 000, Italy, 2007-11

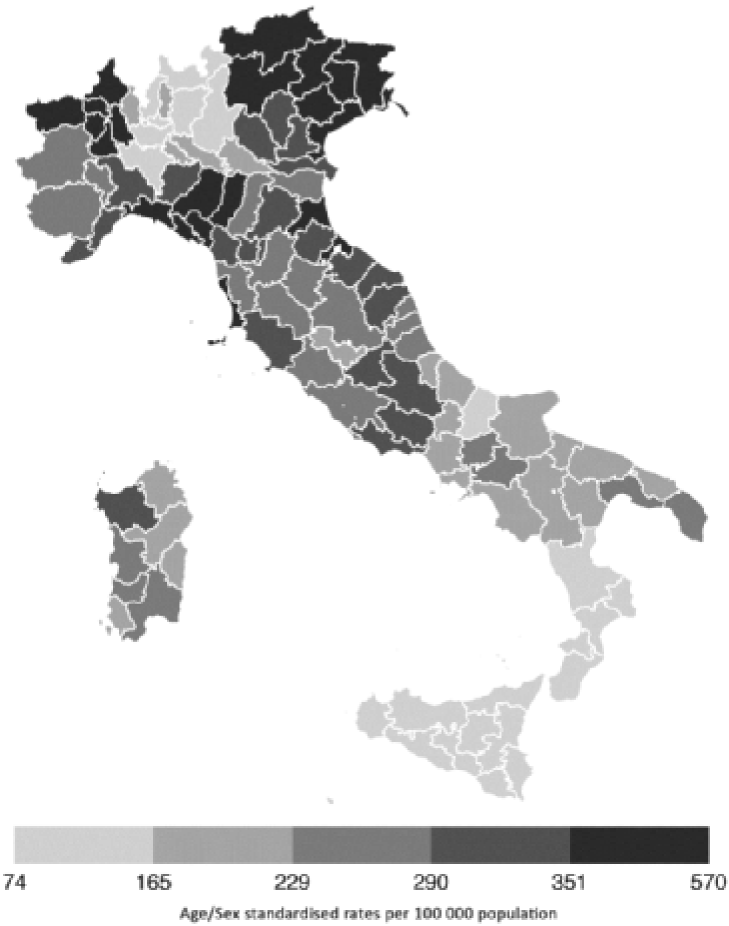
Year	Italy		Distribution of standardised rates by province				Ratio (province)
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum
2007	173 594	342	330 (161 - 638)	212	502	0.33	4.00
2008	173 866	339	331 (158 - 631)	218	491	0.31	4.00
2009	169 043	327	321 (133 - 596)	196	481	0.34	4.50
2010	141 651	277	290 (70 - 634)	137	449	0.40	9.10
2011	129 550	249	260 (74 - 570)	118	429	0.42	7.70

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

In 2011, the age-standardised median was remarkably higher in men (348) than in women (157) per 100 000 but with slightly less variation across provinces (CV of 0.40 vs. 0.47, respectively). The geographical distribution showed substantially higher values in the North and the Centre, compared to the South.

The results for knee interventions are especially difficult to interpret for Italy, as there is a very limited literature available on the subject. Knee replacement rates, albeit average when compared internationally, are on the increase and are also moderately variable across the country. In terms of geographical variation, the results contrast with the recent evidence (Dixon et al., 2011; Judge et al., 2009), which indicates a significant association between average deprivation at the regional level and higher rates of intervention. Knee arthroscopy has only recently gained the attention of national institutions in Italy. The National Outcomes Programme (Fusco et al., 2012) includes the rate of further interventions six months after the first arthroscopy. For instance, the success rates for knee arthroscopy varied substantially across the country. Overall, the high variation in arthroscopy rates nationally should be more thoroughly investigated, as the available literature on the subject is still very limited.

Figure 10.11. Map of knee arthroscopy rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Gynaecological procedures

Caesarean sections

In 2011, the national rate for caesarean sections was 369 per 1 000 live births (Table 10.9). The rates across provinces showed a six-fold variation between the extremes, ranging from 111 caesarean sections per 1 000 live births (Crotone, Calabria) to 664 (Napoli, Campania).

Between 2007 and 2011, the national rate of caesarean sections was stable, with only a 3% decrease in the last year with no change in the coefficient of variation. However, the ratio between the value of the highest province and the lowest increased by 50% (from four-fold in 2007). The average length of stay was also stable at approximately five days (ranging between 3.8 and 7.2 across provinces).

Table 10.9. Caesarean section standardised rate per 1 000 live births, Italy, 2007-11

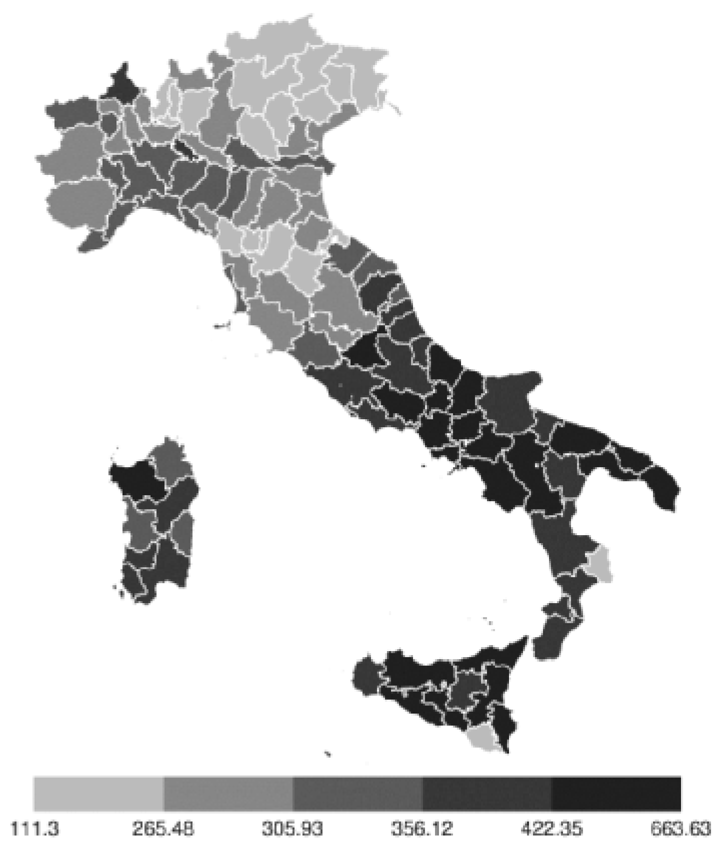
Year		Italy	Distribution of standardised rates by province				Ratio (province)	Control variable
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum	LOS by province Median (range)
2007	214 994	381	333 (163-645)	245	488	0.29	4.00	5.30 (3.80-7.40)
2008	216 204	375	331 (141-650)	234	497	0.30	4.60	5.20 (3.90-7.50)
2009	214 436	377	329 (83-655)	239	491	0.29	7.90	5.20 (3.70-7.40)
2010	210 730	381	343 (104-646)	241	473	0.29	6.20	5.20 (3.70-6.90)
2011	201 459	369	335 (111-664)	234	461	0.29	6.00	5.10 (3.80-7.20)

LOS: Length of stay.

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

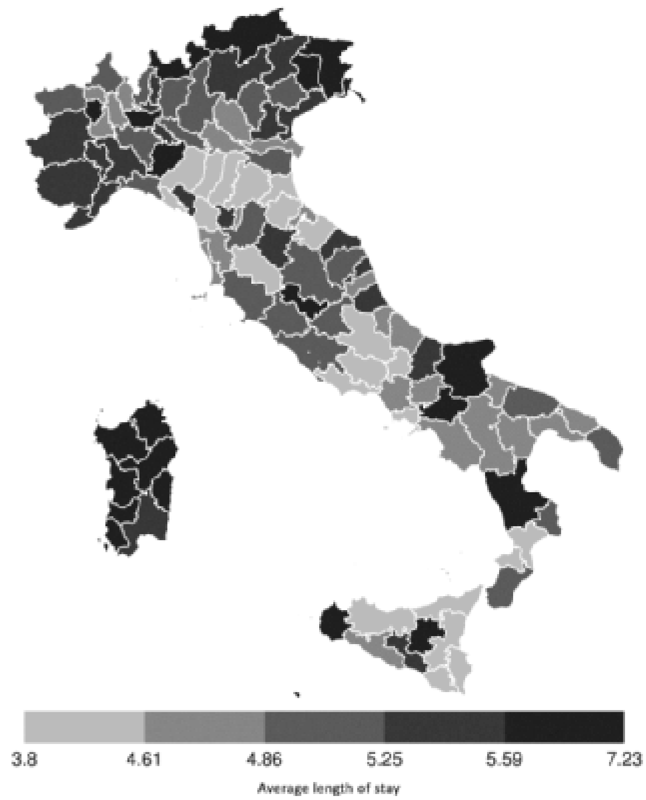
In 2011, the geographical distribution showed a clear pattern of systematically higher values in all provinces of southern Italy (Figure 10.12). A large portion of outliers with high variation are located in southern provinces, shifting the overall national average away from that of the bulk of densely populated areas of the North. The average length of stay was generally higher in the North and in Sardinia (Figure 10.13).

Figure 10.12. Map of caesarean section rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.13. Map of average length of stay for caesarean section by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

The high rates of caesarean sections, both in average terms and patterns of variation, appear to be most concerning of all health care activities and procedures examined in this study. In Italy, there is a clear geographical trend towards more caesarean sections, which the recent literature confirms to be significantly associated with women in the South, particularly those receiving care in the private sector, even in case of a preference for natural delivery (Barbadoro et al., 2012). The problem has been addressed by a range of policy reports and monitoring initiatives, e.g. the Appropriateness Operational Plan (*Programma Operativo Appropriatezza*) launched in 2011 by the Italian Ministry of Health. In 2012, caesarean rates showed a general inversion, particularly for selected regions in the South (Basilicata, Campania and Sicily) showing a remarkable decline (Ministero della Salute, 2014). Nevertheless, the persisting high level of geographical variation seems still worth continued attention.

Hysterectomy

In 2011, the national rate for discharges involving hysterectomy was 228 per 100 000 female population (Table 10.10). The rates across provinces showed a variation of over two-fold, ranging from 144 discharges per 100 000 female population (Livorno, Tuscany) to 368 discharges per 100 000 (Lecco, Lombardy).

From 2007 to 2011, the rate of hysterectomies decreased by 8%. However, the coefficient of variation increased from 0.15 to 0.17, as did the ratio between the maximum and minimum value (2.3 to 2.6). The average length of stay decreased from 7.3 to 6.6 days, with the same variability across provinces (approximately 4.5 days difference).

Table 10.10. Hysterectomy standardised rate per 100 000 females, Italy, 2007-11

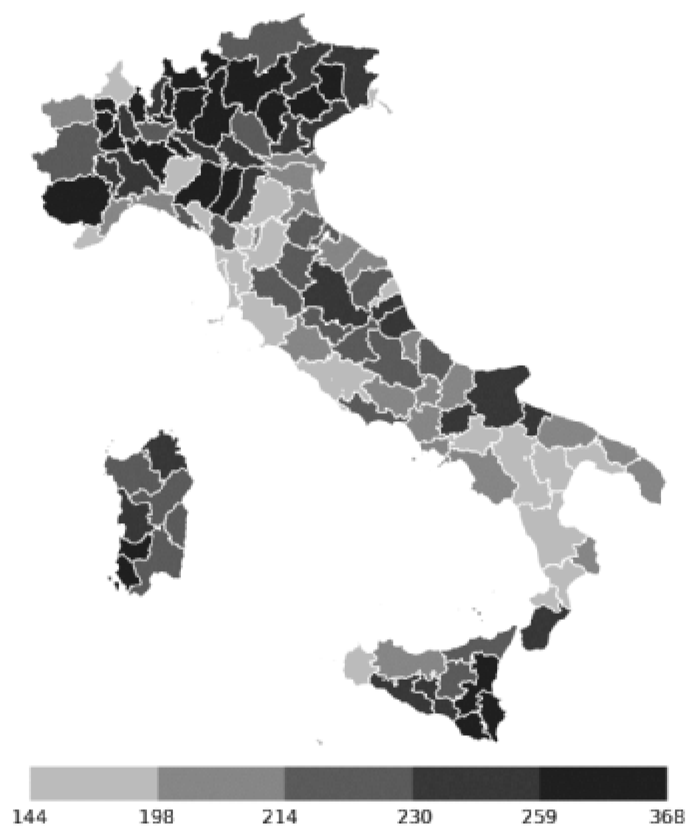
Year	Italy		Distribution of Standardised Rates by Province				Ratio (province)	Control variable
	Hospital discharges (total)	National rate	Median (range)	Q10	Q90	Coefficient of variation	Maximum/ Minimum	LOS by province Median (range)
2007	65 184	247	250 (164-370)	202	295	0.15	2.30	7.30 (5.40-9.90)
2008	64 495	242	241 (166-339)	204	303	0.16	2.00	7.10 (5.10-9.30)
2009	63 624	237	236 (154-385)	188	290	0.18	2.50	6.90 (5.10-9.30)
2010	62 886	237	227 (134-391)	187	287	0.17	2.90	6.70 (4.70-9.70)
2011	61 867	228	221 (144-368)	191	284	0.17	2.60	6.60 (4.50-8.80)

LOS: Length of stay.

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

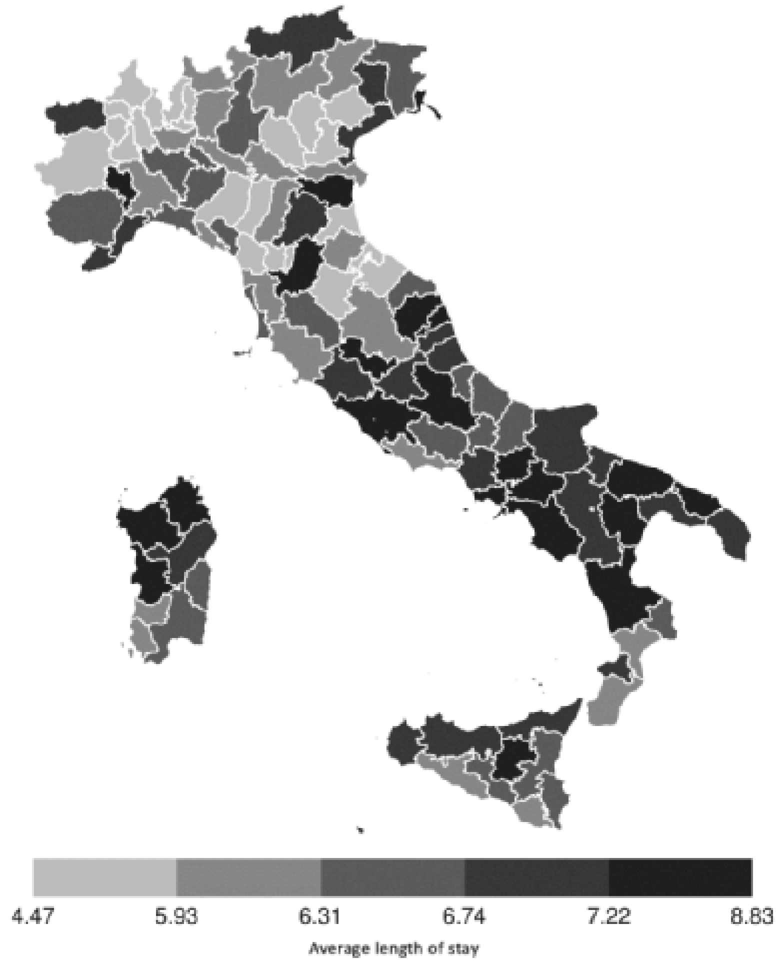
In 2011, the geographical distribution showed more frequent higher values in northern Italy, the Umbria region and the Islands, with the notable exception of two large metropolitan areas (Rome, Naples) (Figure 10.14). The average length of stay was generally higher in the Centre and the South (Figure 10.15).

Figure 10.14. Map of hysterectomy rate by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Figure 10.15. Map of average length of stay for hysterectomy by province, Italy, 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Although high industrialisation and socioeconomic status may be associated with higher hysterectomy rates, the result deserves further analysis, as it contrasts with the conclusion of the relevant literature where higher rates are associated with lower socioeconomic status (Marshall et al., 2000). Clinicians have recently expressed increasing concern about the large number of hysterectomies in Italy. However, until now the subject has never been systematically tackled by national institutions.

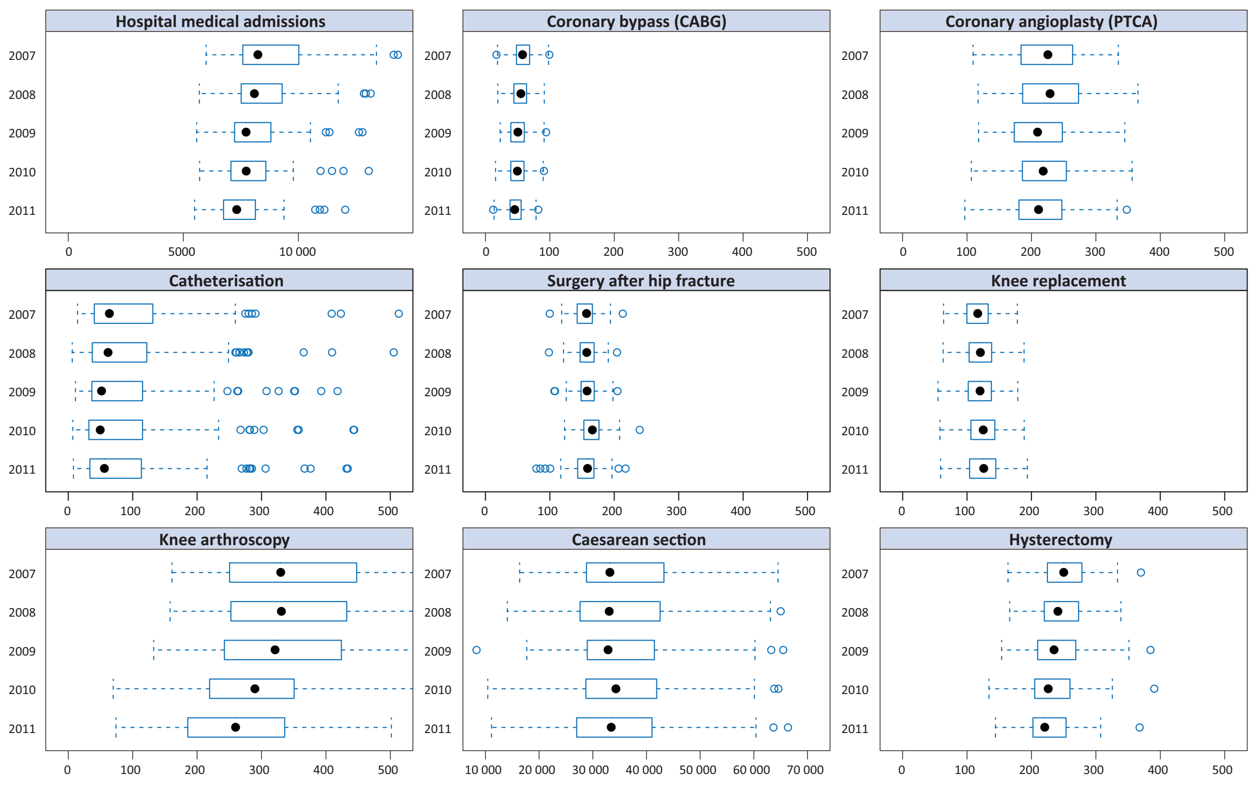
Patterns of variation over time

From 2007 to 2011, the evolution of the selected OECD indicators in Italy shows a fairly high degree of consistency for all results (Figure 10.16). For most indicators, both the national rate and the median observed across provinces declined, with the exception of the increase in knee replacements (+8%) and the stable rates for caesarean sections and surgery after hip fracture. Notably, sharp decreases were observed for knee arthroscopies (-27%), coronary artery bypass graft (-19%), catheterisation (-11%) and hospital medical admissions (-14%).

With regards to the geographical variation, the coefficient of variation between provinces between 2007-11 remained generally stable, with the exception of a decrease in hospital medical admissions and increase in catheterisation and knee arthroscopy. However, the gap between the highest and lowest rates, except for hospital medical admissions, generally widened, showing that extreme values are still present and shall raise the concern of policy makers.

In 2011, the regions Basilicata, Calabria, Liguria and Lazio had lower utilisation rates for most indicators, while Sicily, Puglia and Campania were generally higher. Lombardy and Piedmont generally show low values for a range of indicators, but high rates for hysterectomy, coronary bypass and coronary angioplasty. Other regions present more fragmented results.

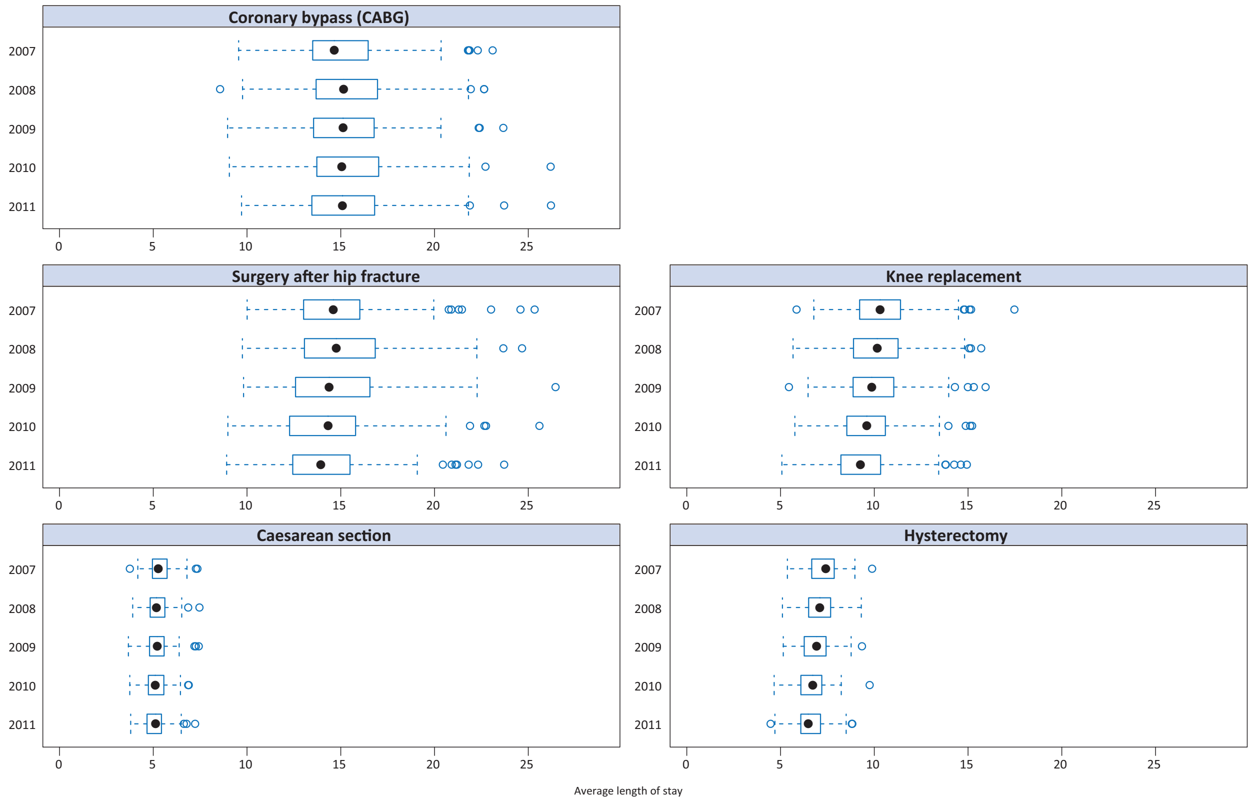
Figure 10.16. Trends in the variation of rates across provinces, Italy, 2007 to 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

The distribution of average length of stay over time for five selected indicators is shown in Figure 10.17. The trend clearly demonstrates, with the notable exception of coronary bypass, that the variation in lengths of stay fell continuously across time during the five years of observation. There is still a non-negligible fraction of outliers (around 5%) in knee replacement and surgery after hip fracture.

Figure 10.17. Trends in the variation of average length of stay across Italian provinces, 2007 to 2011



Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

In 2011, Sardinia and Friuli Venezia Giulia showed high rates of length of stay for all indicators except knee replacements; Abruzzo, Basilicata and Calabria presented higher averages for coronary bypass, knee replacements and hysterectomy; and Tuscany, Marche and Lombardy appeared to perform best for all procedures.

10.5. Conclusions

Over the study period, there was an increase of knee replacements (+9%); a reduction of 7% to 27% for the rates of several procedures, including knee arthroscopy (-27%), CABG (-19%) and hospital medical admissions (-14%); and moderate decreases for catheterisation (-11%), PTCA (-9%) and hysterectomies (-8%). There was a slight decrease for caesarean sections (-3%) and no change for surgery after hip fracture, although relevant progress has been noted in 2012 for both indicators.

As measured by the coefficient of variation in 2011, the degree of heterogeneity was found to vary among the territorial provinces. The variation was very high for catheterisation (101%); relatively high for knee arthroscopy (42%); moderately high for CABG (30%), caesarean sections (29%), PTCA (23%) and knee replacement (20%); and average for hysterectomy (17%), hospital medical admissions (15%) and surgery after hip fracture (14%).

In the North, there were higher rates of hysterectomies and in the North-West lower rates for knee replacements; in part of the North-East (Trentino) and Emilia-Romagna, there were higher rates for surgery after hip fracture; and in the North-East, higher rates of knee interventions.

In the Centre generally, lower rates were observed for hospital medical admissions and revascularisations. In the Centre North (Tuscany, Marche), there were higher rates for knee replacements and surgery after hip fracture. Sardinia and Molise had low rates of catheterisations.

In the South, there were generally higher rates of caesarean sections. Lower rates of knee arthroscopies were generally observed in the South, with the notable exception of Lombardy, as well CABG (particularly for Campania, Calabria and Sicily). In both the large Islands (Sardinia, Sicily), there were high rates of hysterectomies and surgery after hip fracture (the latter improving in 2012). Sardinia had low rates of PTCA, catheterisations and knee replacements.

As far as the length of stay is concerned (examined only for five out of the nine activities/procedures), it decreased consistently in all cases, except for CABG (+0.5 days). Geographical patterns indicate a higher length of stay in the north for caesarean sections and surgery after hip fracture, in the Centre South for CABG, and in the South for hysterectomies.

The range of results reported here may help outline specific areas that merit further attention and investigation. The results for caesarean sections appear to be most concerning. Despite recent policy efforts, targeted strategies are still needed to improve results and significantly reduce caesarean sections, through specific activities, e.g. increasing women’s knowledge about delivery and driving evidence-based practice among physicians, particularly in the South. The same considerations apply to the case of hysterectomies. The routine monitoring of hospital procedures, together with a scientific assessment of the determinants of potentially inappropriate interventions (using targeted surveys with balanced sampling in terms of different strata with respect to supply and population) should be given higher priority in the future.

The results for knee interventions are difficult to interpret for Italy. Targeted investigation is needed to understand these patterns in the Italian context, particularly at the point of care. The policies of the Appropriateness Operational Plan have likely had a positive impact on the low rate and average level of variation for hospital medical admissions.

The rates of revascularisation procedures observed in Italy are in line with the OECD average, though falling, in contrast to the positive average annual growth in the OECD area (+6.2%) observed from 2000 to 2009 (OECD, 2011). However, these trends are similar to those observed in the United States, where CABG rates have constantly continued to decline. The very high variability across provinces for catheterisation should be interpreted with caution, as mapping this code to the OECD guidelines may explain the very low rate observed for this procedure.

Assessing the impact of the rates that give rise to the provincial variations observed in this study would require targeted surveys including a direct investigation of medical records at the physician level. As these practices may cluster in specific regions/provinces, the result may also explain the striking level of variability observed across the country in several procedures. Potential determinants should be explored on the supply side. For cardiac procedures, the number of surgeons and intervention cardiologists and the territorial coronary heart disease admission rate, as is done in the international literature could be taken into account in future analysis (Hannan et al., 2006).

Surgery after hip fracture had low variation across provinces and is in line with findings from the literature. There was no notable geographical pattern for this procedure, except for the length of stay, which is generally higher in the North. These results confirm the relevance of actions taken during the last ten years, particularly to reduce the number of interventions carried out beyond 48 hours after admission. An indicator was included in the "Griglia LEA", a system through which the Ministry of Health monitors the commitment of regions and autonomous provinces against set targets, showing improvement in areas of critical intervention (Ministero della Salute, 2014).

Finally, some limitations of the present study should also be noted.

Firstly, despite the volume of performance reports delivered by national governments and institutions e.g. the OECD, WHO and the European Commission, the set of definitions still appears to be heterogeneous. To make policy use of analytical reports at the national level, Ministries of Health should collaborate on a more regular basis, building common platforms e.g. shared data repositories that can be accessed directly to support the interpretation of results and the development of actionable measures for decision makers worldwide.

Secondly, it is still difficult to apply common definitions without a rigorous assessment of the impact of potentially heterogeneous coding practices. In a country like Italy, where governance is shared between the state and the regions and implementation depends in many ways on the management of local health care authorities, there is a particular need to align the information infrastructure with the goals of evidence-based clinical practice.

While specific activities concerning continuous medical education (ECM) and National Guidelines are co-ordinated by the Ministry of Health and central agencies (e.g. AGENAS and the National Institute of Health), there is still space for similar initiatives to assess the level of accuracy of ICD coding in Italian hospitals for purposes related to performance reporting (e.g. special training for coders). It would thus still not be easy to draw firm conclusions on an observed level of variation in this study, which to some extent may be due to differences in data quality collection across the country.

Thirdly, this study did not even attempt to identify potential determinants of practice variation. The analysis has been mainly descriptive of the different geographical patterns observed in Italy.

The present analysis supports the hypothesis that Italy's current actions concerning National performance assessment systems e.g. the "Griglia LEA", SiVeAS and the PNE may have played a positive role in the overall reduction of excess rates and average lengths of stay.

Such considerations apply to hospital medical admissions, revascularisations, knee arthroscopies and hysterectomies. However, the reduction has been only moderate for caesarean sections, while knee replacements increased. Caesarean sections and hysterectomies are still too frequent compared to the international average. There is also considerable variation in the rates for catheterisations, knee arthroscopies, caesarean sections and CABG. Large deviations from national rates raise concerns about the level of equity and fair access to the most appropriate treatment for all Italian citizens.

There are many areas that need to be strengthened, particularly for caesarean sections and hysterectomies, for which proactive action is certainly needed. Further investigation is required to collect multiple characteristics at all levels and to test the relative importance of territorial, provider and individual characteristics through the use of multivariate techniques, e.g. multilevel models. Additional work is needed to assess the presence of any potential bias induced by different coding practices.

Sharing this work with regional decision makers, health professionals, scientific associations and representatives of citizens, will be necessary to improve quality and to achieve greater efficiency and equity in Italy. The availability of updated international benchmarks and a common set of agreed criteria are essential for the routine provision of usable information on practice variation to all relevant stakeholders. In an approach similar to the Medical Practice Variation project, the OECD Health Care Quality Indicators (HCQI) project has begun routine collection and exchange of fine aggregated results at the sub-national level on hospital performance. The new direction taken by the HCQI will allow expanding the collaborative agenda from the choice and calculation of a core set of quality indicators, to the co-ordination of research projects that will test new uses of health information for policy.

Countries with decentralised health systems, e.g. Italy, may particularly benefit from this approach, drawing on lessons learned from others, and comparing own internal geographical variation with that of other countries, in a standardised manner. Experience from this project has helped countries, e.g. Italy, to structure the research process in a way that can be more systematically approached by other interested countries in the future.

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ANNEX 10.A1

Summary of the definitions of selected health care activities and procedures

Activities/procedures	Numerator definition (ICD 9 CM Diagnosis)	Denominator	Unit	Age groups	Control variable
Hospital medical admissions	Inpatient hospital discharge with overnight stay and valid LOS Type DRG = "M"	Population by province, region	100 000	15-34 35-44 45-54 55-64 65-74 75+	
Caesarean sections (Females)	Inpatient hospital discharge with valid LOS Any procedure: 74.0-74.2 Classical, low cervical, extraperitoneal caesarean 74.4 Caesarean section of other specified type 74.99 Other caesarean section unspecified type	Live births by province, region	1 000	<19 20-24 25-29 30-34 35-39 40+	Average length of stay by province, region
Coronary bypass (CABG)	Inpatient hospital discharge with valid LOS Any procedure: 36.1, 36.11-36.19 Aortocoronary bypass for heart revascularisation	Population by province, region	100 000	20-49 50-64 65-74 75+	Average length of stay by province, region
Coronary angioplasty (PTCA)	Inpatient/outpatient hospital discharge Any procedure: 36.0 Removal of coronary artery obstruction and Insertion of stent(s)	Population by province, region	100 000	20-49 50-64 65-74 75+	
Catheterisation	Inpatient/outpatient hospital discharge Any procedure: 37.21 Right heart cardiac catheterisation 37.22 Left heart cardiac catheterisation 37.23 Combined right left heart cardiac catheterisation	Population by province, region	100 000	20-49 50-64 65-74 75+	
Knee replacement	Inpatient hospital discharge with valid LOS Any procedure: 81.54 Total knee replacement 81.55 Revision of knee replacement, not otherwise specified 00.80-00.84 Revision of knee replacement if specified	Population by province, region	100 000	15-34 35-44 45-54 55-64 65-74 75+	Average length of stay by province, region
Knee arthroscopy	Inpatient/outpatient hospital discharge Any procedure: 80.26 Arthroscopy knee and 80.6 Excision of semilunar cartilage of knee	Population by province, region	100 000	15-34 35-44 45-54 55-64 65-74 75+	
Surgery after hip fracture	Inpatient hospital discharge with valid LOS Any procedure: 820.0-820.3, 820.8,820.9 Only emergency admissions of fracture of neck of femur 733.14 Pathologic fractures Exclusion criteria (for 2011 only): E800-E849.9 (Accidents: railway, motor vehicle, road, water, air and space)	Population by province, region	100 000	15-34 35-44 45-54 55-64 65-74 75+	Average length of stay by province, region
Hysterectomy (Females)	Inpatient/outpatient hospital discharge Any procedure: 68.3-68.9 Abdominal or vaginal hysterectomy	Population by province, region	100 000	15-34 35-44 45-54 55-64 75+	Average length of stay by province, region

Source: Authors' estimates based on National Hospital Discharges Database, Ufficio VI, DG Programmazione sanitaria, Ministero della Salute, Italy.

Chapter 11

Portugal: Geographic variations in health care

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During the eight-year period covered in this report (2002-09), there has been a reduction in geographic variations in the use of some of the health care procedures selected in this study, such as cardiac catheterisation and coronary angioplasty. There has also been a reduction in geographic variations in caesarean section rates, although the variation between public and private hospitals rates continues to be wide. The Portuguese Ministry of Health recently asked a group of experts to develop a plan to reduce the inappropriate use of caesarean sections throughout the country.

This study also shows that geographic variations in the use of some other procedures that are becoming less frequently used and replaced by other treatment options are increasing, for example for coronary artery bypass graft (CABG) and hysterectomy. This indicates that the reduction in the use of these procedures has not been uniform across the countries, and a need to promote greater convergence in clinical practices.

11.1. Introduction

Life expectancy for both men and women in Portugal has continued to increase between 2002 and 2012, while the crude and standardised death rates have decreased. However, regional disparities persist, particularly between urban-coastal regions and rural-interior regions, with worst health and living conditions in the latter regions (Barros et al., 2011).

Up until recently, there had been little, if any, studies of medical practice variations in Portugal. In 2010, a group of researchers based at the National School of Public Health became involved in the ECHO (European Collaboration for Healthcare Optimization) project, funded by the European Commission. The project results will be the first to analyse medical practice variations at a geographic and hospital level in Portugal. The findings presented in this chapter draw on the ECHO work.

Section 11.2 provides an overview of the Portuguese health care system. Section 11.3 turns to the data and methods used, followed by a presentation of the results. Between 2002 and 2009, there has been a slight reduction in the geographic variations in the use of most of the procedures covered under this study. However, in 2009, there were still substantial variations in the utilisation rate of selected procedures in Portugal which cannot be solely attributed to differences in population structure. The final section provides some conclusions and policy discussions. It is important to address medical practice variations, because equitable access to health care is a cherished goal of Portuguese health care policy and of the NHS in particular. Identifying areas of both appropriate and inappropriate care will help to understand the determinants of good performance and create opportunities to monitor the impact of changes.

11.2. Overview of Portugal's health care system

Political and organisational structure

Portugal has a tax-funded national health service that provides coverage to all residents. Health care is a shared responsibility between the central and regional level. The Ministry of Health and its institutions oversee the planning and regulation of the national health service (NHS). The Ministry of Health is responsible for the design, implementation and evaluation of the overall health plan, while the five regional health administrative boards look after the management and delivery of health services. The health administrative boards are accountable to the Ministry of Health and define the strategic management of the population's health, the supervision and control of hospitals, the management of primary care and NHS primary care centres, as well as the contractual agreements for services with hospitals and private sector providers (Barros et al., 2011).

Health care expenditure

Total health spending accounted for 10.2% of GDP in Portugal in 2011, above the OECD average of 9.3% (OECD, 2013a). However, Portugal ranks below the OECD average in terms of health spending per capita, with spending of USD 2 619 in 2011 (adjusted for purchasing power parity), compared with the OECD average of around USD 3 300. The share of hospital spending in Portugal in 2011 (27%) was slightly lower than the OECD average (29%).

Health spending per capita in Portugal increased in real terms by 1.8% on average between 2000 and 2009, and grew at a similar rate of 2% for 2009/10. However, health spending per capita fell by 6.3% in 2010/11. Several other OECD countries also experienced a marked slowdown or reduction in health spending after 2010, following the recession and the need for fiscal consolidation.

Health care financing

The NHS provides universal health coverage for all residents, and health care is largely financed from general taxation. Public spending accounted for 65% of total health spending in 2011, less than the OECD average of 72% (OECD, 2013a). About one-fifth of the population also have a private health insurance (PHI), which provides duplicate coverage (i.e., faster access to health services in the private sector). PHI accounted for only 5% of total health spending in 2011, with the remainder (about 30%) financed from direct out-of-pocket payments by households (OECD, 2013a).

Health care delivery and provider payments

Physician services and payments

Primary care in the NHS is predominantly delivered in public clinics staffed by physicians and other health professionals (OECD Health Systems Characteristics Survey, 2012b). Physicians in the NHS play a gatekeeper role in primary care and are public salaried employees, though those working in family health units partially receive remuneration that includes capitation (risk-adjusted) and pay-for-performance (OECD Health Systems Characteristics Survey, 2012b). Specialists provide services in inpatient and outpatient departments of hospitals, and are also public salaried employees. Private sector providers are remunerated mainly on a fee-for-services basis (Barros et al., 2011).

Hospital services and payments

Hospital services are provided by both the public and the private sector. NHS hospitals provide elective and non-elective care, ambulatory surgery, maternity services, diagnostic procedures, ancillary tests, and accident and emergency services. Most non-acute psychiatric inpatient and outpatient services are provided by psychiatric hospitals.

Public hospitals (which accounted for 72% of all hospital beds in 2011) are funded through prospective global budgets, with the financing of inpatient and ambulatory surgery based on diagnosis related groups (DRGs). Since 2012, 4% of the budget is allocated based on quality measure improvements (OECD Health Systems Characteristics Survey, 2012b). Private not-for-profit hospitals (20% of beds) and private for-profit hospitals (8%) are remunerated on a fee-for-service basis (OECD, 2013b).

In terms of activities, 80% of inpatients were cared for in NHS public hospitals in 2010, with the remaining 20% treated in private hospitals (DGS, 2012). Hospital activities generally increased over the past decade, in particular in the areas of ambulatory surgeries, day hospital sessions and consultations.

Several important measures have been taken in recent years to reshape the provision of health care in Portuguese NHS hospitals. One that is particularly noteworthy concerns administrative hospital mergers. From 2000 to 2010, more than 50 hospitals were merged with others, although no hospital was closed. Other policy measures include support for the implementation of public-private partnerships and the creation of Local Health Units, which combine under the same board the management of hospitals and primary care centres (Barros et al., 2011).

11.3. Data and methods

Data for the selected procedures were obtained from the national DRGs database, which includes all inpatient episodes in the Portuguese NHS hospitals in any given year. In Portugal, coding is performed by physicians with specific training. During the period under analysis, two different groupers were used in Portuguese NHS hospitals: HCFA DRG version 16.0 until mid-2006, and AP-DRG version 21.0 from mid-2006 onwards. Diagnoses and procedures were coded based on the ICD-9-CM classification.

The list of procedures selected is displayed in the results presented in Table 11.1. Surgery after hip fracture is expected to be a low variation procedure and was used for calibration purposes.

Table 11.1. Total inpatient discharges and ALOS, and discharges for selected procedures, Portugal, 2002-09

	2002	2003	2004	2005	2006	2007	2008	2009	% change 2002-09
Inpatient discharges	957 592	977 523	971 597	983 004	975 185	964 784	959 036	936 315	-2.20%
ALOS[1] (days)	7.30	7.02	7.05	7.05	7.02	7.10	7.11	7.00	-4.10%
Medical admissions	465 615	465 316	462 767	473 691	459 352	457 412	456 233	454 750	-2%
CABG	2 379	2 283	2 236	2 355	2 588	2 556	2 500	2 467	4%
PTCA	3 982	5 667	6 737	7 614	8 190	9 505	9 914	9 715	144%
Cardiac catheterisation	12 121	13 693	15 589	16 074	17 900	24 438	24 814	24 224	100%
Surgery after hip fracture	8 476	9 035	9 197	9 178	9 001	9 552	9 921	10 344	22%
Knee replacement	2 764	3 417	4 196	4 359	5 308	5 384	6 091	6 601	139%
Knee arthroscopy	3 518	3 853	4 663	4 695	5 023	5 516	5 392	5 924	68%
Caesarean sections	27 917	28 332	28 060	28 985	28 238	27 605	28 181	26 859	-4%
Hysterectomy	11 445	12 049	12 007	11 693	11 545	11 087	10 288	7 290	-36%

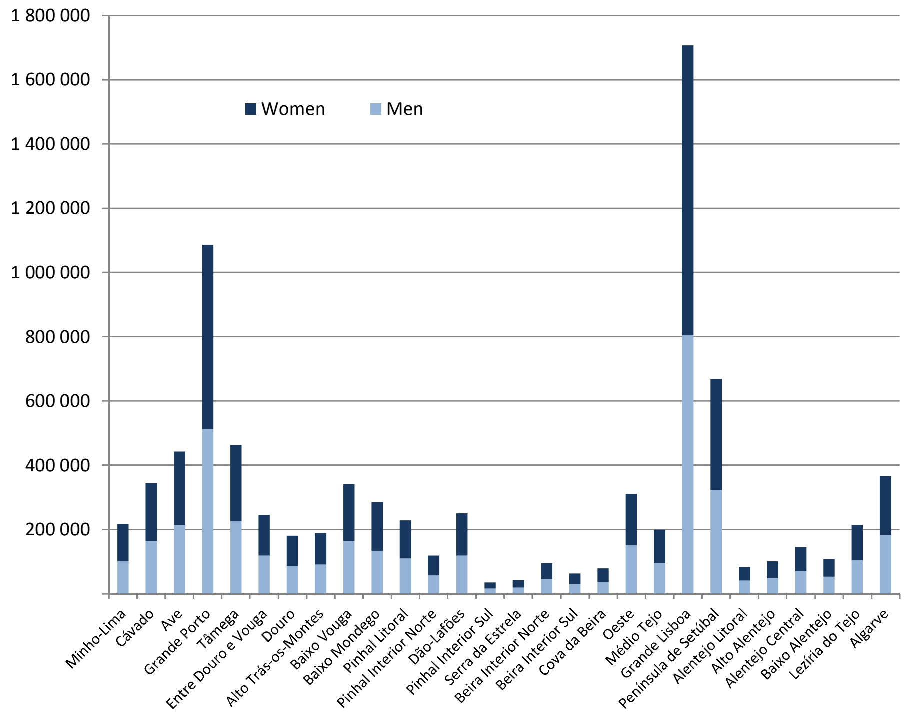
1. ALOS: Average length of stay. Inpatient only.

Source: Authors' estimates based on national DRG database, 2002-2009.

The total number of inpatient discharges in NHS hospitals decreased by 2.2% from 2002 to 2009, and the average length of stay (ALOS) also decreased by 4.1%. The number of medical admissions (which represents slightly less than half of all inpatient admissions), caesarean sections and hysterectomies also decreased during this period, although the rate of caesarean sections per 1 000 live births increased from 30% to 36% between 2002 and 2009. The number of cardiac catheterisation (used to diagnose ischaemic heart diseases) doubled, with the number of coronary artery bypass graft (CABG) increasing by a modest 4% (and declining in fact in the most recent years) while coronary angioplasty (PTCA) grew steadily and rapidly over this period. As for knee procedures, the number of knee replacement more than doubled (from 2 764 to 6 601), while the number of knee arthroscopies rose by 68%. Finally, the number of surgery after hip fracture increased by 22%.

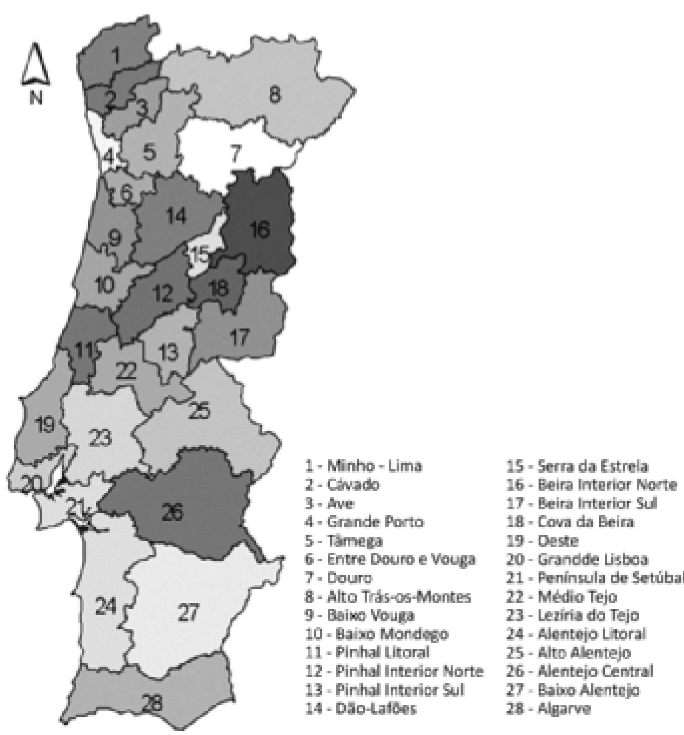
The geographic unit of analysis in this report is based on NUTS III, which corresponds to 28 groups of municipalities in Portugal inland. Figure 11.1 shows the size of the population and the gender breakdown in these 28 groups of municipalities and Figure 11.2 displays a map of the Portuguese municipalities. Standardised rates were based on the national population structure of 2009 (INE, 2013).

Figure 11.1. Population over 15 by gender and geographic unit, Portugal inland, 2009



Source: National Statistical Institute (INE), annual estimates of the resident population in Portugal, 2009.

Figure 11.2. Map of the Portuguese municipalities



Source: http://pt.wikipedia.org/wiki/Ficheiro:NUTS_III.png#file.

Table 11.2 provides some key facts on the geographic disparities in the supply of hospital beds and different categories of doctors across these 28 regions. The number of beds in NHS hospitals ranges from 72 per 100 000 population in Serra da Estrela to 878 in Baixo Mondego. The region of Baixo Mondego also has the highest rates for the different categories of doctors shown in this table. The number of cardiac surgeons per 100 000 population is higher in those regions that have teaching hospitals: Baixo Mondego, Grande Lisboa and Grande Porto. It should be noted that only cardiac surgeons do CABG procedures, while PTCAs and catheterisations are performed by cardiologists. In small regions that are sparsely populated such as Serra da Estrela, there are no medical specialists.

Table 11.2. Beds, gynaecologists-obstetricians, orthopaedic surgeons and cardiac surgeons per 100 000 population, by geographic region, Portugal, 2010

	Beds	Gyn-obstetrics physicians	Orthopaedic surgeons	Cardiac surgeons
Minho-Lima	187	6	4	0.4
Cávado	164	5.3	5.8	3.4
Ave	164	8.2	6.7	3.4
Grande Porto	278	11.4	7.4	8.2
Tâmega	90	3.2	3	1.6
Entre Douro e Vouga	141	5.9	5.2	2.4
Douro	251	4.3	7.2	4.3
Alto Trás-os-Montes	321	3.8	6.6	1.4
Baixo Vouga	144	3.7	5	2.7
Baixo Mondego	878	31.9	17.3	18.3
Pinhal Litoral	209	6.7	5.6	2.2
Pinhal Interior Norte	Not available			
Dão-Lafões	222	6.5	7.9	3.4
Pinhal Interior Sul	Not available			
Serra da Estrela	72	0	0	0
Beira Interior Norte	303	7.4	7.4	4.6
Beira Interior Sul	420	4.1	5.5	6.9
Cova da Beira	378	18.9	5.6	4.4
Oeste	127	4.4	4.1	0.8
Médio Tejo	205	3.9	6.1	2.6
Grande Lisboa	292	8.6	5.2	9.3
Península de Setúbal	178	6.3	4.5	3.8
Alentejo Litoral	121	0	3.2	0
Alto Alentejo	255	2.6	5.2	0.9
Alentejo Central	197	4.8	4.2	4.2
Baixo Alentejo	186	6.4	4	1.6
Lezíria do Tejo	153	6	3.6	3.6
Algarve	188	6	4.6	2.8
National average	239	7.8	5.8	5.3

Source: National Statistical Institute (INE), Hospitals' Survey, 2010.

11.4. Description of results

Overview of results

In 2009, geographic variations among the selected set of health care activities and procedures in Portugal was highest for CABG, and for knee replacement and knee arthroscopy (Table 11.3). It was the lowest for caesarean sections and surgery after hip fracture. The low variation for surgery after hip fracture was expected, given that this was selected as a "calibration" procedure on the grounds that there is little discretion for doctors to operate patients suffering from a hip fracture. Regarding caesarean sections, while the degree of variations across different regions in Portugal is low, the rates have generally increased in most regions between 2002 and 2009, and were much higher in 2009 than in most regions in Spain (see the chapter on Spain in this publication).

Table 11.3. Summary of geographic variations for a selected set of health care activities and procedures, Portugal, 2009

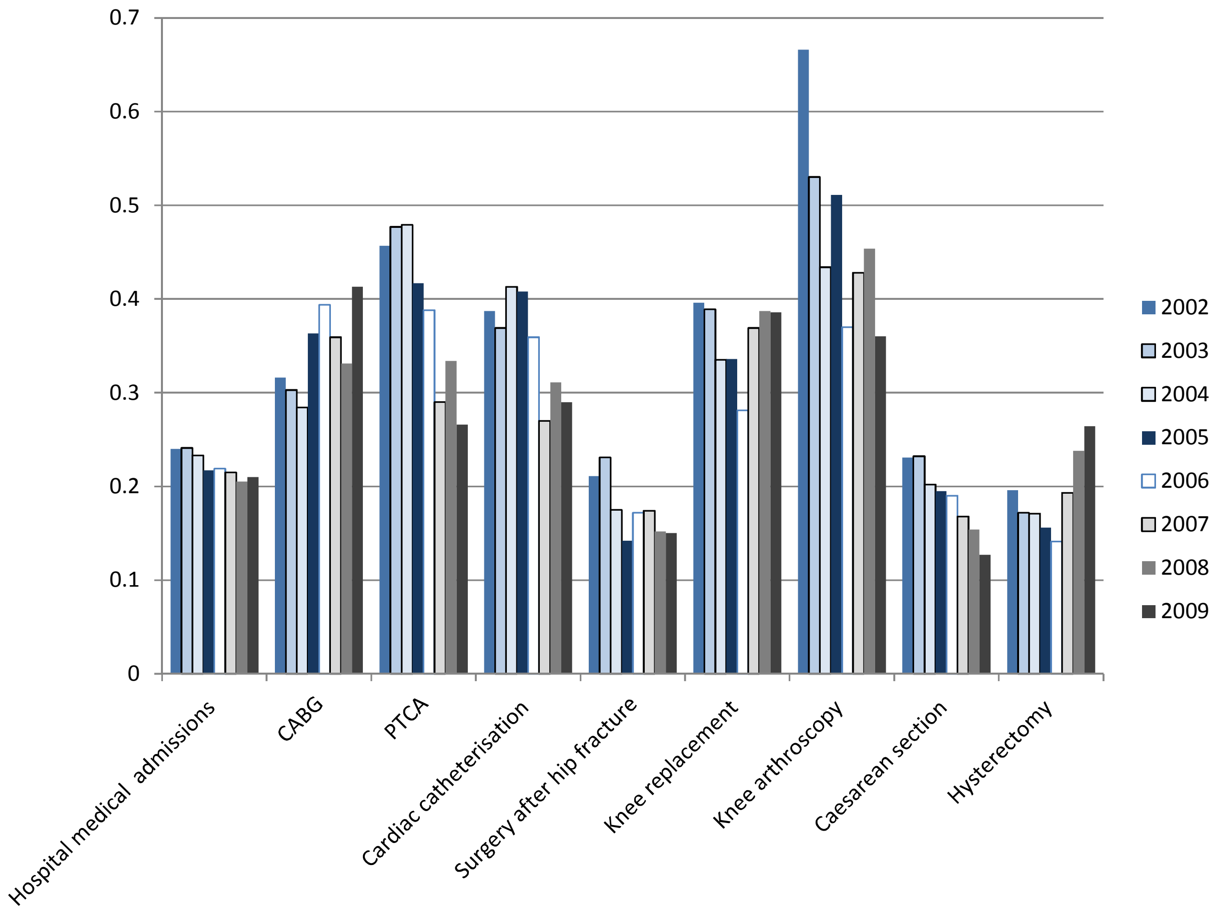
	Hospital medical admissions	CABG	PTCA	Catheterisation	Surgery after hip fracture	Knee replacement	Knee arthroscopy	Caesarean section (per 1 000 live births)	Hysterectomy
Crude rate (national)	4 483	24	96	239	102	65	58	329	175
Standardised unweighted average rate	5 569	27	117	327	126	84	67	330	179
Q10 (lowest decile)	4 449	16	83	235	107	42	42	278	121
Q90 (highest decile)	6 462	41	154	472	147	123	106	397	238
Coefficient of variation	0.21	0.41	0.27	0.29	0.15	0.39	0.36	0.13	0.26
Systematic component of variation	5	13.6	6.4	10.3	2.3	18	11.3	1.3	7.5

Note: All rates are expressed per 100 000 population, except caesarean sections (per 1 000 live births) and hysterectomy (per 100 000 women).

Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.3 presents trends over time in the coefficient of variation for the selected health care activities and procedures. While there has been an increase in regional variations in the use of CABG between 2002 and 2009, this has been accompanied by a reduction in variations in PTCA rates, indicating that there was some convergence in the use of PTCA across regions. Regional variations in knee arthroscopy decreased, but still remain very high. Following some reductions in regional variations for knee replacement between 2002 and 2006, the degree of variations went up again between 2007 and 2009, so there was no reduction over the entire period. While the overall number of hysterectomies in Portugal has come down significantly between 2002 and 2009 (Table 11.1), this has been accompanied by a rise in regional variations in hysterectomy rates, indicating that the reduction has not been uniform across the country.

Figure 11.3. Evolution of the coefficient of variation across geographic regions for a selected set of health care activities and procedures, Portugal, 2002-09

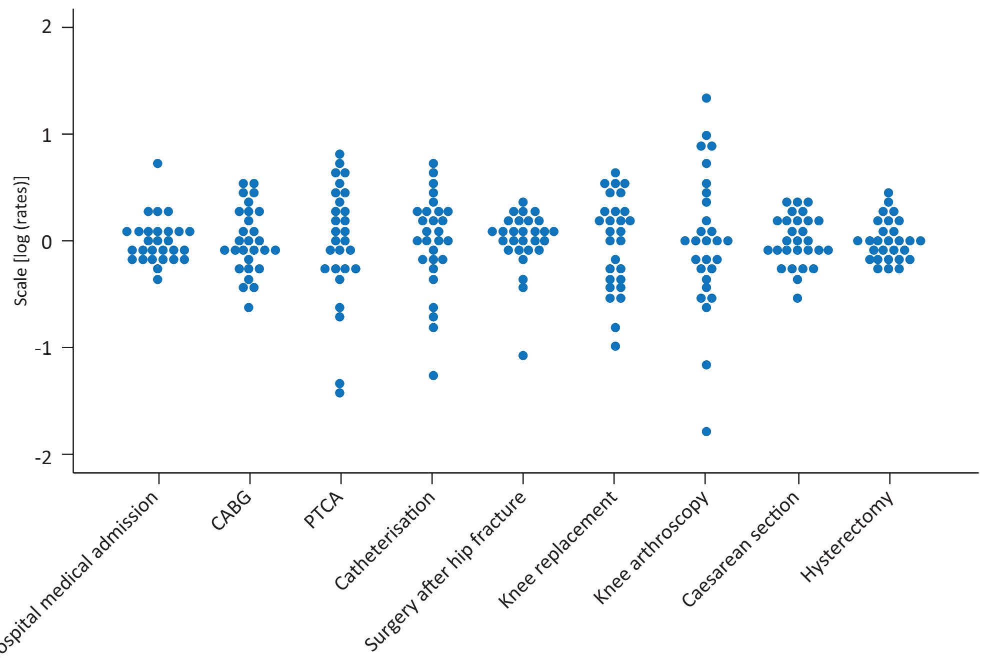


Source: Authors' estimates based on national DRG database, 2002-2009.

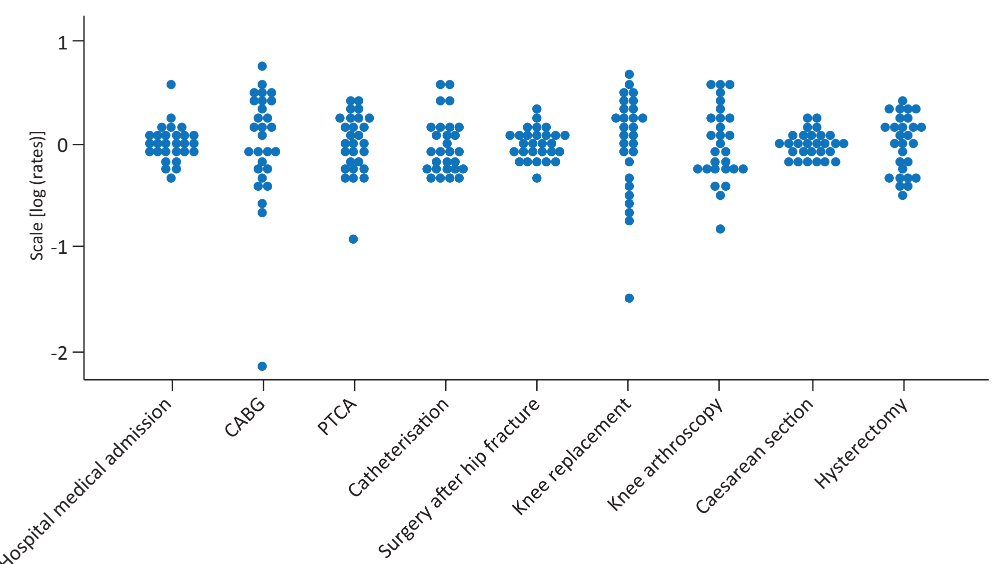
Figure 11.4 shows the regional variations in the log of the standardised rate for each procedure, with the values centered on the national average for each procedure, in 2002 and 2009. It illustrates in another way that the variations are more marked for cardiac care and knee procedures. In general, there is always more dispersion for the regions below the zero line, meaning that those with rates below the national average are more different from the national pattern than those above the average.

Figure 11.4. Geographic variations for a selected set of health care activities and procedures, Portugal, 2002 and 2009

2002



2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Hospital medical admissions

The level of geographic variations in hospital medical admissions in Portugal was relatively low in 2009, and declined slightly between 2002 and 2009, in a context of a slight overall reduction in hospital medical admission rates during that period (Table 11.4).

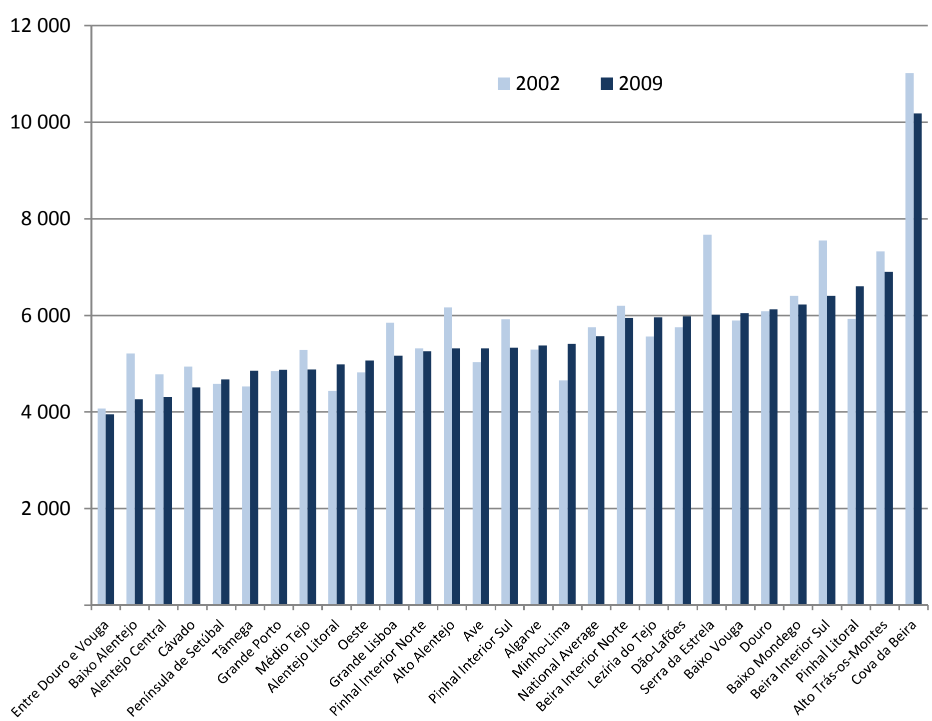
Table 11.4. Hospital medical admissions standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	5 755	5 774	5 771	5 842	5 702	5 593	5 586	5 569
Q10	4 566	4 683	4 639	4 682	4 651	4 507	4 490	4 449
Q90	7 393	7 625	7 332	7 452	7 241	6 843	6 499	6 462
Coefficient of variation	0.24	0.24	0.23	0.22	0.22	0.22	0.21	0.21

Source: Authors' estimates based on national DRG database, 2002-2009.

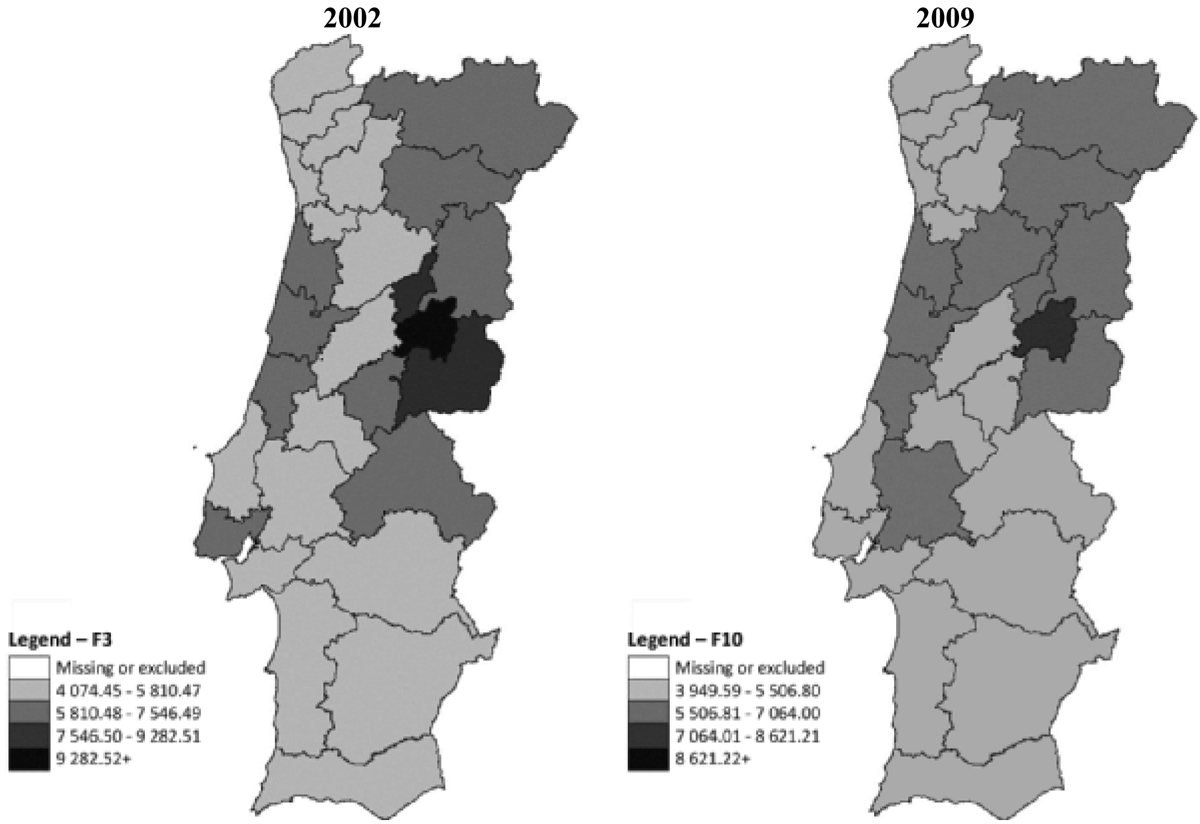
In 2009, Cova da Beira was the region with the highest rate of hospital medical admissions (standardised for age and sex), despite the fact that admission rates decreased by about 10% between 2002 and 2009 (Figure 11.5). Following Cova da Beira, the regions of Alto Trás-os-Montes and Pinhal Litoral had the highest rates in 2009, with all three regions having rates at least 50% higher than in the Entre Douro e Vouga and Baixo Alentejo regions. In general, the rural-interior regions located in the northeast part of the country tend to have higher hospital medical admission rates than the urban-coastal regions (Figure 11.6).

Figure 11.5. Hospital medical admissions standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.6. Maps of hospital medical admissions standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Revascularisation procedures

Cardiovascular diseases, the leading cause of mortality in Portugal, are responsible for around 30% of all deaths. The growing number of cardiac catheterisation and revascularisation procedures to treat people with ischaemic heart disease certainly contributed to the reduction in (age-standardised) mortality rates from cardiac disease between 2002 and 2009.

CABG

While CABG rates remained fairly stable overall in Portugal between 2002 and 2009, the coefficient of variation across regions increased during this period, although there were fluctuations from year-to-year (Table 11.5 and Figure 11.7).

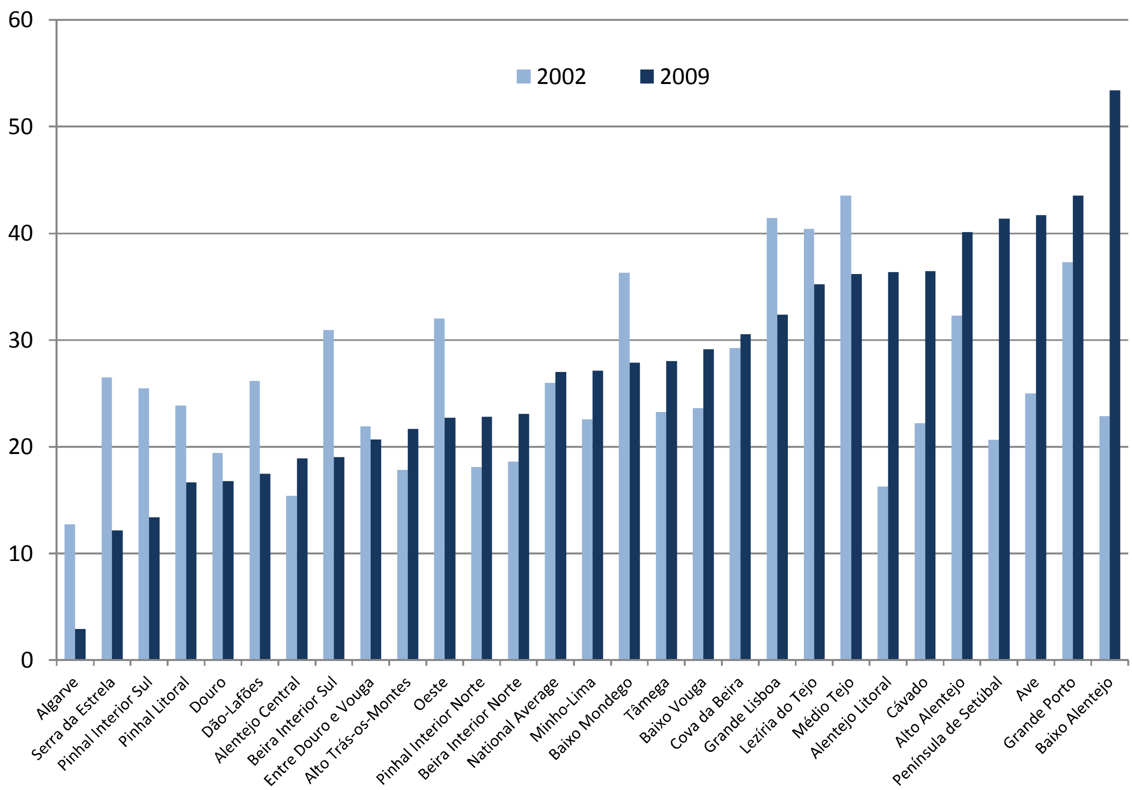
Table 11.5. Coronary artery bypass graft (CABG) standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	26	25	25	26	26	28	28	27
Q10	17	15	16	13	13	18	18	16
Q90	38	37	35	37	41	40	41	41
Coefficient of variation	0.32	0.3	0.28	0.36	0.39	0.36	0.33	0.41

Source: Authors' estimates based on national DRG database, 2002-2009.

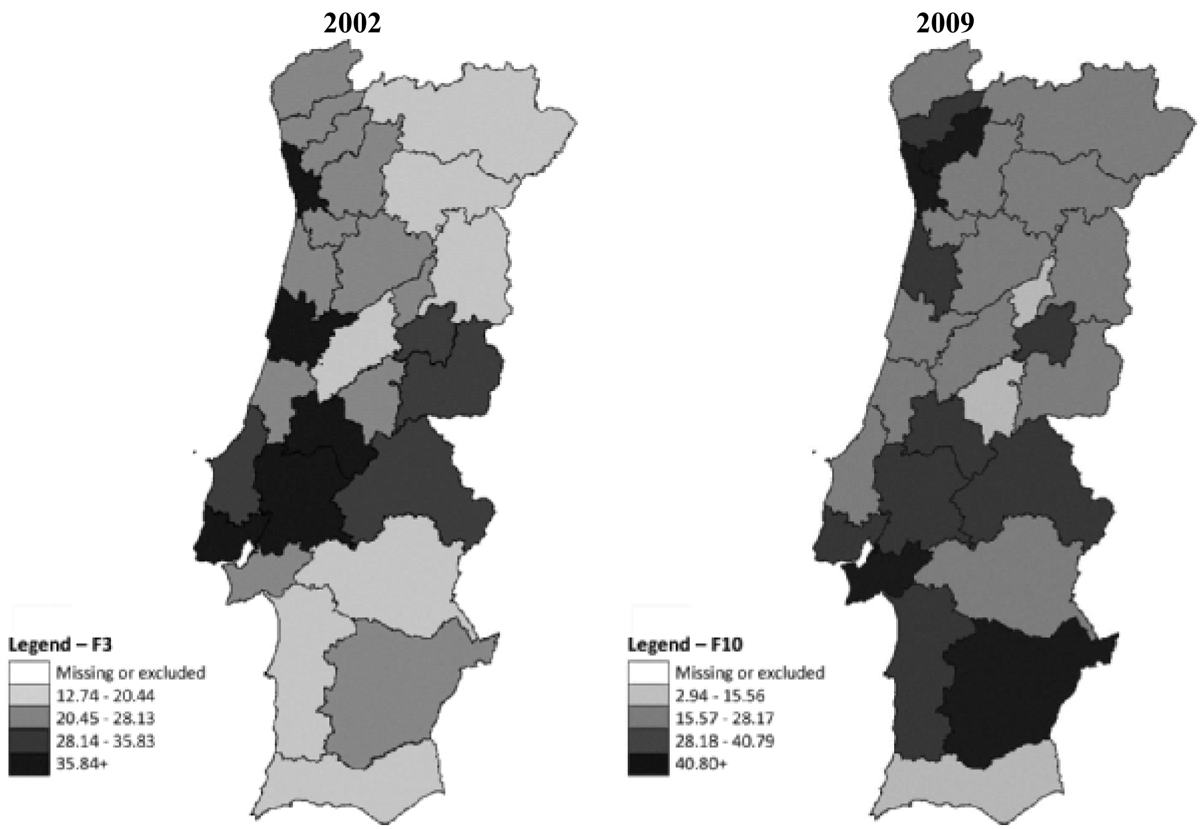
The use of CABG (a very invasive procedure, involving an open chest surgery) has decreased in most regions, being replaced by coronary angioplasty or other less invasive treatments for ischaemic heart diseases, but CABG rates have also increased in some regions, like Baixo Alentejo, Península de Setúbal, Alentejo Litoral and Ave (Figure 11.8). This might possibly indicate growing variations in the treatment of ischaemic heart diseases, with a possible over-use of CABG in some regions, although this might also reflect a growing concentration of CABG surgery in certain regions and hospitals.

Figure 11.7. CABG standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors’ estimates based on national DRG database, 2002-2009.

Figure 11.8. Maps of CABG standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

PTCA

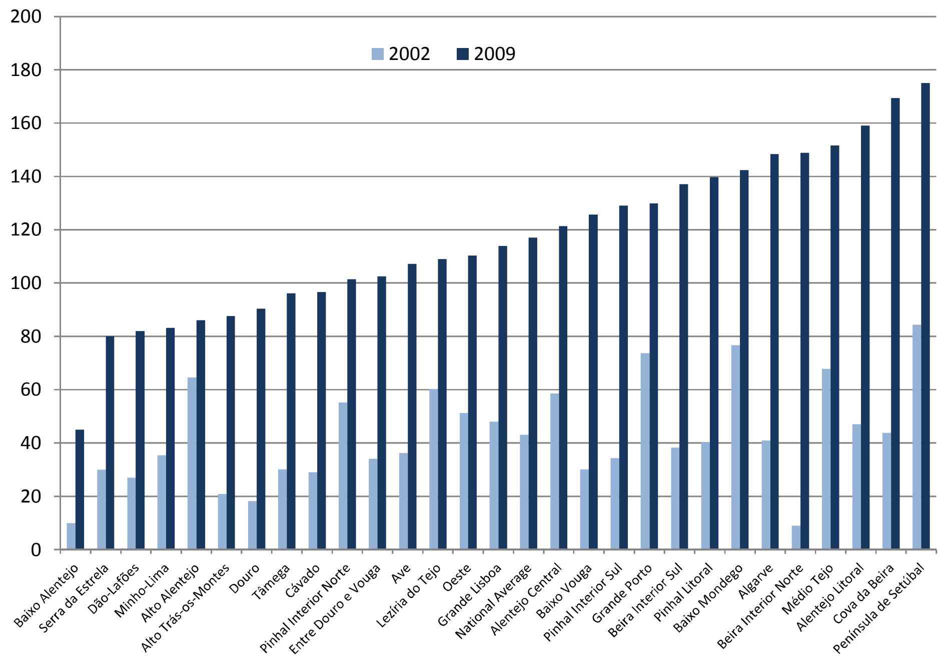
For PTCA, the unweighted average rate across regions nearly tripled over the period (Table 11.6). Combined with the fact that the coefficient of variation fell substantially during this period, this means that the growth rate was particularly strong in those regions that had relatively low rates in 2002, pointing towards some convergence in the use of PTCA across regions (Figures 11.9 and 11.10). The growth rate of PTCA was marked in the regions of Beira Interior Norte, Douro, Baixo Alentejo, Alto Trás-os-Montes, and Baixo Vouga.

Table 11.6. Coronary angioplasty (PTCA) standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	43	55	68	79	89	108	121	117
Q10	20	26	31	39	50	69	86	83
Q90	70	86	113	118	138	153	166	154
Coefficient of variation	0.46	0.48	0.48	0.42	0.39	0.29	0.33	0.27

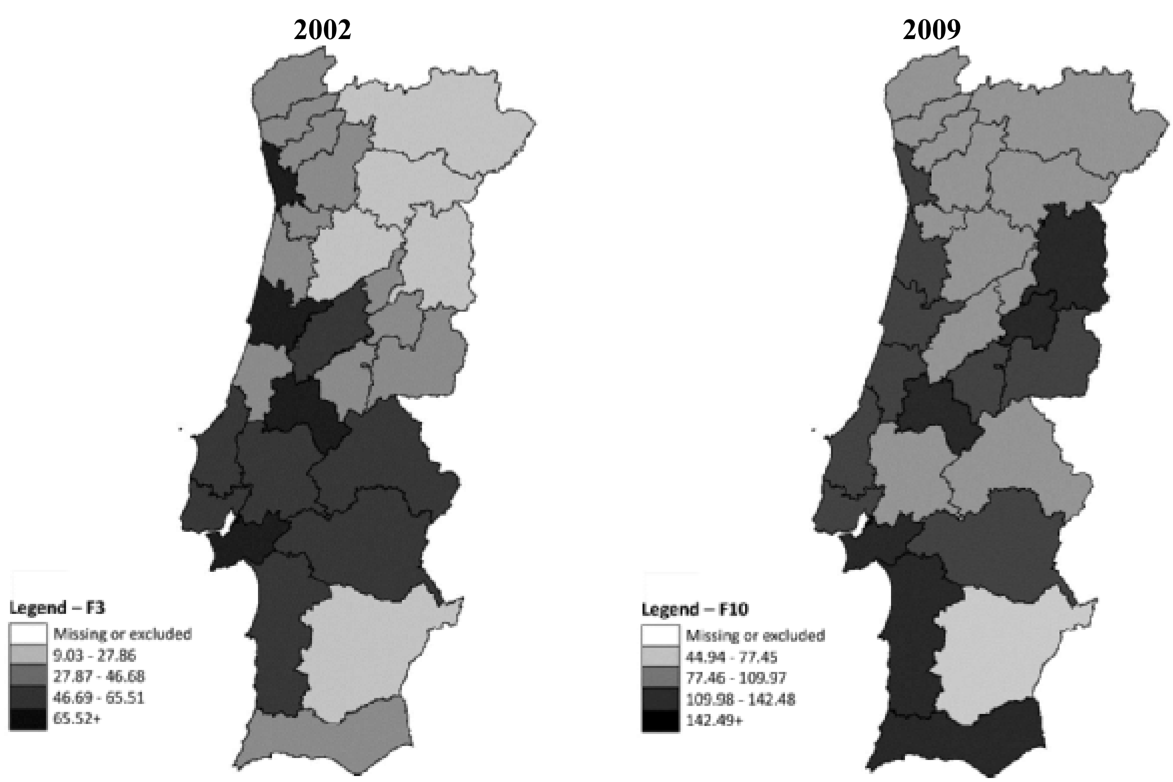
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.9. PTCA standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.10. Maps of PTCA standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Catheterisation

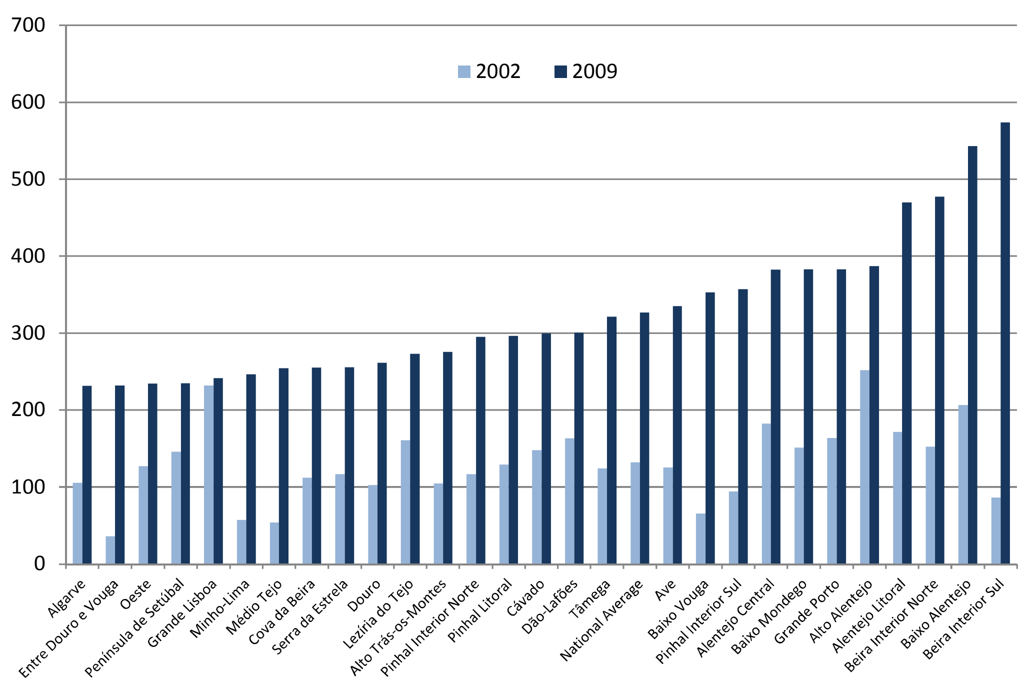
The trend rise in cardiac catheterisation (used to diagnose ischaemic heart disease) is, not surprisingly, fairly similar to the rise in PTCA. The unweighted average rate of cardiac catheterisation more than doubled between 2002 and 2009, while the coefficient of variation went down, indicating a more uniform access to this important diagnostic procedure (Table 11.7, Figures 11.11 and 11.12). The Grande Lisboa is an exception to the general strong growth in cardiac catheterisation rates: the rate in the national capital region was one of the highest in 2002, but did not increase much up in the following years, with the result that the region had one of the lowest rates in 2009, well below the national average.

Table 11.7. Cardiac catheterisation standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	132	156	176	180	214	323	341	327
Q10	63	85	74	78	117	239	232	235
Q90	190	219	267	267	290	418	489	472
Coefficient of variation	0.39	0.37	0.41	0.41	0.36	0.27	0.31	0.29

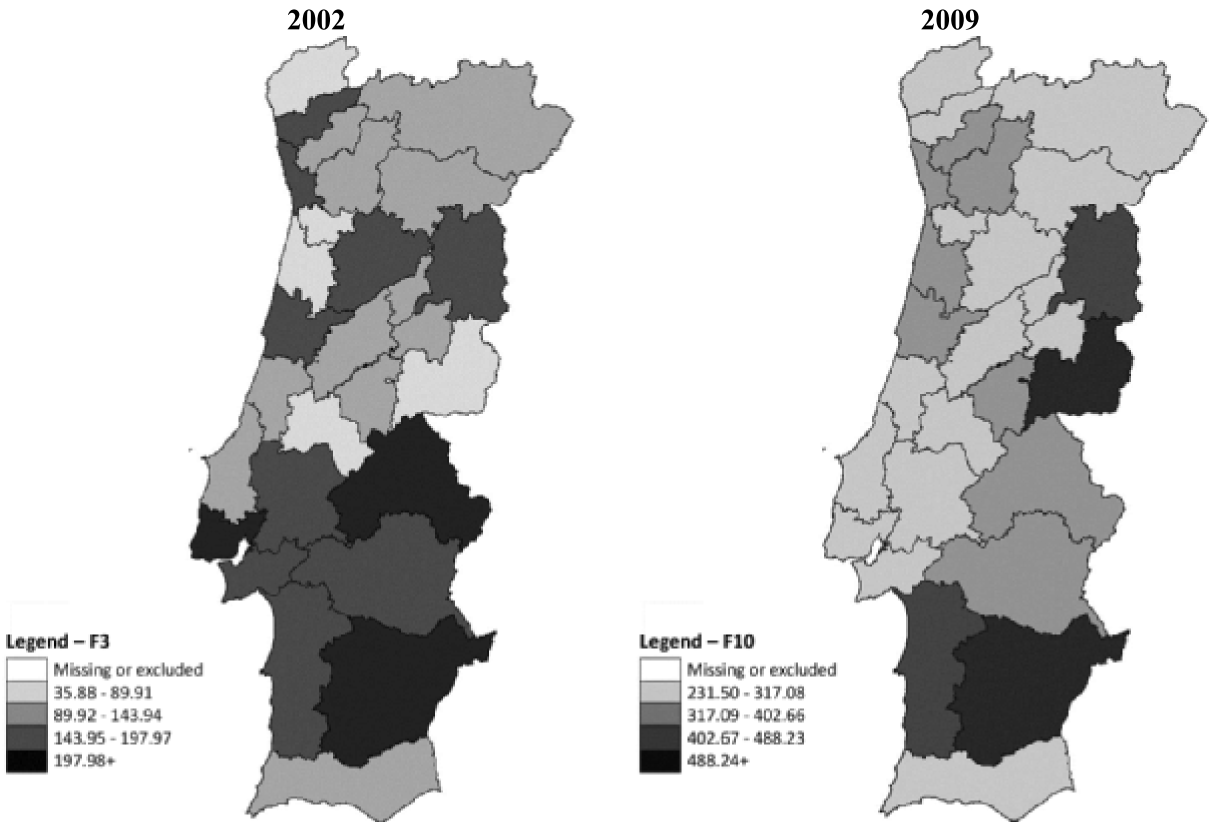
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.11. Cardiac catheterisation standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.12. Maps of cardiac catheterisation standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Joint procedures

Surgery after hip fracture

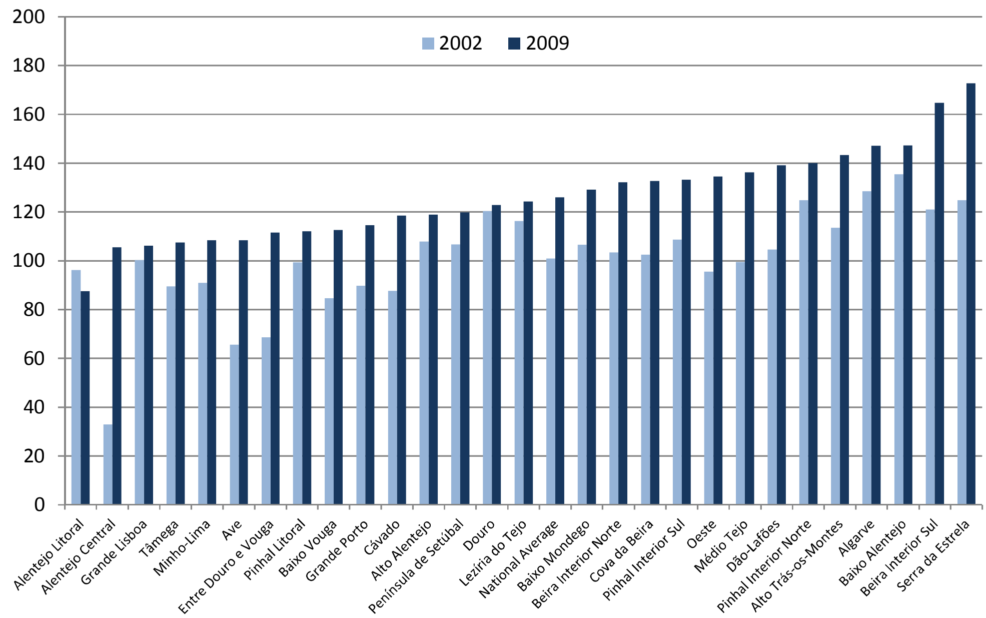
Regarding surgery after hip fracture, a procedure used for "calibration" purposes, the average rate increased by about 25% between 2002 and 2009, while the coefficient of variation was reduced and is, as expected, one of the lowest of all procedures covered under this study (Table 11.8 and Figures 11.13 and 11.14). In 2009, the regions with the lowest values were Alentejo Litoral, Alentejo Central and Grande Lisboa, while the ones with the highest were Baixo Alentejo, Beira Interior Sul and Serra da Estrela. The low variation observed in other countries is thus also present in Portugal.

Table 11.8. Surgery after hip fracture standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Average of all age groups	101	106	111	109	108	114	120	126
Q10	80	89	91	91	85	90	99	107
Q90	125	123	127	128	125	134	141	147
CV	0.21	0.23	0.18	0.14	0.17	0.17	0.15	0.15

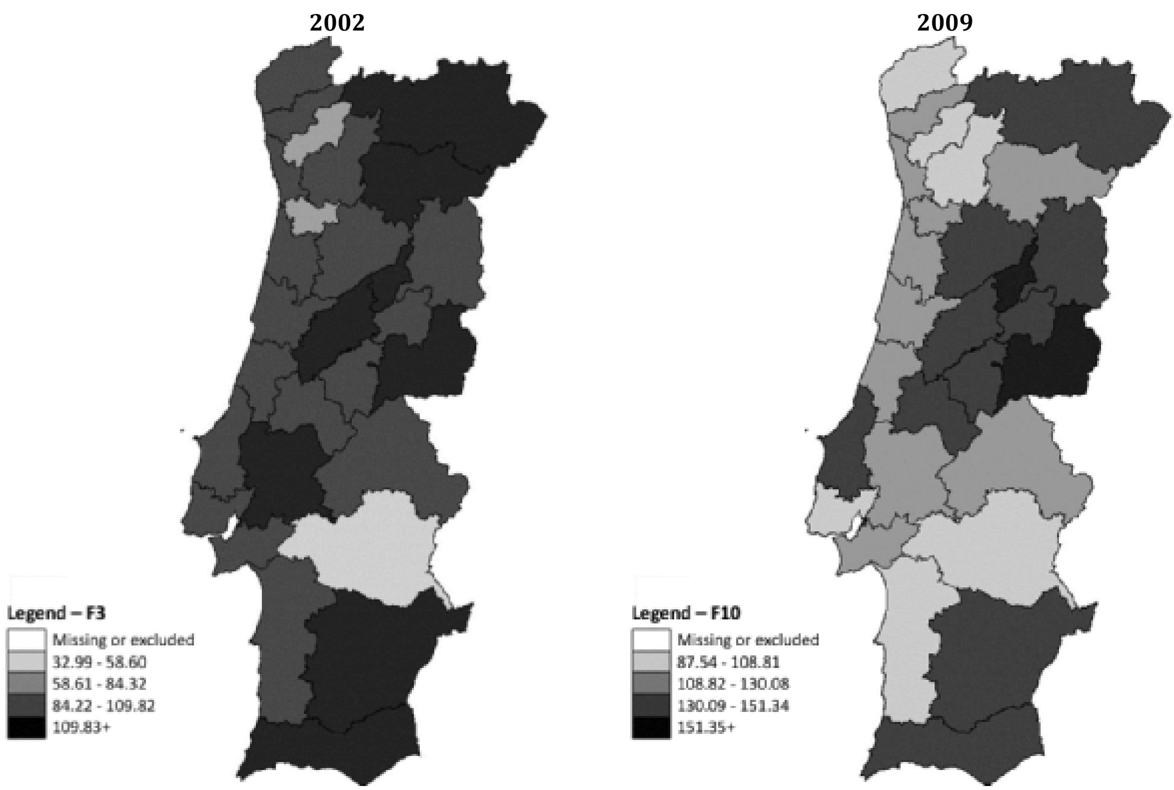
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.13. Surgery after hip fracture standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.14. Maps of surgery after hip fracture standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Knee replacement

Portugal has a low rate of knee replacement when compared with other OECD countries (OECD, 2013a), but the number of these operations has grown rapidly in a context of population ageing. From 2002 to 2009, the unweighted average rate of knee replacement more than doubled across regions in Portugal (Table 11.9, Figures 11.15 and 11.16). This was accompanied by a reduction in the degree of variation across regions between 2002 and 2006, indicating that the growth rate was particularly rapid in those regions that had low rates. However, since 2007, the geographic variations have widened again, suggesting more rapid growth in those regions that have already high rates.

The regions of Baixo Alentejo and Alentejo Litoral had very low rates of knee replacement in 2002, but following strong and steady growth, they were among the regions with the highest rates in 2009, immediately after the Alto Alentejo region.

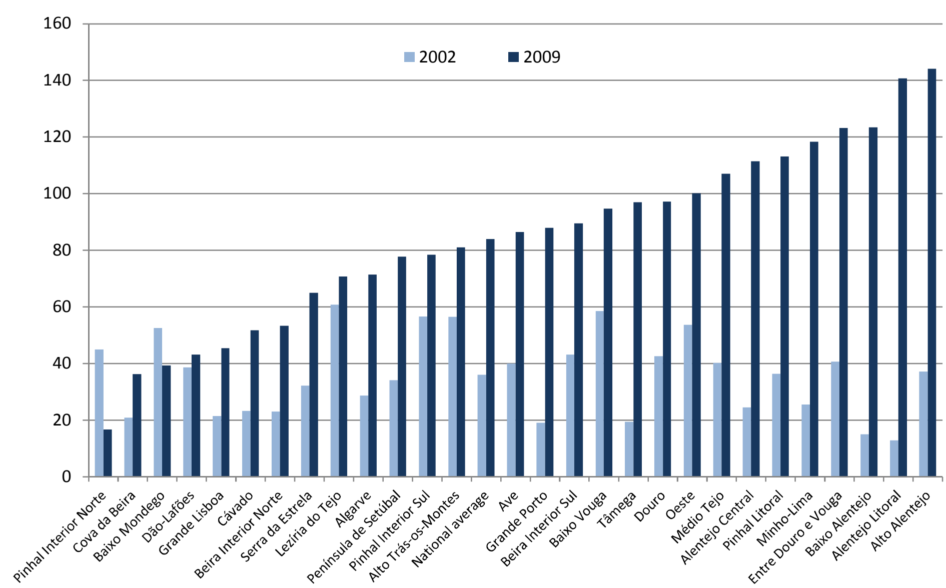
The decrease observed in Pinhal Interior Norte and Baixo Mondego might mean that in both regions most of the people that should receive a knee replacement have already received it or that patients are being moved to the private sector. Further analysis in the changes in the number of orthopedic surgeons in hospitals in the surrounding areas might help to understand the evolution in the waiting list.

Table 11.9. Knee replacement standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	36	44	55	52	70	70	84	84
Q10	19	22	31	30	47	38	39	42
Q90	57	69	79	76	97	102	121	123
Coefficient of variation	0.4	0.39	0.34	0.34	0.28	0.37	0.39	0.39

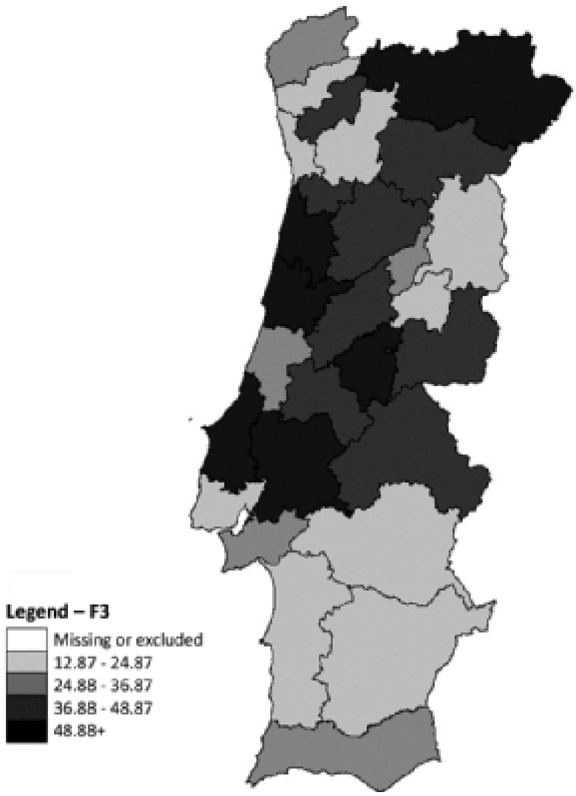
Source: Authors' estimates based on national DRG database, 2002-2009.

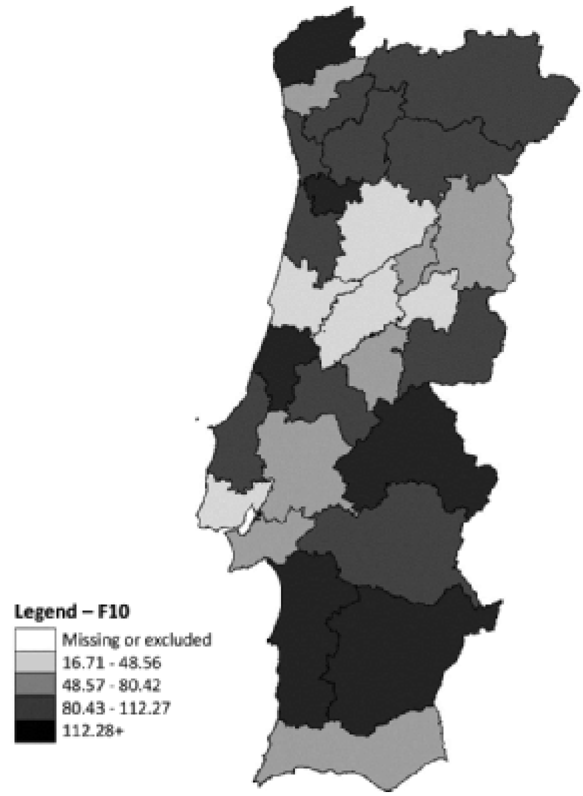
Figure 11.15. Knee replacement standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.16. Maps of knee replacement standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009





Source: Authors' estimates based on national DRG database, 2002-2009.

Knee arthroscopy

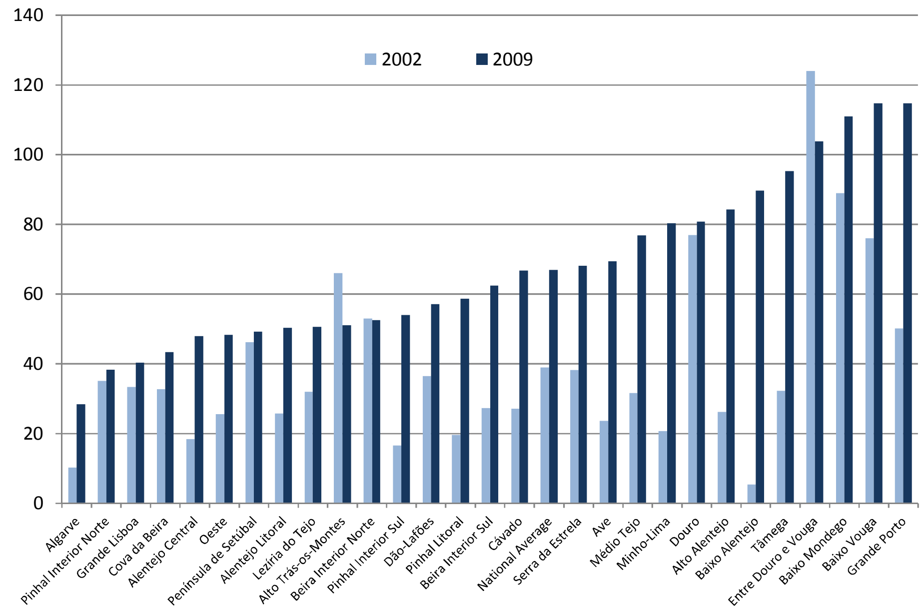
With respect to knee arthroscopy, the unweighted average rate across regions increased by over 70% between 2002 and 2009, while the degree of variations across regions was reduced substantially, indicating a more rapid growth rate in some of the regions that had relatively low rates in 2002 (Table 11.10). This was the case notably in the Algarve region, although the rates of knee arthroscopy remained lower than in other regions in 2009 (Figures 11.17 and 11.18).

Table 11.10. Knee arthroscopy standardised rate per 100 000 population, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	39	44	52	51	57	65	60	67
Q10	18	23	27	16	29	25	31	42
Q90	76	73	81	84	85	98	97	106
Coefficient of variation	0.67	0.53	0.43	0.51	0.37	0.43	0.45	0.36

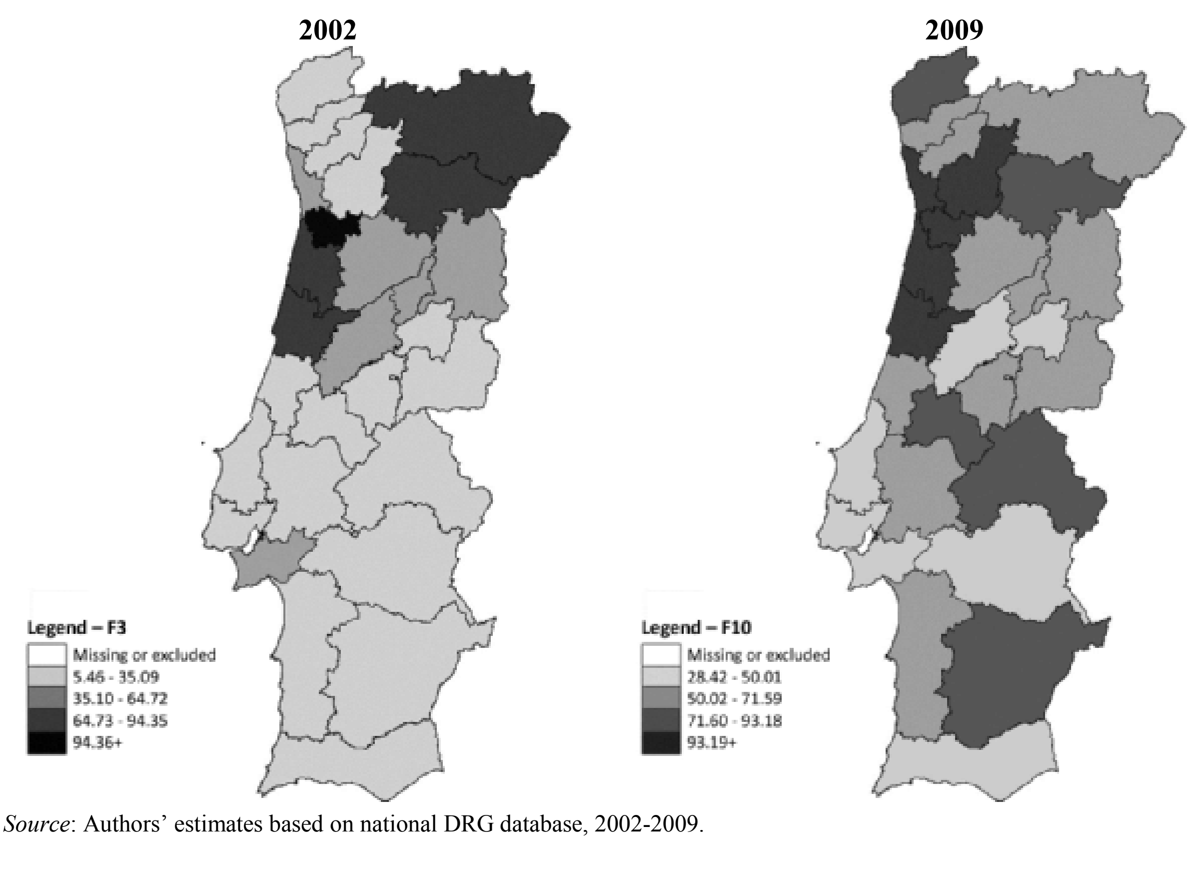
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.17. Knee arthroscopy standardised rate per 100 000, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.18. Maps of knee arthroscopy standardised rate per 100 000 population, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Gynaecological procedures

Caesarean section

Caesarean sections have been increasing as a proportion of all live births. It is worth mentioning that a noteworthy reform of maternity services took place in 2006. Out of all NHS hospitals, around ten maternity services were closed because they were performing very few deliveries. This might result in less caesarean sections for women living in those regions because they would deliver their babies in hospitals in regions with better trained maternity teams. Nearly 90% of all deliveries in 2009 took place in NHS hospitals, with the remaining 10% occurring in private hospitals. However, there are large variations in caesarean section rates between public and private hospitals: 33% of deliveries in public hospitals were caesarean sections, whereas this proportion reached 66% of deliveries in private hospitals in 2009.

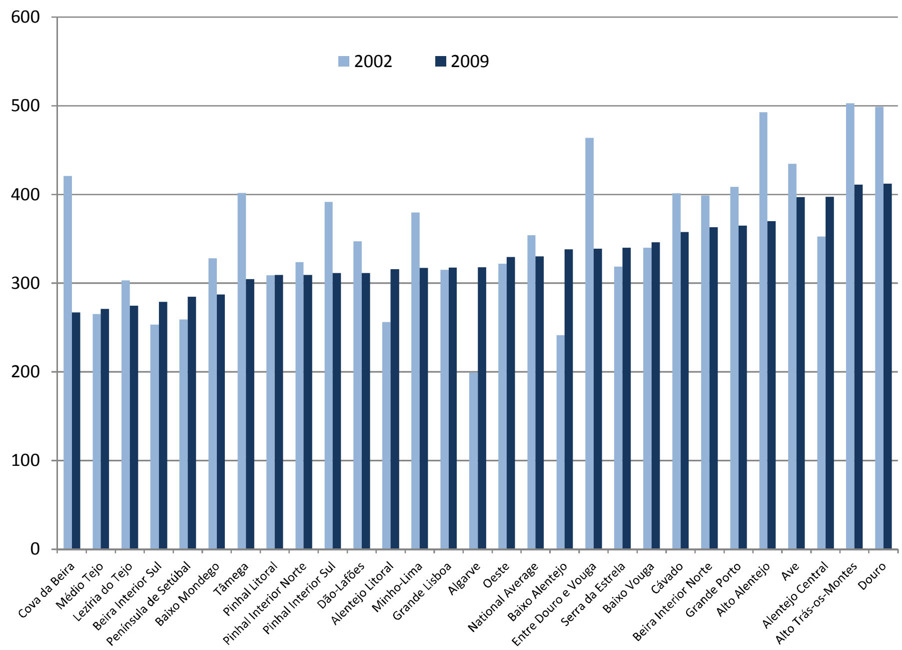
The total number of caesarean sections and total deliveries fell during the study period but the share of caesarean section as a percentage of total deliveries increased. The age-standardised rate of caesarean sections per 1 000 live births, however decreased from 354 in 2002 to 330 in 2009, but peaked at 365 in 2005 (Table 11.11). This implies that the changes in the number of caesarean sections have not been able to compensate for the changes in the number of deliveries over the study period. Douro and Alto Trás os Montes were the regions with the highest rates of caesarean sections in 2009, although the rates in these two regions decreased markedly since 2002 (Figures 11.19 and 11.20). The caesarean section rate also decreased substantially in the Cova Da Beira region, so that it had the lowest rate in 2009. In some regions such as Algarve, caesarean section rates increased greatly between 2002 and 2009, and are now close to the national average.

Table 11.11. Caesarean section age-standardised rate per 1 000 live births, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	354	355	359	365	358	344	343	330
Q10	255	268	282	280	286	283	285	278
Q90	472	465	471	445	445	416	419	397
Coefficient of variation	0.23	0.23	0.2	0.2	0.19	0.17	0.15	0.13

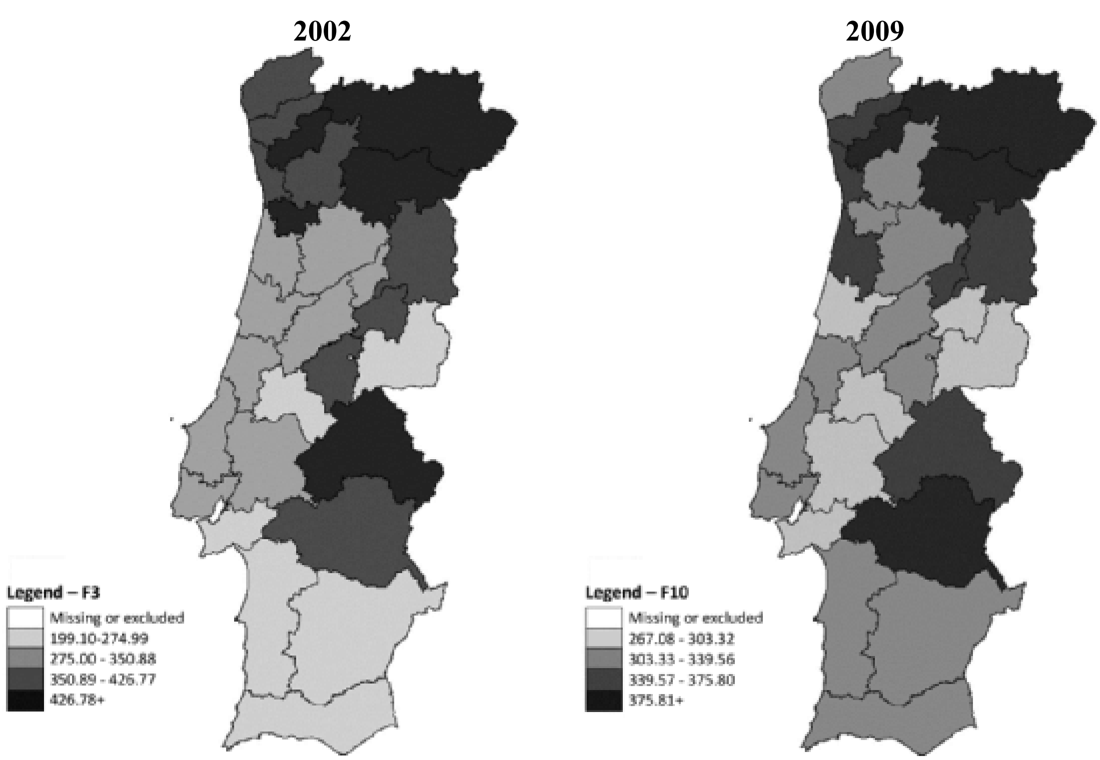
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.19. Caesarean section age-standardised rate per 1 000 live births, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.20. Maps of caesarean section age-standardised rate per 1 000 live births, by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Since the percentage of total deliveries involving a caesarean section is rising, the reduction in the coefficient of variation during the study period might mean that more women are being offered caesarean sections, which is contributing to the decrease in regional differences. Another contributing factor is the decrease in the number of caesarean sections in the top 10th percentile where there was a decrease in Q90 during the study period.

Since 2007, the rate of caesarean sections is taken into account in assessing hospital performance and for financing purposes, including penalties for hospitals that have rates above what is considered desirable (Valente, 2010).

Hysterectomy

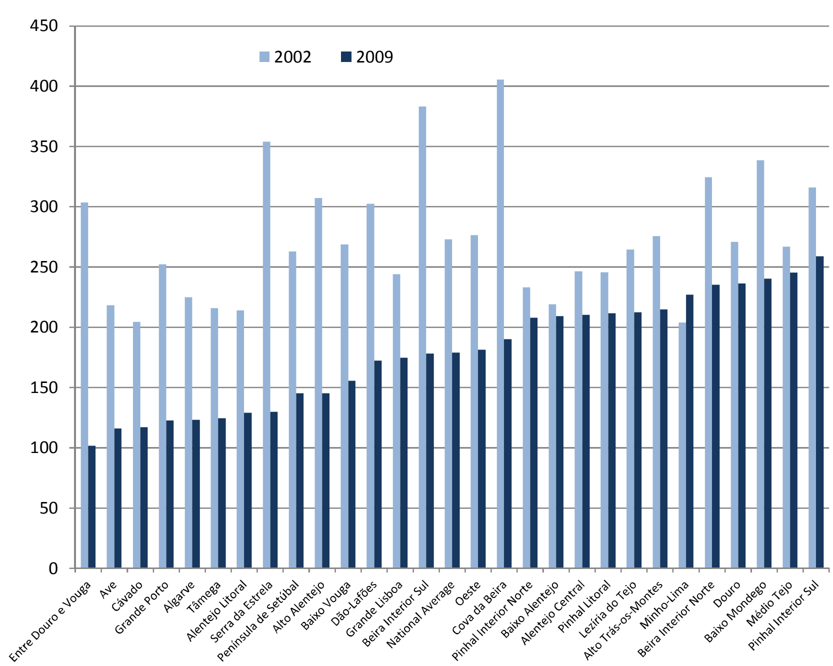
By contrast with the previous interventions, the average rate of hysterectomy has come down significantly in Portugal as in many other OECD countries, particularly since 2007. However, the regional variations have increased, indicating that the reduction has not been uniform across all regions (Table 11.12). There was even a slight increase in the Minho-Lima region between 2002 and 2009 (Figures 11.21 and 11.22). In 2009, the regions with the lowest rates were Entre Douro e Vouga, Ave and Cávado, while the regions with the highest rates were Baixo Mondego, Médio Tejo and Pinhal Interior Sul.

Table 11.12. Hysterectomy age-standardised rate per 100 000 females, Portugal, 2002-09

NUTS III	2002	2003	2004	2005	2006	2007	2008	2009
Unweighted average	273	287	287	275	277	274	255	179
Q10	215	226	217	232	234	207	188	121
Q90	343	342	351	325	327	341	332	238
Coefficient of variation	0.2	0.17	0.17	0.16	0.14	0.19	0.24	0.26

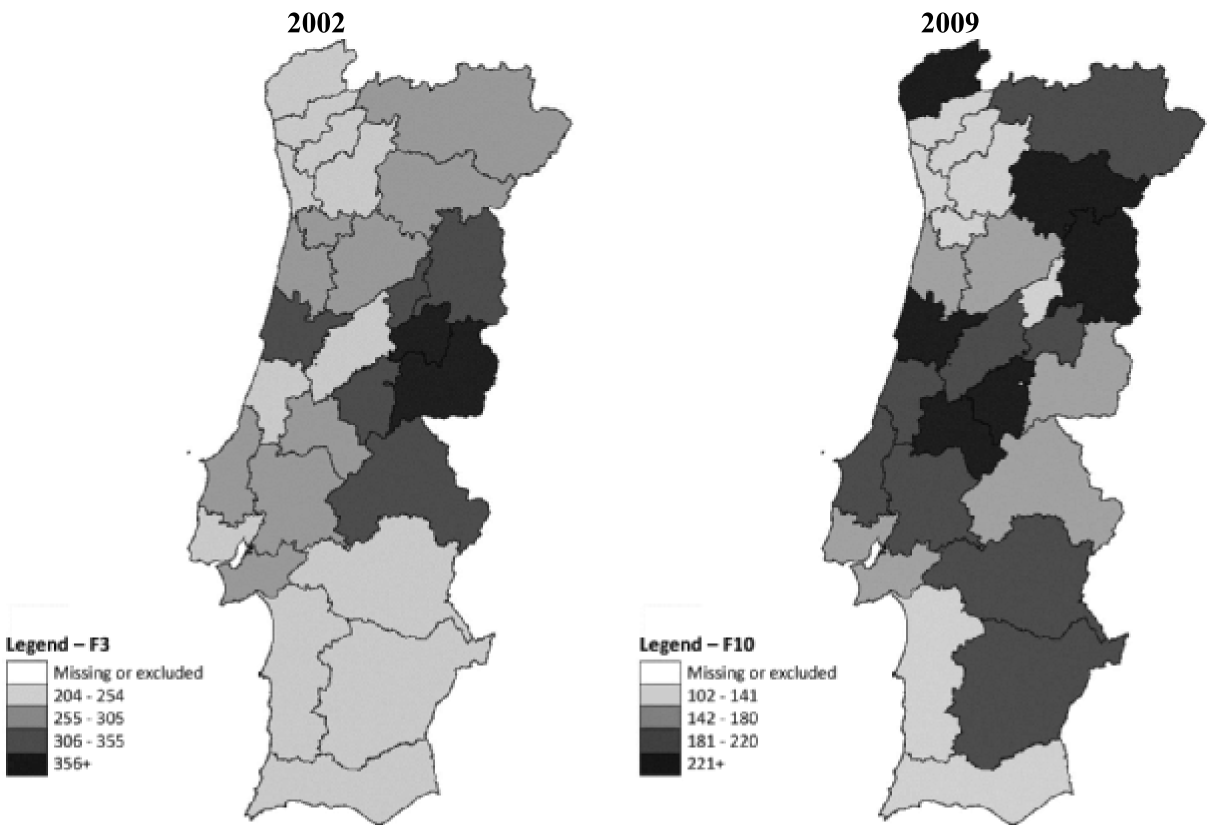
Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.21. Hysterectomy age-standardised rate per 100 000 females by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

Figure 11.22. Maps of hysterectomy age-standardised rate per 100 000 females by geographic region, Portugal, 2002 and 2009



Source: Authors' estimates based on national DRG database, 2002-2009.

11.5. Conclusions

This report has reviewed the evolution of geographic variations in the use of a selected set of health care procedures in Portugal between 2002 and 2009, based on 28 groups of municipalities. The data on utilisation rates have been age- and sex-standardised to remove any effect of different population structures across these different regions and over time. For some of the interventions, there has been a reduction in geographic variations during this period of time, notably for cardiac catheterisation and coronary angioplasty (PTCA) which are used to diagnose and treat ischaemic heart disease, one of the leading causes of mortality in Portugal. The overall increase in PTCA rates combined with the reduction in geographic variations, reflects positive developments in the adoption and access to good clinical practice.

While geographic variations have also decreased for caesarean section rates, the rates as a percentage of deliveries have increased in Portugal but decreased when measured per 1 000 live births. There is evidence that some caesarean sections are not medically required as is the case also in many other OECD countries. Caesarean section rates in Portugal (as in France, Spain and Switzerland) are particularly high in private hospitals, two-times greater than in public hospitals, although caesarean section rates have also been rising in public hospitals where most of the deliveries take place. In response, the Portuguese Ministry of Health has appointed in 2010 a group of experts, with a mandate to: 1) monitor both rates and complications; 2) issue guidelines, particularly regarding the follow-up of low-risk pregnancies; 3) develop guidance for a training programme aimed at health care professionals; 4) propose a plan for both internal and external audits; 5) propose a communication plan for the general population; 6) verify the existence of adequate resources (human and others) in all maternity services; and 7) help implement caesarean section registries and new payment schemes for hospitals.

The number of knee arthroscopies and knee replacements has increased markedly in Portugal between 2002 and 2009, as is the case also in many other OECD countries. While the geographic variations in knee arthroscopies decreased to a certain extent, it still remains very high, and there has been no reduction in the large geographic variations in knee replacement. This means that knee replacement rate has grown as rapidly in regions that had high rates compared with regions that had low rates. With the growing use of this procedure, it is becoming increasingly important to ensure that decisions to perform a knee replacement are based on proper clinical assessment of the potential benefits and risks of the intervention for each patient, and that each patient is properly informed of these potential benefits and risks.

In general, there remain significant geographic variations in the use of different health care procedures in Portugal which cannot be explained by population characteristics. This situation points towards the need to improve access to appropriate care, in order to improve the health outcomes of the Portuguese population.

A National Strategy for Quality in Health Care was launched in 2009 and sets out the goal of improving clinical and organisational quality as well as patient safety (Ordinance 14223/2009). More recently, a national network was created to address the need for continuous improvement in health care quality and to foster a better articulation between the different levels of care.

Minimum volume of activity thresholds should also be taken into consideration in order to reach high-quality standards. This might increase geographic variation if it leads to closing down of small surgical units and their concentration in fewer and bigger hospitals particularly if access problems persist or get worse. People living in the affected region should be offered the procedure but sometimes the hospital will be located further away, which might be a disincentive for people to get the procedure.

There are no decision aids for patients, and patient empowerment is still in its infancy in Portugal. A more systematic collection of information on patient health outcomes, assessed through instruments such as EQ-5D, SF-36, the Oxford Knee Score or the Western Ontario and McMaster Universities Osteoarthritis Index, could also assist in assessing the benefits of different interventions and inform physicians' decision making. In Sweden and England, patient reported outcomes measures are used to study local utilisation rates [see Chapter 14 on United Kingdom (England)].

Even though numerous clinical guidelines have been published by the General Directorate of Health, these have been targeted mainly at the prescription and use of pharmaceuticals. There is a need to develop and monitor the implementation of up-to-date clinical guidelines for diagnostic and surgical procedures, to promote greater harmonisation of medical practices in Portugal. Reasons for non-compliance with the recommended clinical guidelines should be examined closely.

Equity in access to health care is one of the main goals of the Portuguese NHS. If part of the variation observed is the result of barriers to access to care, these barriers need to be identified and measures should be implemented to overcome them.

Knowledge about unwarranted medical practice variations in Portugal is still scarce. More research on this topic, in particular about some of the reasons for these variations, might contribute to improving access to appropriate care for the Portuguese population.

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Chapter 12

Spain: Geographic variations in health care

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This chapter outlines geographic variations in Spain at the provincial and regional levels in the period 2000-10. Hospital admission rates remained stable over time and across regions, with relatively little geographic variation. While caesarean section rates increased in Spain up to 2005, and then decreased, greater variation is observed at the province level. Caeserean section rates have continued to rise in private hospitals, while the trend has been reversed in public hospitals. The overall rates of hysterectomy and the variation across regions decreased during the study period. Cardiovascular procedures (CABG, PTCA and catheterisation) show great variations between provinces, although the variations have decreased over time for PTCA. The number of joint procedures increased over time, with great variation, particularly for knee arthroscopies and knee replacements. As expected, variations across regions have been lower and more stable for surgery after hip fracture. The recent experience in reducing caesarean section rates in many public hospitals provides a good example of the possibility of reducing the over-use of certain interventions through the development and implementation of clinical guidelines in a way that involves all key stakeholders. Nevertheless, the challenge remains to extend this approach to all regions and hospitals.

12.1. Introduction

Medical practice variations have been researched for some time in Spain as part of a policy to improve the quality of the country's health care. The Quality Plan for the National Health System was launched in 2006. The project falls within the line of studies on variations in medical practice developed by the Group of Variations in Medical Practice (Group VPM) under the co-operation agreement signed by the Carlos III Health Institute and by the Instituto Aragones of Health Sciences. Clinical Practice Guides associated with Health Strategies have reinforced and extended the Guía Salud Project with professionals then trained in these methodologies.

The Atlas VPM, which was built on the Dartmouth Atlas of Health Care, is a bottom-up collaborative health services research project that aims to describe systematic and unwarranted variations in medical practice, using both a population-based and a hospital-specific analysis. This project evaluates the health care provided to 35 million people from 180 health areas in 16 autonomous communities (with the exception of Madrid). In the context of this Atlas, variations between procedures or interventions have been analysed in relation to orthopaedics and general surgery, paediatrics, cardiovascular procedures, hospitalisations for mental health conditions and in elderly people and "avoidable" hospitalisations, among others.

This chapter presents the results for Spain for nine selected health care activities and procedures. Section 12.2 presents an overview of Spain's health care system. The next section presents the methods, followed by the results. Policy implications are discussed in the final section.

12.2. Overview of Spain's health care system

Political and organisational structure

In Spain, health care is decentralised to the regions, also called 17 autonomous communities (AC), covering 50 provinces and two autonomous cities. Since 2002, all regions have had autonomous responsibility for managing health care provision. Prior to 2002, only six of the 17 regions had such responsibilities for managing health care provision; the remaining 11 were managed by the National Institute of Health (INSALUD) under the responsibility of the Ministry of Health. Since then, the Spanish health map has been changing, with the construction of new health infrastructure.

The regions have the authority to establish their own health plans and have responsibility for the funding, budget setting, organisation, delivery and evaluation of health services within their region. The Inter-territorial Council of the National Health System (CISNS), which includes the 17 regional ministers of health and is chaired by the national minister, is the highest decision-making body. About one-third of the total budget of the autonomous communities is allocated to health.

One of the responsibilities of the Ministry of Health is to promote the co-ordination and cohesion of the health system across the country. In 2003, the Cohesion and Quality Law for the NHS was published, which still regulates some of the core functions of the Ministry of Health, within the framework of co-ordination between the state and the regions. The Quality Agency of the National Health System was also created, which is responsible for the development and maintenance of the quality of infrastructure elements.

The Quality Plan for the National Health System (NHS) is designed to benefit citizens and promote high-quality health care focused on patients and their needs. It supports health care personnel in the promotion of clinical excellence and in the adoption of best practices based on the best scientific knowledge available (Ministerio de Sanidad y Política, 2009). The Plan has the following main objectives: achieving clinical excellence and improving clinical practice; evaluating clinical and management technologies and procedures; accrediting and auditing health care facilities and services; improving patient safety in NHS health care facilities; and improving the care given to patients with certain pathologies.

Health care expenditure

Total health spending accounted for 9.3% of GDP in Spain in 2011, the same as the OECD average (OECD, 2013). Spain ranks slightly below the OECD average in health spending per capita, with spending of USD 3 072 in 2011 (adjusted for purchasing power parity), compared with an OECD average of around USD 3 300. The share of hospital spending was 42% in 2011, higher than the OECD average of 36%.

Health spending per capita in Spain grew, in real terms, by an average of 4.1% per year between 2000 and 2009 (same as the OECD average), but fell by 0.5% on average between 2009 and 2011 due to a large reduction in public spending on health (OECD, 2013).

Health care financing

Spain has a national health system with universal coverage of the whole population, funded by public taxes. The system is financed overwhelmingly from general taxation (94%), while payroll contributions to work injuries account for 2.5% and mutual funds for civil servants 3% (García-Armesto et al., 2010). After the devolution of health care responsibilities in 2002, the regions fund health care via general budgets. They also receive money from central funds to compensate for regional differences in revenue-raising capacity.

Health care provision is free at the point of use except for dental, optical, over-the counter medication and prescription pharmaceuticals. Prescribed drugs are subject to co-payments. Out-of-pocket (OOP) payments accounted for about 21% of total health expenditure in 2011 (OECD, 2013).

Private health insurance (PHI) plays a small role, mainly to gain faster access to specialist services or dental care (García-Armesto et al., 2010). About 13% of the population have private health insurance, and PHI accounted for 6% of health financing in 2011 (OECD, 2013).

Health care delivery and provider payments

Physician services and payments

GPs act as gatekeepers and work in the public sector in primary health centres. The centres are staffed by GPs, paediatricians, nurses and social workers, and some also have physiotherapists and dentists. The health centres either have their own basic laboratory and diagnostic facilities or are connected to a centralised one that serves a certain area. Specialists work in publicly-funded hospitals and are remunerated on a salary basis. In 2010, Spain had 3.8 practising physicians per 1 000 population, above the OECD average of 3.2.

Hospital delivery and payments

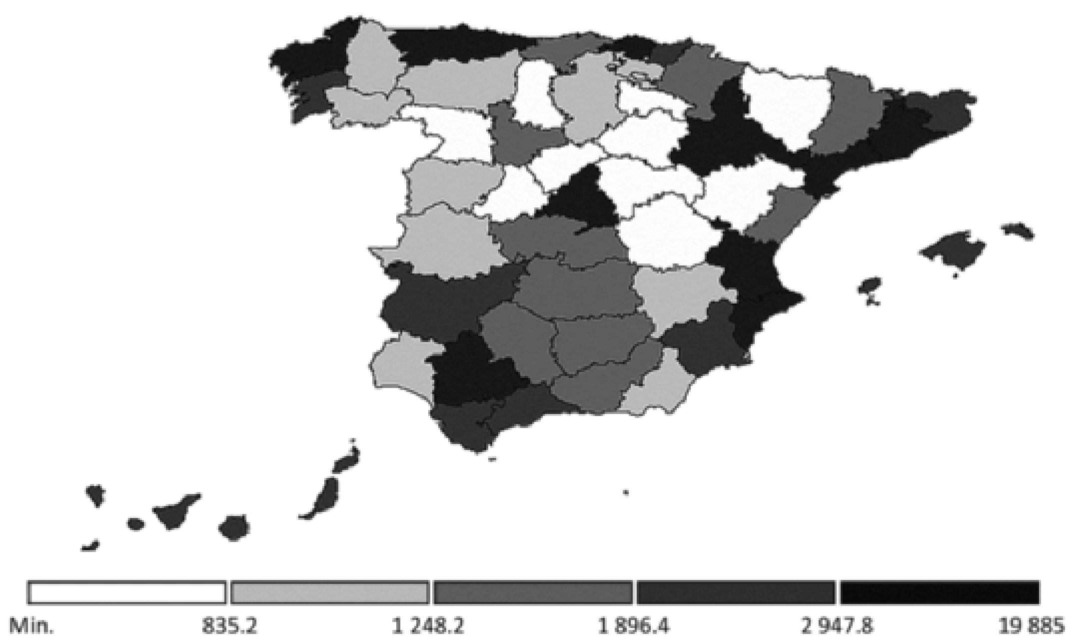
In 2011, 45% of all hospitals were publicly owned, 39% were private for-profit and 16% were private not-for-profit (OECD, 2013). While the majority of hospitals are thus privately owned, 40% of the discharges in private hospitals are publicly funded (García-Armesto et al., 2010). Hospitals are typically remunerated with a global budget that is set prospectively (García-Goñi and Costa-Font, 2013).

The number of hospital beds in Spain was 3.2 per 1 000 population in 2011, less than the OECD average of 5.0. As in most OECD countries, the number of hospital beds per capita in Spain has fallen over time. This reduction has coincided with a reduction in the average length of stay in hospitals and an increase in the number of surgical procedures performed on a same-day (or ambulatory) basis.

In 2000, there were 283 public acute care hospitals, a figure that went up to 292 (95 679 beds) in 2010. There were 270 general acute care private hospitals with a total of 22 999 beds, but the distribution of private hospitals varies across the autonomous communities. Of total hospital admissions, 75.5% were performed in public hospitals and 24.5% in private.

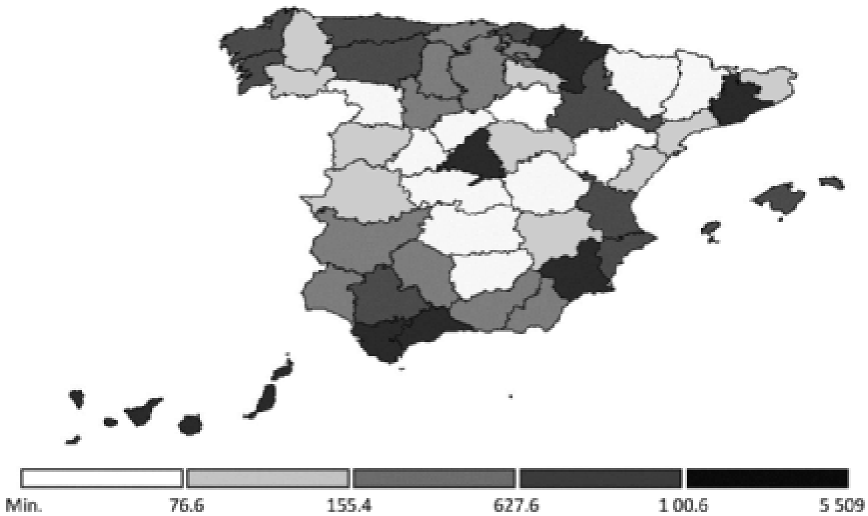
The number of public hospital beds has decreased over the past 10 years in almost all provinces. About 80% of acute hospital beds are installed in public hospitals and only 20% in the private sector. The percentage of private beds ranges from 10% in Extremadura, Castile-La Mancha and Catalonia to around 40% in Navarra, Murcia and Canarias (Figures 12.1 and 12).

Figure 12.1. Map of the number of public beds by province, Spain, 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Figure 12.2. Map of the number of private beds by province, Spain, 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

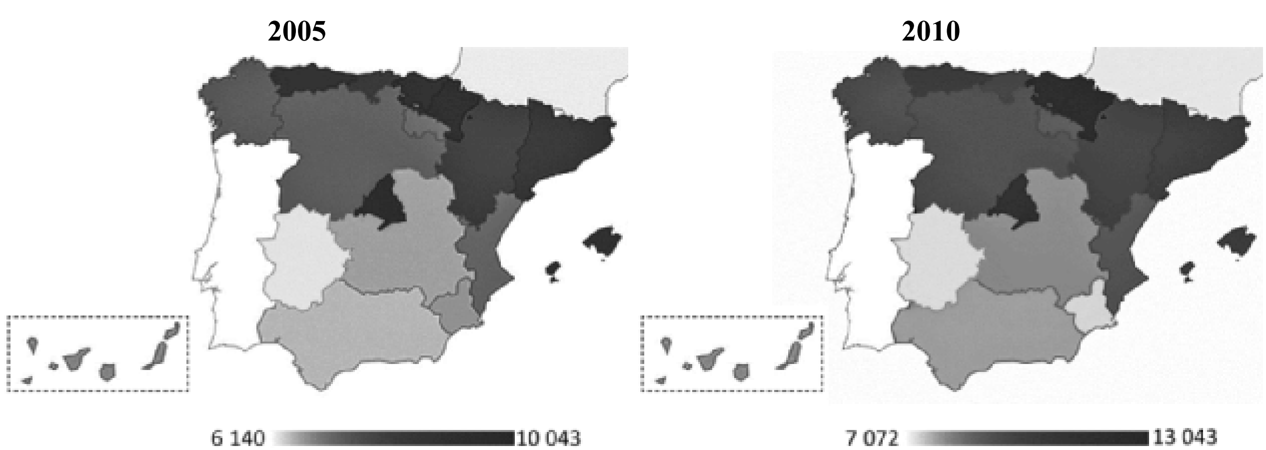
Population characteristics

The population density of the provinces is uneven. Two provinces, Madrid and Barcelona, represent 25% of the total population, while 23 provinces have fewer than 500 000 inhabitants each, representing only 17% of the total.

There has been an increase in the birth rate over the last ten years, with slight growth in the population aged 0-10. The population is also an ageing population, with a particular increase in the percentage of those over 80 years old.

The average income in Spain varies across regions, with the regions in the north of the country generally enjoying higher average income than those in the south (Figure 12.3).

Figure 12.3. Maps of the average net annual income per person, by autonomous community, Spain, 2005 and 2010



Source: National Statistics Institute (2010), "Health Statistics", www.ine.es.

12.3. Data and methods

This study analysis geographic variations at the provincial level over a period of ten years (2000-10) for the following procedures: hospital medical admissions, revascularisation procedures (CABG and PTCA) and cardiac catheterisation, joint procedures (knee replacement, knee arthroscopy and surgery after hip fracture), and gynaecological procedures (caesarean section and hysterectomy).

The source of data for hospital admissions and surgical procedures, including cardiac catheterisation and PTCA, is the minimum data set (MDS) of public hospitals. For the period of analysis, the data from private hospitals are not available for all provinces. As already mentioned, the public sector performs around 75% of all hospital activities, but this percentage care vary, depending on the procedure.

It is important to mention that in the case of caesarean sections and knee arthroscopies, there is a particularly large under-estimation of the number of interventions, as a large share of them are performed in private hospitals (e.g. 37% of caesarean sections).

In this study, the province will be considered the unit of analysis. Ceuta and Melilla, the two autonomous cities, are excluded due to their specific characteristics. The Spanish MDS has two geographic variables. The first considers the province where the hospital is located and the second the province where the patient lives. For most of the procedures analysed, including hospital admissions, we have considered the hospital province, but for CABG, PTCA and catheterisation we have used the patient's province of residence. This is because not all hospitals have cardiovascular surgery or catheterisation laboratories, so for these procedures patients are transferred to the referral hospital.

For knee arthroscopies, PTCA and catheterisation, the data for 2005 and 2010 include not only inpatients but also day cases. Knee arthroscopy is increasingly becoming an ambulatory procedure, but there are still differences among hospitals. The same is also true for PTCA and catheterisation, for which the most experienced catheterisation-lab units have increased the number of outpatient cases. In order to avoid a bias due to under-reporting, activity in both inpatient and outpatient settings are included.

Additional data from the National Hospital Statistics (public and private hospitals) have been used for analytical purposes. The numbers of hospitals, beds and physicians have been obtained from this information system.

12.4. Description of results

Overview of results

Cardiac procedures showed high levels of variation across provinces, followed by knee interventions. Gynaecological procedures showed relatively less variation, along with surgery after hip fracture and hospital medical admissions (Table 12.1 and Figure 12.4).

Hospital admission rates have remained stable over this time period and across the autonomous communities, with relatively little variation between regions. While caesarean section rates increased in Spain up to 2005, and then decreased, there is greater variation is observed at the province level. While caesarean section rates have continued to rise in private hospitals, the earlier upward trend has been reversed in public hospitals. An analysis of hysterectomy shows a downward trend not only in the overall rate of procedures but also in the variation across regions. The results for cardiovascular procedures (CABG, PTCA and catheterisation) show great variations between provinces, although the variations have decreased over time for PTCA. For orthopaedic procedures, there has been an upward trend in the number of procedures over time, with great variation, particularly for knee arthroscopies and knee replacements. As expected, variations across regions have been lower and more stable for surgery after hip fracture.

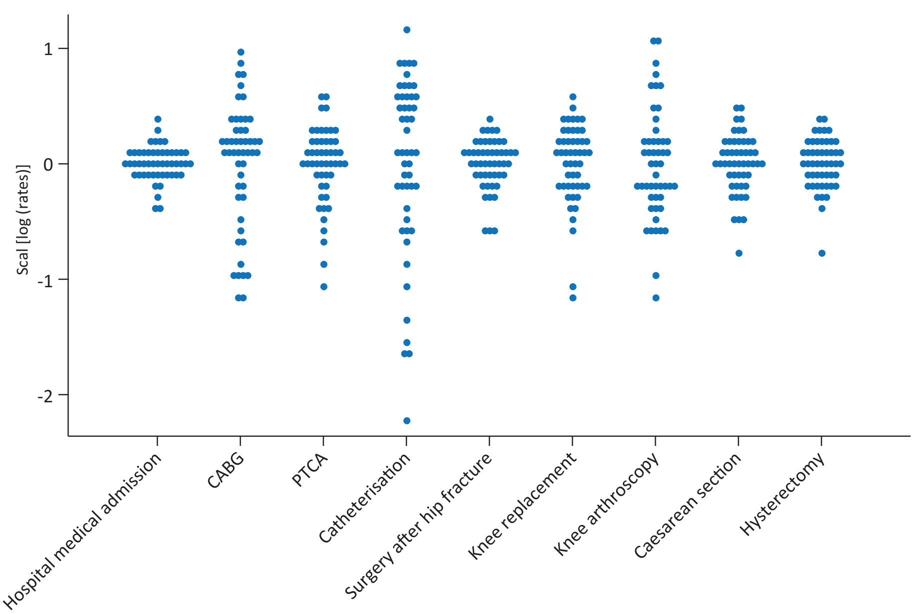
Table 12.1. Summary measures of variation in selected health care interventions by province, Spain, 2010

2010	Hospital medical admissions	CABG	PTCA	Catheterisation	Surgery after hip fracture	Knee replacement	Knee arthroscopy	C-sections (per 1 000 live births)	Hysterectomy (per 100 000 females)
Crude rate (per 100 000 population)	5 244	19	145	174	124	106	106	170	162
Unweighted rate across provinces	5 364	17	137	168	126	104	106	188	175
Q10	4 670	6	88	44	94	68	54	131	135
Q90	6 234	28	179	290	156	148	187	245	221
Coefficient of variation	0.15	0.48	0.3	0.58	0.2	0.3	0.52	0.25	0.21
Systematic component of variation	3.1	23.8	16.4	26.1	4.7	10.7	24.5	6.4	4.7

Note: Unless otherwise specified, all rates are age/sex standardised rates per 100 000 population.

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Figure 12.4. Summary of variation in selected health care activities and procedures by province, Spain, 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Hospital admissions

Hospital admission rates in public hospitals have been fairly stable between 2000 and 2010 (Figure 12.5). The rate ranged 2.1-fold from 7 477 per 100 000 population in Álava to 3 561 in Tenerife in 2010. This is one of the indicators with the lowest variation between provinces. The coefficient of variation was 0.16 in 2000, coming down slightly to 0.15 in 2010.

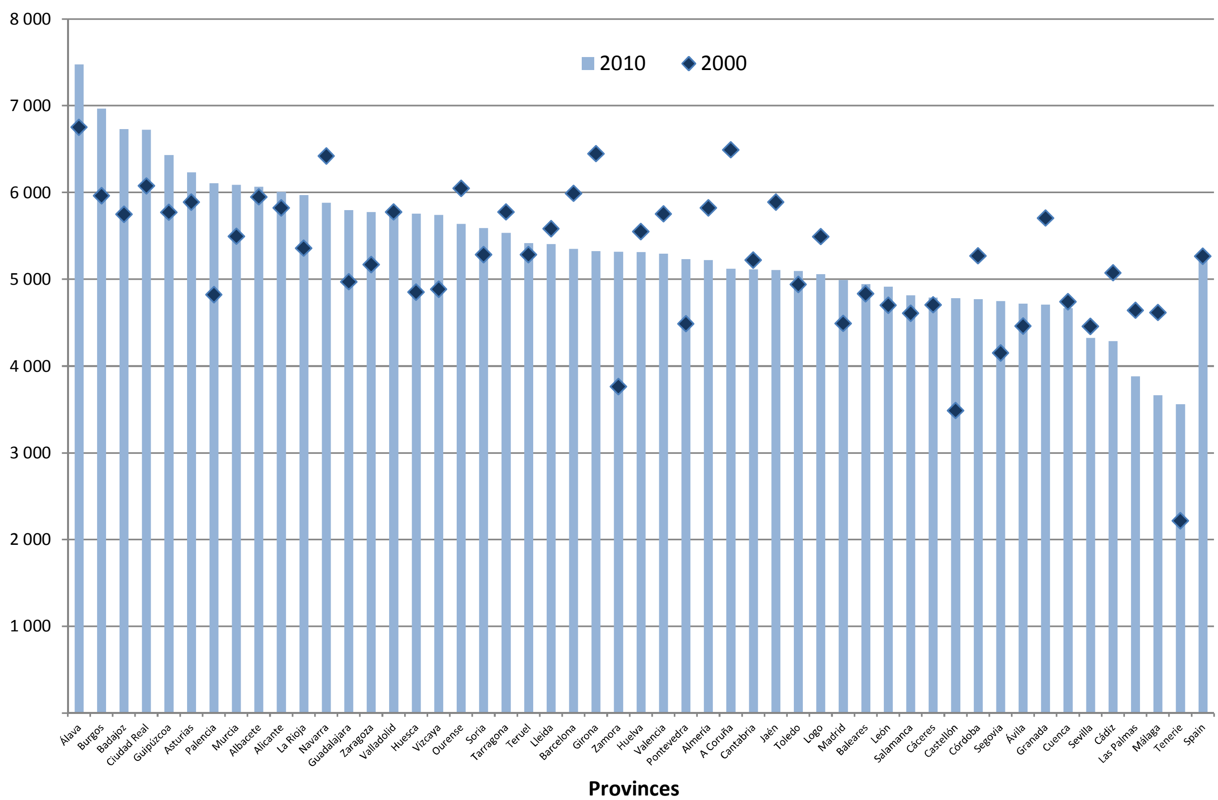
Table 12.2. Summary measures for hospital medical admissions per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rate	5265	5297	5244
Unweighted standardised rate	5242	5399	5364
Q10	4463	4652	4670
Q90	6066	6172	6234
Coefficient of variation	0.16	0.13	0.15

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

All the autonomous communities have increased the number of their facilities and equipment, and the inpatient admission rate has decreased in many provinces (both in public and private hospitals). This has been accompanied by an important rise in the admission of patients as day cases (up 60%) and ambulatory surgery (up 138%) over the last ten years.

Figure 12.5. Hospital medical admissions standardised rate, by province, Spain, 2000 and 2010



Note: The ranking of provinces is from the highest to the lowest rate in 2010.

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Revascularisation procedures

CABG

Coronary bypass (CABG) experienced a slight drop from 18 to 17 per 100 000 population from 2000 to 2010 (Table 12.3). This had a high coefficient of variation across provinces, with this variation growing over the past ten years in spite of a general slight decrease in the overall bypass rates in the last ten years, with the striking exception of Asturias (Figure 12.6). The reason for this increase is unclear. The rate ranged from 38 per 100 000 population in Asturias to one in La Rioja. This is likely due to bias in reporting. For instance, in three provinces with no public supply of cardiac care (Albacete, Guipuzcoa, Rioja), patients are transferred to an associated private hospital which has an agreement with public hospitals hospitals, which likely explains the very low rates of CABG observed in this report.

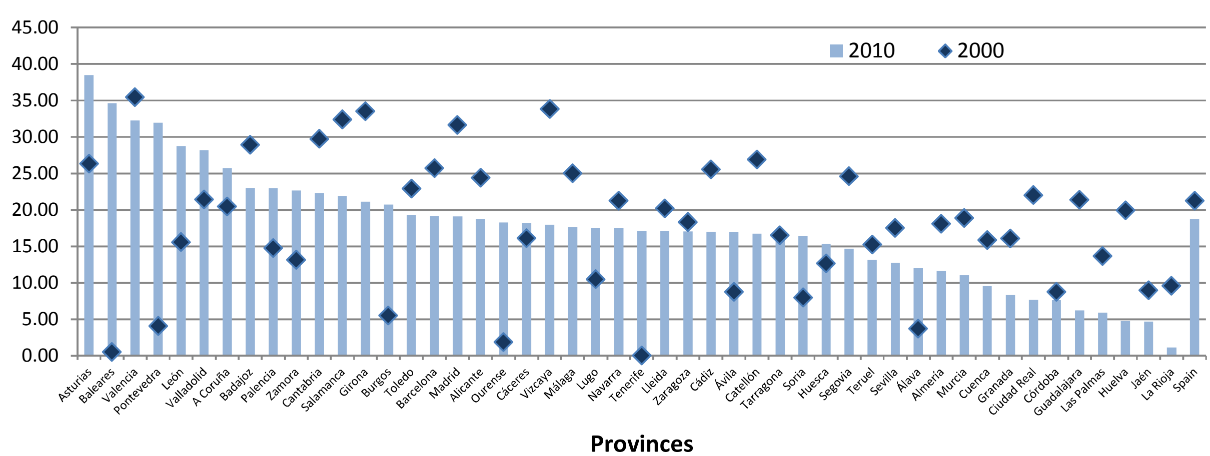
Table 12.3. Summary measures for CABG rate per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rate	21	20	19
Unweighted standardised rate	18	18	17
Q10	7	9	6
Q90	31	29	28
Coefficient of variation	0.38	0.45	0.48

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

By sex and age group, in 2000, the male CABG rate was two-fold or even higher than the female rate, and the majority of the procedures were done between age 64 and 75. Ten years later, in 2010, the gender gap remained, but in most provinces, there has been a change in the most frequent age of performance to the oldest group.

Figure 12.6. Coronary bypass standardised rate per 100 000 population, by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

PTCA

PTCA is a procedure that has shown strong growth in the last ten years, more than doubling from an average rate of 59 per 100 000 in 2000 to 137 in 2010 (Table 12.4). The largest increase occurred between 2000 and 2005. The coefficient of variation dropped sharply between 2000 and 2010, probably because of the greater convergence in practice as a result of standardisation of clinical indications for the procedure.

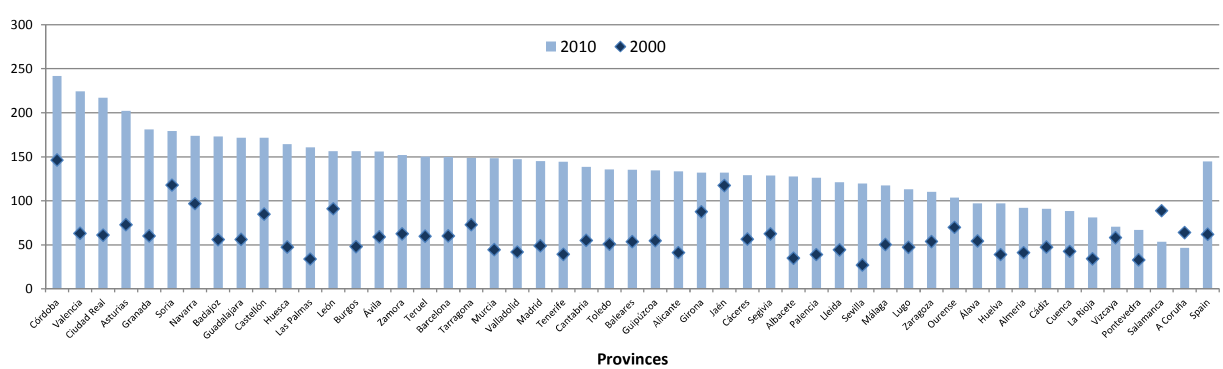
Table 12.4. Summary measures for PTCA rate per 100 000 population (public hospitals only), by province, Spain, 2000 to 2010

	2000	2005	2010
Crude rate	62	117	145
Unweighted standardised rate	59	110	137
Q10	39	76	88
Q90	89	158	179
Coefficient of variation	0.4	0.34	0.3

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

It is important to point out that while this procedure used to be carried out with the hospitalisation of patients for at least one night, an increasing portion of these procedures are performed as day surgery (ranging from around 12% in some provinces up to 28% in others). These same-day surgery activities are not included in the data presented here. The highest rate was in Córdoba (241 per 100 000 population) to 47 in A Coruña (Figure 12.7), showing a five-fold variation.

Figure 12.7. PTCA age- and gender-standardised rates per 100 000 population, by province, Spain, 2000 and 2010



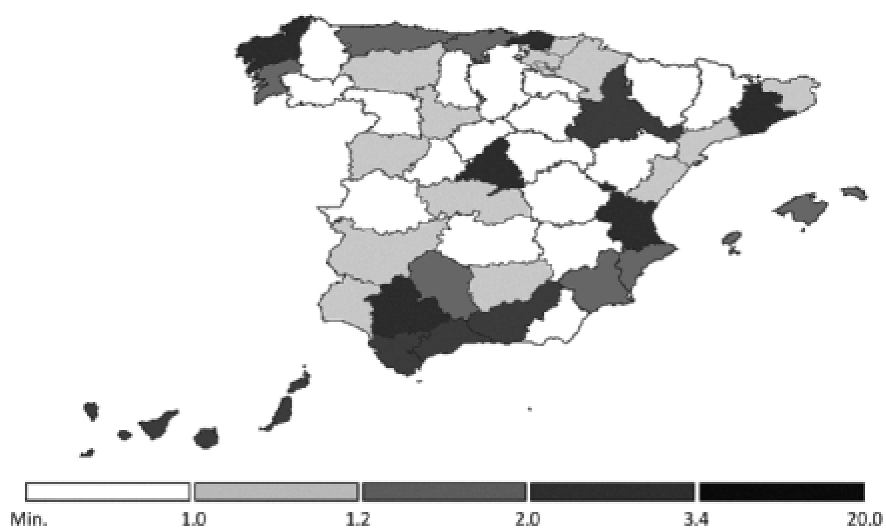
Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

If we compare rates between men and women, both PTCA and CABG are more frequently performed in males than in females, with an almost three-fold ratio in some cases, for all age groups and all provinces; these differences remain over the whole period. As for age, the rate of the procedure increased substantially over the years for the 75+ age group, which, in some provinces has the same rate as the 64-75 age group.

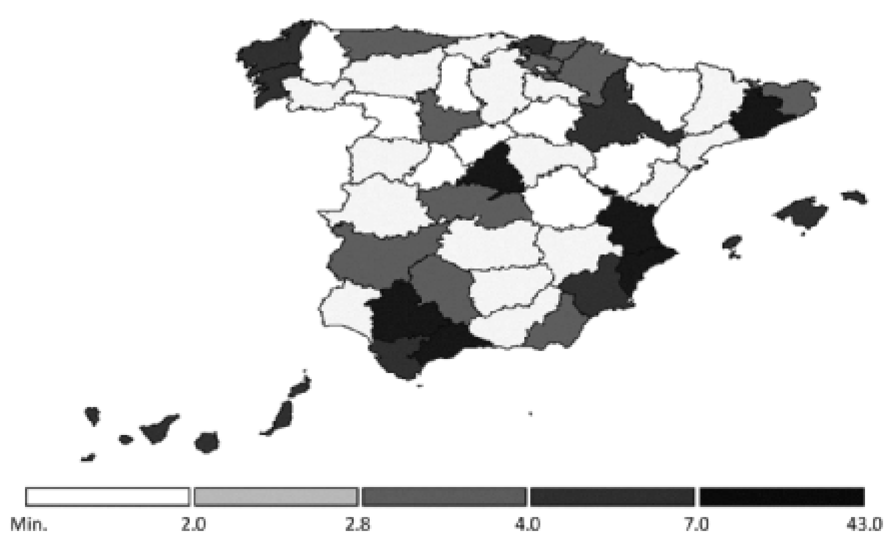
The map of the health care infrastructure and specialties portfolio has changed during the last ten years. While in 2000, 22 provinces had a cardiovascular surgery unit, this went up to 27 in 2010. There has been also a substantial increase in the number of catheterisation labs between 2000 and 2010; in 2000 there were 97 cath-labs and in 2010, the number totalled 244 (an increase of 151%) (Figure 12.8).

Figure 12.8. Maps of catheterisation labs, by province, Spain, 2000 and 2010

2000



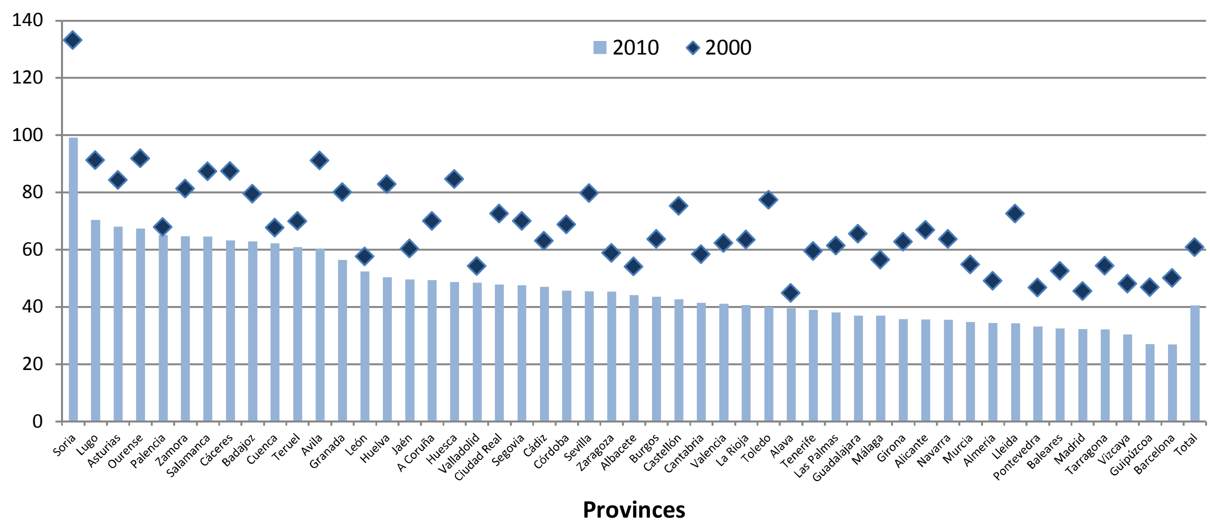
2010



Source: Ministry of Health, Social Services and Equity (2010), “Minimum Data Set”, www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

According to Bertomeu and Castillo-Castillo (2008), the mortality rate from cardiovascular disease (CVD) varies substantially between the different regions of Spain. The regions with the highest cardiovascular mortality rate (including both for ischaemic heart disease and cerebrovascular disease) are the Community of Valencia, Extremadura, Andalusia, Murcia, and the Canary Islands. On the other hand, Madrid, Navarre, Castile and Leon and Aragon are the communities with the lowest cardiovascular mortality rates (Figure 12.9).

Figure 12.9. Ischaemic heart disease mortality rate per 100 000 population, by province, Spain, 2000 and 2010

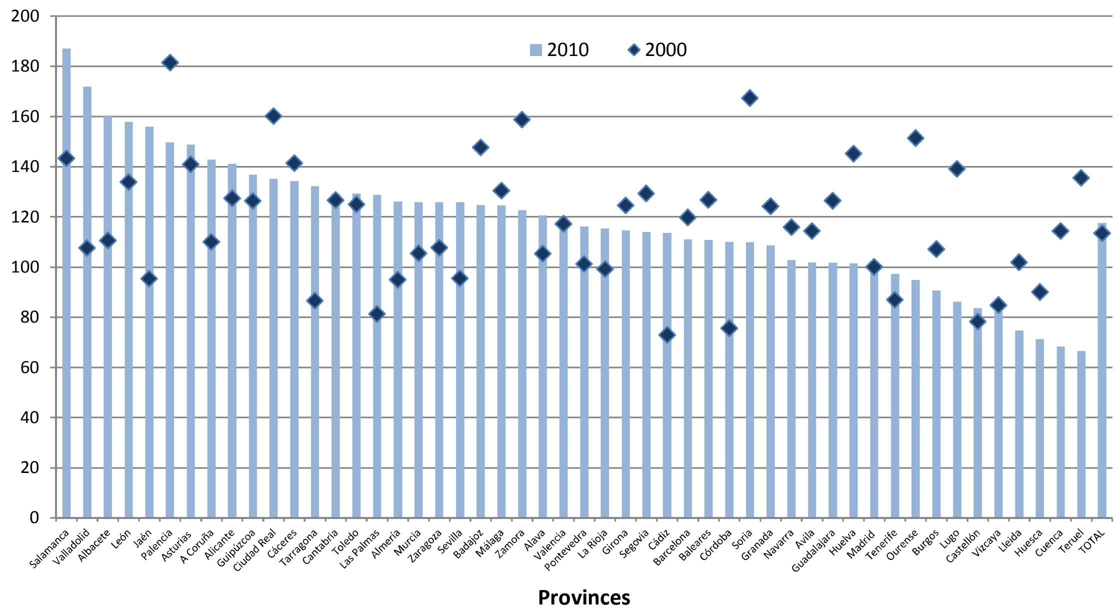


Source: National Statistics Institute (2010), "Health Statistics", www.ine.es.

With regard to the rate of hospitalisation for cardiovascular disease in public hospitals, Navarra and Madrid have rates below the national average, while Castile and Leon have the highest rates (Figure 12.10). The Atlas VPM group has published a study pointing out variations in hospital admissions for cardiovascular diseases (Márquez-Calderón et al., 2007).

Improving care for ischaemic heart disease in Spain has been a strategic objective for the Ministry of Health since 2004. The Ischaemic Heart Disease Strategy is part of the Quality Plan for the Spanish national health system (NHS) co-ordinated by the Ministry of Health. Some of its main goals are the promotion of the use of the best therapeutic option, depending on the place and time, with an emphasis on primary angioplasty in acute myocardial infarction cases. The identification of the low-volume heart surgery units with which disparate results are associated corresponds to one of the key drivers of the parallel initiative of the MSPS, namely the creation of CSURs – Reference Centres, Services and Units – for the Spanish NHS network. Finally, the strategy aims to consolidate research networks as an essential part of the management of this condition (Ministry of Health and Social Policy, 2009). Among the recommendations, considering the primary angioplasties as the initial treatment for myocardial infarctions requires the creation of a tertiary hospital network guaranteeing the continuous availability of angioplasty.

Figure 12.10. Myocardial infarction hospitalisation rate per 100 000 population, by province (patient residence), Spain, 2000 and 2010



Source: National Statistics Institute (2010), "Health Statistics", www.ine.es.

The Spanish Society of Cardiology (SEC) plays a major role in the dissemination of clinical guidelines and indication protocols for various therapeutic procedures related to ischaemic heart disease. Alonso et al. (2000) published a clinical guideline on coronary surgery which informed the society's work. The Society has participated in the Working Group of the European Society of Cardiology for coronary intervention (Silber et al., 2005) and in the Working Group of Myocardial Revascularisation of the European Society of Cardiology (ESC) and the European Association of Cardiothoracic Surgery (EACTS) (Wijns et al., 2010). The role of the Society could be one of the causes for the reduction of the variation in revascularisation procedures, such as PTCA.

Catheterisation

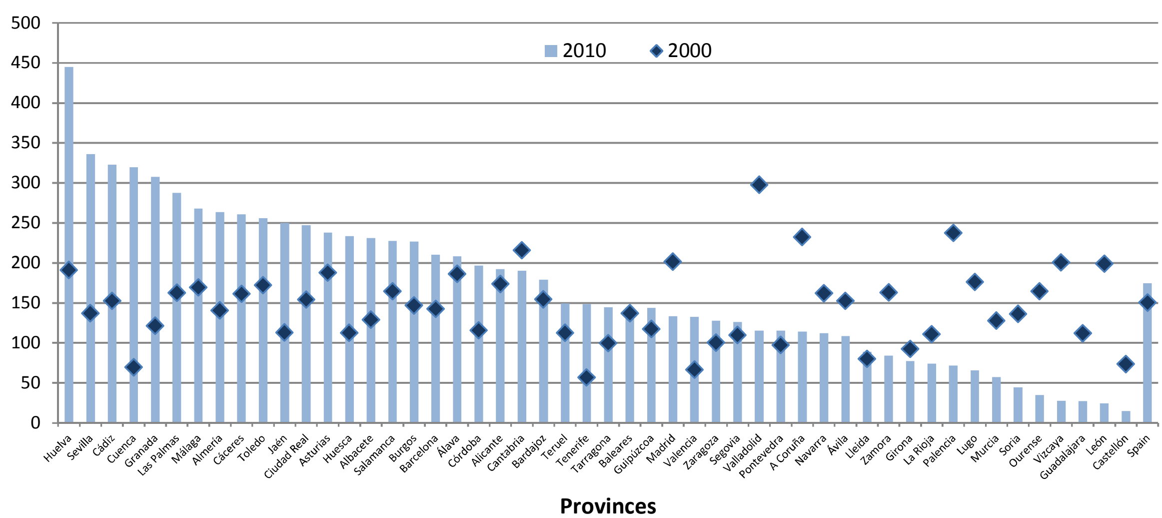
Just as for PTCA, there was a large increase in coronary angiographies between 2000 and 2005 from 146 per 100 000 to 191 (Table 12.5), with coefficients of variation lower than PTCA but still high, at 0.33. If we analyse inpatient activity alone, there has been a downward trend, but if outpatient activity is added, the differences soften. The use of coronary angiographies still shows a large variability between provinces (Figure 12.11).

Table 12.5. Summary measures for catheterisation standardised rate per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rates	150	197	174
Unweighted standardised rate	146	191	168
Q10	91	120	44
Q90	201	285	290
Coefficient of variation	0.33	0.33	0.58

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Figure 12.11. Catheterisation standardised rate per 100 000 population, by patient's province of residence, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Joint procedures

Surgery after hip fracture

The rate of surgery after hip fracture has increased over time from 102 to 126 per 100 000 between 2000 and 2010 (Table 12.6). Although there is some variability between provinces, the coefficient of variation is the lowest of all the analysed procedures, and it has been decreasing over the years, dropping from 0.25 in 2000 to 0.20 in 2010.

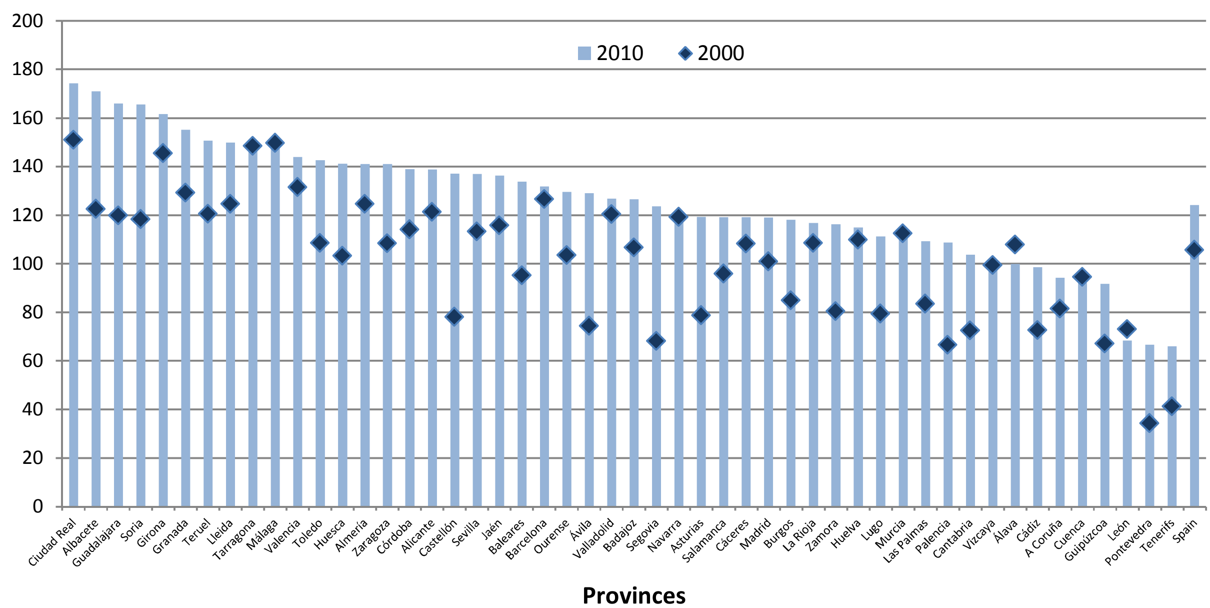
Table 12.6. Summary measures for surgery after hip fracture rate per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rates	106	117	124
Unweighted standardised rate	102	115	126
Q10	72	89	94
Q90	129	144	156
Coefficient of variation	0.25	0.22	0.2

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Figure 12.12 shows that the rate increased gradually for most provinces with a consistently higher rate in women than in men. This procedure is performed mostly in patients over age 75. The surgery is indicated when needed to prevent complications from a long-term immobilisation.

Figure 12.12. Surgery after hip fracture standardised rate, by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Knee replacement

The rate of knee replacements increased at a very striking pace between 2000 and 2005, with the rate nearly doubling in some provinces from 55 per 100 000 population to 93 (Table 12.7). Between 2005 and 2010, Spain as a whole had a slight increase, although the rate decreased in a few provinces. The coefficient of variation decreased during the study period but remained high: it stood at 0.38 in 2000 and 0.42 in 2005, but dropped to 0.33 in 2010.

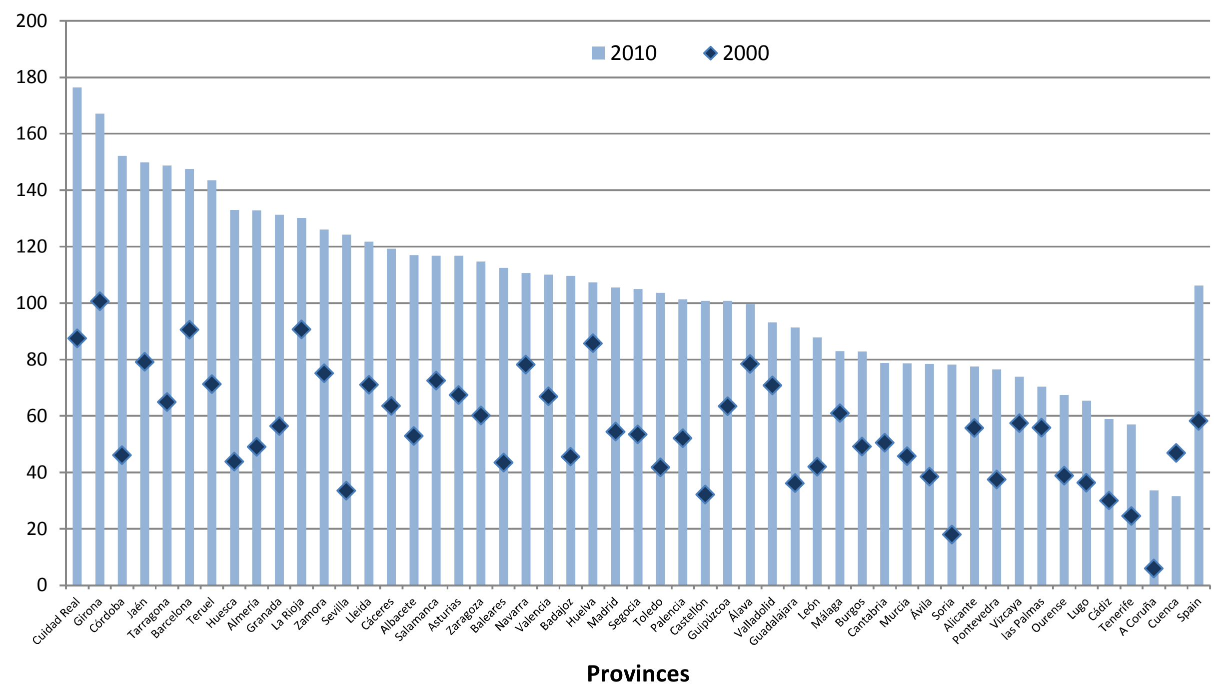
Table 12.7. Summary measures for knee replacement rate per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rates	58	102	106
Unweighted standardised rate	55	93	104
Q10	33	46	67
Q90	80	159	148
Coefficient of variation	0.35	0.41	0.3

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Ciudad Real had the highest rate (176 per 100 000) and Cuenca (32 per 100 000) had the lowest rate (Figure 12.13). Regarding gender distribution, the knee replacement rate is higher among women, and is twice as much in some provinces.

Figure 12.13. Knee replacement standardised rate per 100 000 population, by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Knee arthroscopy

The major increase in knee arthroscopy happened between 2000 and 2005 from 69 per 100 000 population to 99, whereas from 2005 to 2010 it increased in some provinces and decreased in others (Table 12.8 and Figure 12.14). The rate ranged from 279 per 100 000 in Navarra to 30 in Las Palmas (9.3-fold variation).

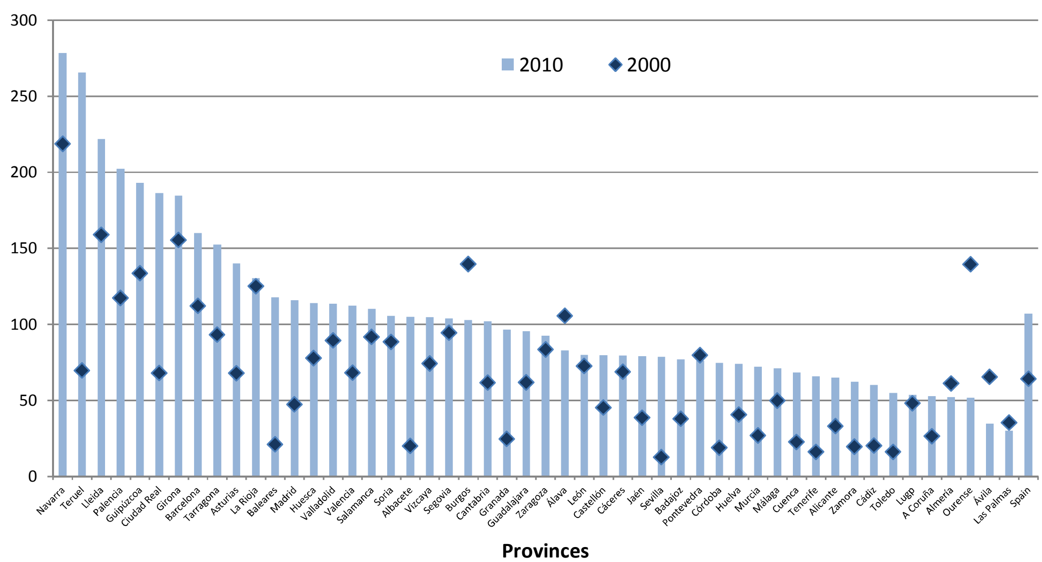
Table 12.8. Summary measures for knee arthroscopy rate per 100 000 population (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rates	64	97	106
Unweighted standardised rate	69	99	106
Q10	19	44	55
Q90	134	157	187
Coefficient of variation	0.65	0.54	0.52

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

For a better analysis of the variations, outpatient hospital day-cases have been taken into account because arthroscopy has become, in many hospitals, an ambulatory procedure. The analysis of knee procedures indicates a significant increase in the number of procedures, combined with a slight reduction in the variation across provinces. Regarding the gender distribution, the procedure is more frequently performed in men than in women. In terms of the age distribution, the procedure is performed most frequently in the middle ages (between age 45 and 64) but the average age in men is lower.

Figure 12.14. Knee arthroscopy standardised rate per 100 000 population, by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

The analysis of knee procedures indicates a significant increase in the number of procedures, combined with a slight reduction in variations across provinces. According to the most recent estimate on the prevalence of knee osteoarthritis, it affected 10% of the adult population (aged 20 and over) in 2012, but with variations between regions (Table 12.9).

Table 12.9. Knee arthrosis by autonomous community, Spain, 2012

Autonomous community	Knee arthrosis number (% of all cases)	Autonomous community	Knee arthrosis number (% of all cases)
Andalucía	752 984 (1.83)	Extremadura	109 163 (0.27)
Aragón	199 159 (0.48)	Galicia	277 939 (0.68)
Asturias	109 361 (0.27)	Madrid	546 376 (1.33)
Islas Baleares	89 356 (0.22)	Región de Murcia	121 061 (0.29)
Canarias	181 165 (0.44)	Navarra	56 572 (0.14)
Cantabria	54 675 (0.13)	País Vasco	213 720 (0.52)
Castilla y León	252 158 (0.61)	La Rioja	27 500 (0.07)
Castilla - La Mancha	178 486 (0.43)	Comunidad Valenciana	427 405 (1.04)
Cataluña	646 951 (1.57)		
Spain	**4 258 725 (10.35)**		

Note: Most recent year used as data for 2010 were not available.

Source: Spanish Society of Rheumatology (2012), "EPISER Study Group. Report of the Prevalence of the Rheumatic Diseases in Spain", available at www.ser.es/actualidad/Informes_Estadisticos.php.

The number of orthopaedic surgeons has increased over the years in all regions (ACs). The largest increases were in regions such as Catalonia, Castilla-La Mancha and Madrid, and were associated with the opening of new health care facilities. In 2010, in some regions the number of orthopaedic surgeons per 100 000 population was about 50% lower than the national average, while it was about 50% higher in others. There is no a correlation between the number of orthopaedic surgeons and the number of procedures.

Gynaecological procedures

Caesarean section

The caesarean section age-standardised rate increased from 165 to 188 per 1 000 live births from 2000 to 2010 while variations across provinces remained stable (Table 12.10).

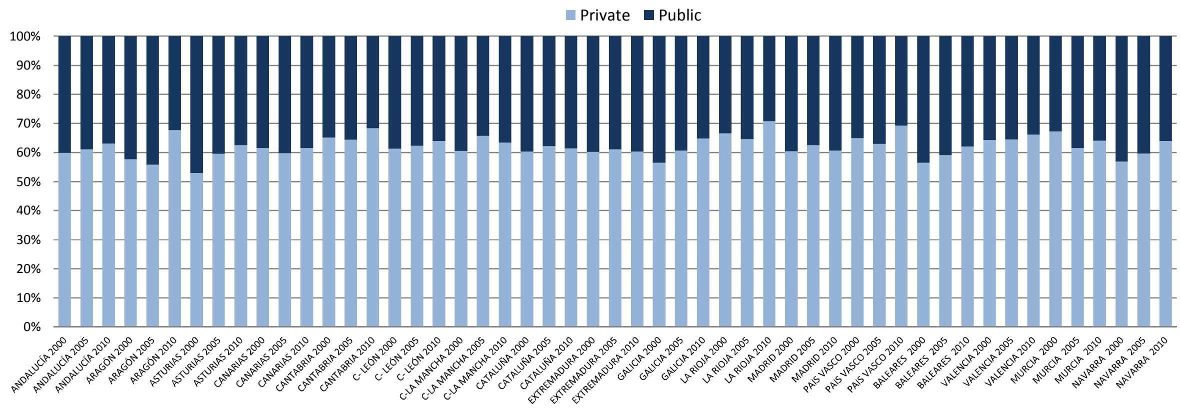
Table 12.10. Summary measures for caesarean section rate per 1 000 live births (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rate	150	173	170
Unweighted standardised rate	165	220	188
Q10	116	165	131
Q90	228	278	245
Coefficient of variation	0.25	0.23	0.25

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

Caesarean section is currently one of the most common surgical emergency procedures. In 2010, the overall caesarean section rate (including both public and private hospitals) stood at 25% of births, according to figures published by the National Statistics Institute (2010) (Figure 12.15).

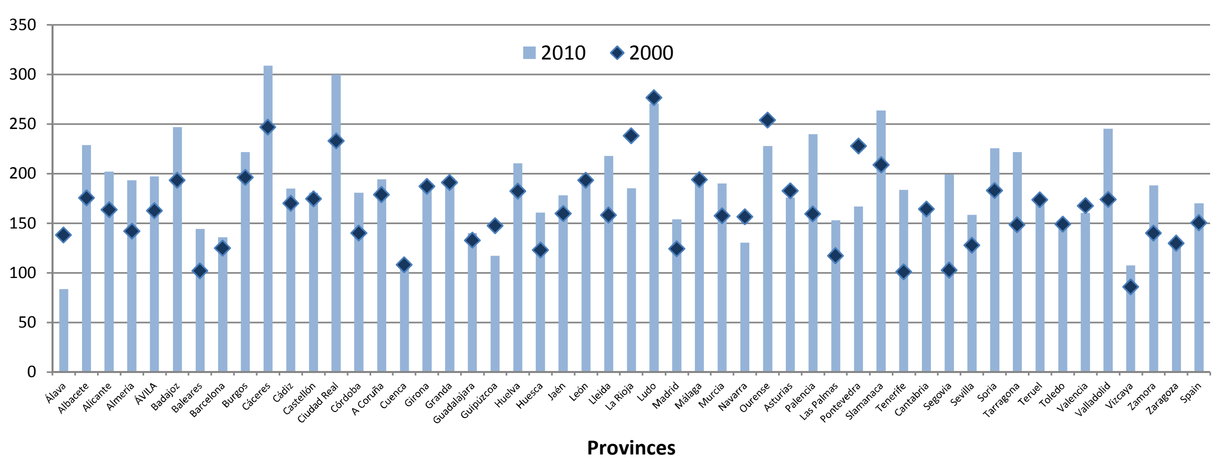
Figure 12.15. Distribution of caesarean section age-standardised rate between public and private hospitals, by autonomous community, Spain, 2000, 2005 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm; National Statistics Institute (2010), "Health Statistics", www.ine.es.

Between 2000 and 2005, there was an increase of about 32% of the national caesarean section rate, although since then there has been a decrease of nearly 15% from 2005 to 2010 (Figure 12.16).

Figure 12.16. Caesarean section age-standardised rate per 1 000 live births by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

It is important to stress that there are practice variations between private and public providers. The Spanish Ministry of Health tackled the earlier upward trend in caesarean sections with two types of projects. One project involved the careful analysis of clinical practice variations, in collaboration with the Atlas-VPM group, which led to the publication of the report "Variations in the use of risk-adjusted caesareans in obstetrical acute hospitals in the national health system, 2009". This report concluded that the variability in caesarean section rates cannot be attributed to differences in need, and recommended the development of a set of indicators for monitoring misuse. The Observatory of Women's Health also co-ordinated the development of a "Strategy of normal delivery care in the National Health System" in collaboration with the autonomous communities, scientific societies and patient associations, with the aim of standardising obstetric practices. Secondly, the project "Clinical standards for the adequacy of caesarean section" was carried out in 2010-11 through a multicentre analysis and aimed to assess the adequacy of caesarean sections in light of standards previously defined by a group of experts. The first phase included 41 public hospitals, and a second phase is planned in 2013-14. One of the major conclusions of this work is that the caesarean rate decreases when they are recorded daily/weekly after the assessment of each case by a protocol of inclusion. Thus, analysing the rates of the 14 provinces where these public hospitals are located, ten of them have shown a reduction in the rate of caesarean sections and in some cases a very significant reduction.

The Spanish Society of Obstetrics and Gynaecology (SEGO) have also been involved in the standardisation of obstetrics procedures. In 2002, it published a protocol for caesarean sections in terms of surgical technique but without specifying indications. Later, in 2010, this Society developed a guidelines and a "Protocol of vaginal delivery after caesarean" (SEGO, 2010).

Hysterectomy

The hysterectomy rate decreased from 181 per 100 000 females to 162 from 2000 to 2010 accompanied by a reduction in variation across provinces (coefficient of variation dropped from 0.33 to 0.21) (Table 12.11).

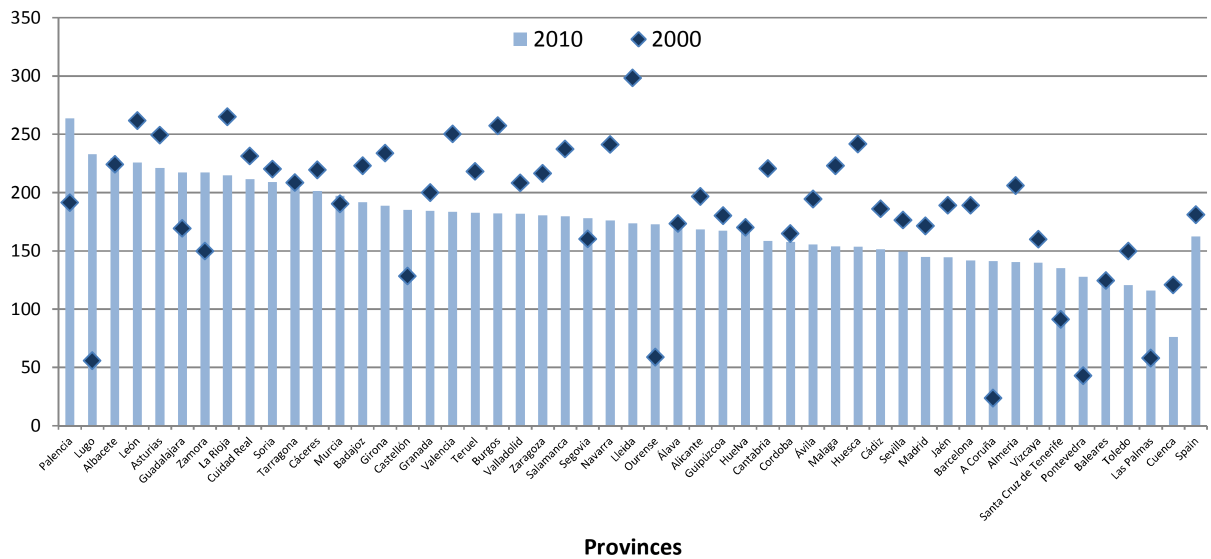
Table 12.11.Summary measures for hysterectomy age-standardised rate per 100 000 females (public hospitals only), by province, Spain, 2000-10

	2000	2005	2010
Crude rate	181	183	162
Unweighted standardised rate	184	193	175
Q10	88	146	135
Q90	249	248	221
Coefficient of variation	0.33	0.2	0.21

Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

There has been a gradual decrease in the hysterectomy rate between 2005 and 2010 in almost all provinces in Spain, with the reduction particularly large in provinces that had high rates in 2005 (Figure 12.17). This reduction is most noticeable for those aged 35 to 54. The rate ranged from 264 per 100 000 females in Palencia to 76 in Cuenca (3.5-fold variation).

Figure 12.17. Hysterectomy age-standardised rate per 100 000 females, by province, Spain, 2000 and 2010



Source: Ministry of Health, Social Services and Equity (2010), "Minimum Data Set", www.msssi.gob.es/estadEstudios/estadisticas/cmbdhome.htm.

In Spain as in many other countries, hysterectomy rates have diminished in recent years due to new and effective conservative alternatives (Domingo and Pellicer, 2009). The availability of new techniques and interventional radiology has enabled a move to less invasive therapeutic approaches. Variations in hysterectomy rates have also decreased due to more precise indications for its appropriate use.

12.5. Conclusions

The analysis of medical practice variations is useful in order to identify territorial differences in the use of different procedures and to understand the reasons behind these variations. High variability for the selected set of procedures has been shown across the geographical units of analysis in Spain.

Caesarean section, which was increasing in frequency in most provinces up until the mid-2000s, has been the subject of a specific health strategy, since which the rates have been decreasing (or at least stabilising) in many hospitals and provinces.

The analysis of variations in coronary bypass (CABG) and PTCA is complex. In the last few years, there have been new techniques or revisions of the indications for PTCA, but not all specialists have adopted these new techniques or new indications at the same time, which could explain some of the variation, although variations in PTCA rates across provinces have generally decreased between 2000 and 2010.

Proper knowledge and understanding of the latest clinical guidelines and existing practice behaviour is important to analyse medical practice variations. Scientific societies have an important role to play in the dissemination of best practices among their members. In this regard, the Spanish Society of Cardiology has been carrying out important work, which could be one of the causes for the reduction of the variation in revascularisation procedures, such as PTCA.

In a country like Spain, which has a decentralised health care system, the Ministry of Health still plays an important role, especially for monitoring health care performance, analysing territorial differences and co-ordinating national strategies to improve care and diminish variability in health care use at the local level. The "National Strategy for Normal Delivery", which has been designed to reduce the number of unnecessary caesarean sections through the development and monitoring of clinical guidelines, is a very good example of such activity. The implementation of medical practice guidelines, with the continuous monitoring of results at the health care provider level, is an important way to improve and further harmonise medical practices.

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Chapter 13

Switzerland: Geographic variations in health care

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This report presents the inter-cantonal differences between rates of utilisation of certain medical services in Switzerland. The analysis focuses on six procedures performed on an inpatient basis (caesarean section, coronary artery bypass graft (CABG), percutaneous transluminal coronary angioplasty (PTCA), cardiac catheterisation, knee replacement and knee arthroscopy) and two types of admission (medical hospital admission and admission for hip fracture) between 2005 and 2011. Cardiac procedures rates seem to converge over the years. With regard to knee arthroscopies the type of care (ambulatory/inpatient) varies from canton to canton, and the rates of utilisation of inpatient care for this medical practice differ to a certain extent. Lastly, the rates for the other procedures and the remaining two types of admission were already fairly close in 2005 and have remained so throughout the period of analysis.

13.1. Introduction

Unlike other countries, such as the United States, Canada, the United Kingdom and, more recently, a number of continental European countries (the Netherlands, Scandinavian countries, Germany, Italy and Spain), Switzerland does not systematically monitor variations in medical practices. A limited number of studies on the subject have been published, primarily by universities.

Two studies concern variations in orthopaedic surgery practices. One examined variations between cantons over the period 2003-05 (Cerboni and Domenighetti, 2008). The rates of utilisation standardised by gender and age varied by up to 2.2-fold, both for total or partial hip replacement and for knee replacement. Widmer et al. (2009) analysed the variations in 83 hospital service regions. They observed three times more patients treated in regions with a high rate of joint replacement (hip, knee) than in those where these procedures were rarely performed. One study (Fischler et al., 2000) reported on the frequency of tracheotomies, on the basis of a questionnaire sent to all intensive care units in Switzerland. This revealed marked differences in rates of utilisation, indications and the technique used and concluded that, however frequent, this is not a standard practice. Finally, a very general study looked at the differences in the rates of consultation of doctors in private practice (Busato and Künzi, 2008) in 1 018 ambulatory service regions. It linked the observed variations to geographical, socio-demographic and cultural factors.

Although several works published by the Swiss Health Observatory (Obsan) are not strictly speaking analyses of medical practice variations, they shed light on inter-cantonal differences over recent years in the utilisation and/or costs of care. One compares, for instance, medicine costs and consumption in the cantons (Roth and Moreau-Gruet, 2011), while another looks at the degree of convergence of the cantonal costs of mandatory basic health insurance (AOS) over time (Roth and Roth, 2012). Lastly, a recent study summarises and seeks to explain cantonal differences in the costs of AOS between 2000 and 2010 (Camenzind and Sturny, 2013).

In response to a parliamentary postulate (08.3935[1]), a report looked in detail at variations in the rate of caesarean sections (OFSP, 2013). Using a multi-level hierarchical model, it showed the need to take account of factors relating to the hospital involved (university, centralised or regional, private or public/subsidised care), to the patients and their socio-demographic characteristics, and also to additional diagnoses. These included the mother's age, complications during pregnancy or childbirth, the patient's nationality, and the extent to which insurance coverage for a (semi-)private room and a stay in a private establishment increases the probability of a caesarean section. The Federal Council concluded that "given the complexity of the cause-effect chain, it is not possible to fully explain the reasons for the high rate of caesareans in Switzerland" (Conseil Fédéral Suisse, 2013). It "calls on the professional associations of this sector to re-examine the validity of the indications relating to planned caesareans" and points out again that it is primarily up to the professional association in the sector to implement good practice guidelines drawn up by the specialists. Furthermore, the Confederation will examine the feasibility of collating the statistical data collected on the mother and the child more closely in future. That would make it possible to study the effects of the mode of delivery on the new-born's health (e.g. transfer to the neonatal intensive care unit).

This chapter presents a descriptive analysis of variations at the canton level in Switzerland. Section 13.2 provides an overview of the country's health system. Section 13.3 sets out the methodological aspects, such as the sources of the data, the criteria for including or excluding cases, the correspondence between the ICD-9-CM codes and the codes of procedures (CHOP) of Medical Statistics of Hospitals, together with the procedures for standardising and comparing rates of utilisation. Section 13.4 gives a brief summary of the scale of observed variations and comments on the results for each of the eight procedures. Finally, Section 13.5 concludes. This report does not discuss the potential political implications of these results at this stage, since that would first require an in-depth analysis and would also need to be discussed with the health system partners.

13.2. Overview of Switzerland's health care system

Political and organisational structure

Switzerland is a federal country with three levels of government (confederation, cantons and municipalities). Cantons sit at the centre of delivering and funding health services: they share joint responsibilities with the confederation in policy making, regulation and monitoring and can often delegate functions to municipalities. Cantons plan hospital capacities and contribute to the costs of hospitals care.

Swiss residents are obliged to purchase mandatory health insurance from an authorised insurer of their choice within their canton. Health insurers are required to offer a benefit package of health care services, outlined in a legal ruling. For medical services, mandatory coverage is based on a non-exclusive catalogue of diagnostic services and treatments. Coverage of hospital services includes the cost of treatment received in a shared ward, with the law specifying certain exclusions (OECD/WHO, 2011).

Health care expenditure

Health spending accounted for 11% of GDP in Switzerland in 2011, almost 2 percentage points higher than the OECD average of 9.3%. Switzerland also ranks well above the OECD average of around USD 3 300 in terms of health spending per capita, having spent USD 5 643 spent per capita in 2011 (adjusted for purchasing power parity). Hospital spending accounted for 28% of total spending in 2011, close to the OECD average of 29% for 2011.

Health spending per capita in Switzerland grew, in real terms, by an average of 1.9% per year between 2000 and 2009. This growth rate slowed to 0.9% in 2009/10 before accelerating again to 2.1% in 2010/2011.

Health care financing

Health insurance covers a wide range of health services and goods, with 10% cost-sharing for patients. Patients and supplementary health insurance can pay for better accommodation in hospitals. Health insurance finances nearly 46% of total health spending and the government about 19%. Direct payments from patients account for 26% and private health insurance for 9% (OECD, 2013).

Health care delivery and provider payments

Physician services and payments

In Switzerland, generalists and specialists delivering ambulatory care are predominantly self-employed and paid on a fee-for-service basis, while specialists delivering inpatient care are mainly employed by hospitals and are salaried (OECD Health Systems Characteristics Survey, 2012). Unless bound by a specific health insurance contract, patients are free to choose any doctor, and generalists do not act as gatekeepers.

The number of physicians per capita in Switzerland was 3.8 per 1 000 population, higher than the OECD average of 3.2. About 28% of the physician workforce in 2011 was designated as generalist, with a further 56% specialist. These proportions are both lower than the OECD 2011 average of 30% and 62% respectively, which may be explained by 16% of physicians in Switzerland being undefined in speciality.

Hospital services and payments

Most hospitals – the major economic entities in the Swiss health system – are owned by the cantons and municipalities, although specialist hospitals are often privately owned. Hospitals receive payments from cantons and health insurers. The payment system changed in 2012 from *per diem* payments toward DRG-like case-based payments.

The number of hospital beds in Switzerland was 4.9 per 1 000 population in 2011, close to the OECD average (five beds). As in most OECD countries, the number of hospital beds per capita in Switzerland has fallen over the past 20 years. The decline has coincided with a reduction in the average length of stay in hospital and an increase in the number of surgical procedures performed on a same-day (ambulatory) basis (OECD, 2013).

13.3. Data and methods

This study examines variations in the following: hospital medical admissions, coronary artery bypass graft (CABG), percutaneous transluminal coronary angioplasty (PTCA), cardiac catheterisation, hip fracture, knee replacement, knee arthroscopy, and caesarean section. The procedures were selected on the basis of their relative volume and cost, substitutability (to explore the rate of utilisation of alternative procedures) and political relevance. Hip replacement after hip fracture was selected as a calibration procedure, for which variations in standardised rates between regions/cantons are not expected to be very marked (Widmer et al., 2009; Brownlee et al., 2011).

The analysis used data from the Medical Statistics and Administrative Statistics of the Hospitals of the Federal Statistical Office (FSO). Since 1998, Swiss hospitals and clinics must provide data on hospital admissions within their establishments, notably on diagnoses and treatments. The medical statistics show, for each hospital stay, the patient's canton of residence, the various treatments and diagnoses that have been performed, and certain socio-demographic data relating to the patients. The Administrative Statistics relate to the hospitals and provide various kinds of information, mainly administrative, on all hospitals of the country. Thanks to a liaison code, patients can be linked to the hospital in which they have been registered. That puts the data relating to patients and their treatment in perspective with the characteristics of the hospital in which they stayed. These two databases provide exhaustive records that are updated annually. Procedure codes were mapped from the Swiss Classification of Operations (CHOP) to match the codes in the OECD guidelines using ICD-9-CM classification (Annex 13.A1). The population data were drawn from the FSO Annual Population Statistics (ESPOP) until 2009 and the FSO Population and Households Statistics (STATPOP) from 2010.

The selected geographical unit is the Swiss canton, the only unit that is relevant in terms of health policy (Figure 13.1 below). Under the Swiss federal system, the 26 cantons are responsible for the organisation and supervision of hospitals. The downside, from a statistical point of view, is that the cantonal populations vary enormously in size. The smallest canton (Appenzell Inner Rhodes – AI) had a population of 15 700 in 2010, the largest (Zurich – ZH) a population of more than a million (1 373 100) inhabitants. The small cantons may generate marked variations in utilisation rates from one year to another. To avoid too many variations for the smallest canton (AI), its data was pooled together with another canton (Appenzell Outer Rhodes – AR).

Figure 13.1. Map of Switzerland by canton, 2011

Source: Office Fédéral de la Statistique – ThemaKart available at www.bfs.admin.ch/bfs/portal/fr/index/regionen/22/nl/02.html.

The study period covers 2005-11, where 2011 data were the most recent available at the time of this study. Although data are available as far back as 1998, the Swiss Federal Statistics Office (FSO) does not recommend using data before 2005 due to the quality and comparability in the coding of the health care activities and procedures.

According to the OECD guidelines, the rate of utilisation of the various procedures were standardised using the Swiss population for each of the years 2005-11 to calculate the standardised rates, which neutralises the demographic effect for each of those years but does not, on the other hand, neutralise the demographic changes over time (between 2005 and 2011).

Maps present the variations in practice between cantons. Five categories are defined on the basis of deviation from the average. The threshold values used are indicated in Table 13.1.

Table 13.1. Method of categorising the standardised rate of utilisation, Switzerland

Category	Standard deviation from the average[1]
Well below average	More than 1 standard deviation below the average (Z<-1.0)
Below average	Between 1 and 0.51 standard deviation below the average (-1.0≤Z<-0.5)
Around average	Within between ± half a standard deviation from the average (-0.5≤Z≤0.5)
Above average	Between 0.51 and 1.00 standard deviation above the average (0.5<Z≤1)
Well above average	More than 1 standard deviation above the average (1<Z)

1. The value Z is defined as the difference between the value under consideration and the distribution average, divided by the standard deviation, according to the formula: $Z = \frac{x - \mu}{\sigma}$.

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

13.4. Description of results

Overview of results

This section now turns to the results found on geographic variations across cantons. It examines the degree of variability of procedures, first by comparing various dispersion measures, then on the basis of two graphs showing the coefficient of variation of the various procedures and the distribution of the standardised rates.

Table 13.2 shows the utilisation rates of the various medical procedures analysed and the scale of inter-cantonal variations. The interventions showing the least and the greatest inter-cantonal variations are, respectively, hospital medical admission and knee arthroscopy.

Table 13.2. Summary of standardised rates and statistics across cantons, Switzerland, 2011

	Hospital medical admissions	CABG	PTCA	Cardiac catheterisation	Hip fracture	Knee replacement	Knee arthroscopy	Caesarean (rates per 1 000 live births)
Average standardised rates	7 044	39	188	340	163	218	243	323
Q10	6 014	24	138	208	121	165	12	265
Q90	8 715	50	231	447	214	265	416	380
Coefficient of variation	0.14	0.26	0.17	0.27	0.2	0.17	0.49	0.15
Systematic variation (2005-2011)	1.7	3.9	4.9	7.7	1.8	2.8	20	1.8

Note: Unless otherwise indicated, the rates are standardised annually by age and gender and expressed per 100 000 inhabitants.

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Figure 13.2 graphically shows the coefficients of variation of the standardised rates of utilisation in 2011 for the eight procedures and admissions examined. This is obtained by dividing the standard deviation of a distribution by its average, so as to compare the variability of series with very different averages or expressed in different units of measurement. A high variation coefficient is the result of a wide dispersion of data.

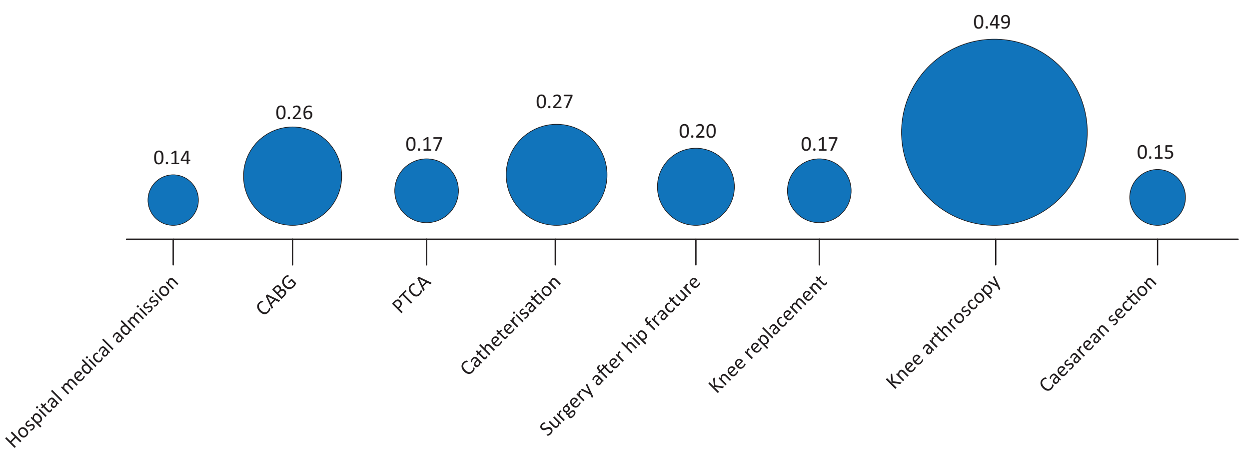
In general, this figure shows three distinct levels of variability:

1. Hospital admission (0.14) and caesarean section (0.15) are the procedures with the lowest inter-cantonal variations. Coronary angioplasty (0.17) and knee replacement (0.17) also have low variability rates.

2. Interventions with average variability rates in 2011 include admission for hip fracture (0.20), cardiac catheterisation (0.27) and coronary bypass (0.26).

3. The widest inter-cantonal variability (0.49) is found in knee arthroscopy. Here, the kind of care, whether ambulatory or inpatient, may explain the variations observed between cantons. In fact, Medical Statistics of Hospitals records only inpatient care and data coverage does not include ambulatory care or activity outside hospitals.

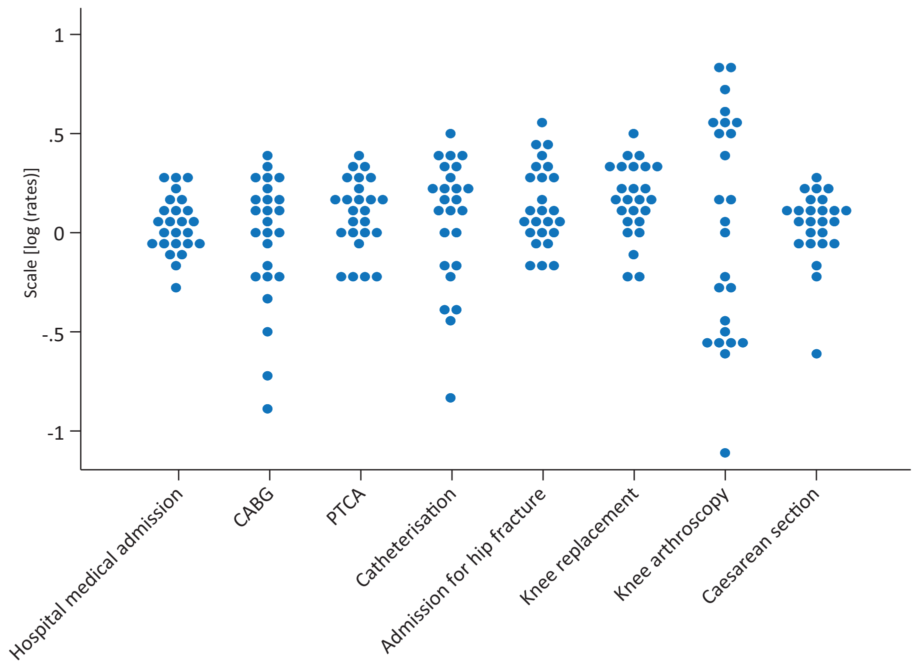
Figure 13.2. Coefficients of variation of standardised rates by procedure, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

While the coefficient of variation provides an overall picture of the variability of a distribution, Figure 13.3 gives a more accurate idea of the dispersion of cantonal rates. In the case of caesarean sections, for example, the rates are relatively close to one another, except for one observed case. Without that outlier, therefore, this procedure would certainly be the one with the least inter-cantonal variability. Conversely, in the case of knee arthroscopy, we find that the high variation coefficient is not the result of a few observed cases that deviate from the national average. Indeed, the distribution of rates in general is highly dispersed.

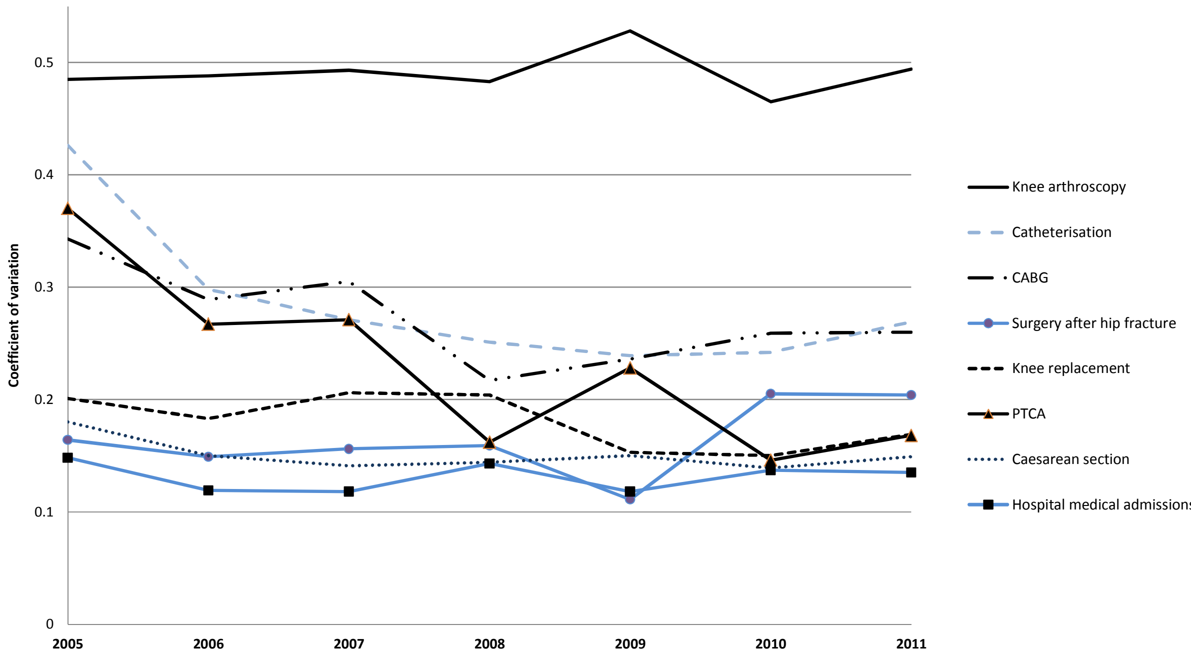
Figure 13.3. Dispersion of cantonal standardised rates by health care activity and procedure, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Although it is difficult to draw an overall conclusion regarding a convergence or divergence of cantonal medical practices over time, three patterns can in fact be identified (Figure 13.4). First, the rates of knee arthroscopy differed quite widely by canton in 2005. Those differences do not seem to have become less marked in 2011 since the variation coefficient remained stable over the period. The wide variation may in part be related to the lack of data coverage outside inpatient care. Second, there is a convergence in cardiac procedures, which show a reduction of inter-cantonal differences over the period of analysis. Third, the variations in the rate of utilisation for the remaining procedures remained fairly stable and low between 2005 and 2011.

Figure 13.4. Evolution of the coefficient of variation (CV) for selected health care activities and procedures, Switzerland, 2005-11



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Hospital medical admissions

In 2011, the average rate of hospital medical admissions was about 7 000 per 100 000 inhabitants. This rate rose by 7.4% between 2005 and 2011, although six cantons that saw a marked rise in utilisation in 2010 or 2011 have brought up the average. The impact of those sudden rises, from +16% to +36% in the space of one year, is clearly reflected in the evolution of the 90th percentile, which surged between 2009 and 2010, and remained high in 2011 (Table 13.3). Whether these trends represent a one-off or a sustained variation in the rate of hospital medical admissions is currently unclear.

Table 13.3. Hospital medical admissions standardised rate per 100 000 population, Switzerland, 2005-11

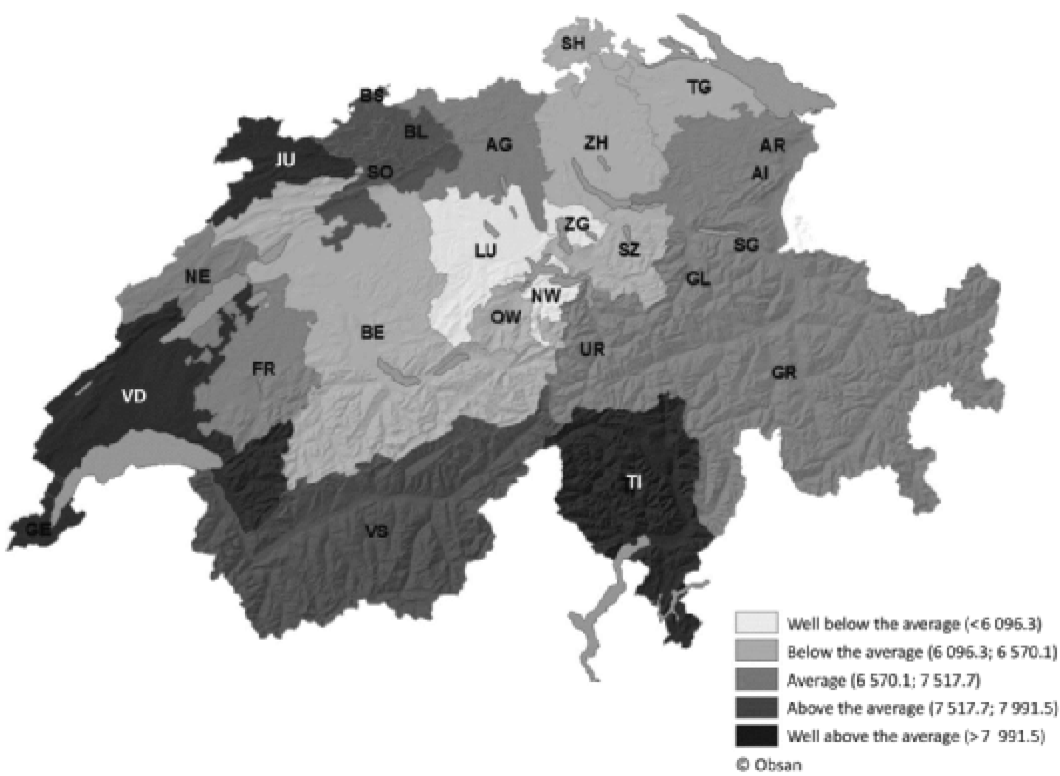
	2005	2006	2007	2008	2009	2010	2011
Average	6 562	6 729	6 680	6 793	6 718	6 985	7 044
10th percentile	5 474	5 632	5 689	5 768	5 758	5 940	6 014
90th percentile	7 769	7 689	7 733	7 679	7 554	8 735	8 715
Coefficient of variation	0.15	0.12	0.12	0.12	0.12	0.14	0.14
Standard deviation	985	813	802	806	807	969	948

Source: OFS (2011), *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Figure 13.5 shows the differences in practice between cantons. Nearly 1.5 times as many inhabitants are admitted to hospital in the canton situated in the 90th percentile as in the one situated in the 10th percentile. That deviation tended to diminish after 2005, only to rise again and return to its initial level in 2011. In principal, differences in hospital medical admission rates should be linked, in part at least, to the organisation of the health system. Highly developed home care and assistance services, well-developed primary care and emergency outpatient services can influence the level of hospital medical admissions.

The cantons with the lowest hospital medical admission rates in 2011 were Lucerne, Zug and Nidwalden, followed by Zurich, Schwyz, Thurgau, Schaffhausen, Obwalden and Bern, i.e. mainly central Swiss cantons. Geneva, Tessin, Jura and Vaud had figures well above the average in 2011. With the exception of Tessin, it is unclear whether the high rates in the other cantons are a one-off or a sustained variation in the rate of hospital medical admissions. With rates per 100 000 inhabitants of between 7 500 and 7 800, Basel-City, Basel-Country, Solothurn and Valais also show higher-than-average hospital admission rates. Finally, the nine remaining cantons show average admission rates (see Annex 13.A2 for a list of the cantons).

Figure 13.5. Map of hospital medical admissions standardised rate by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Cardiac procedures

Coronary bypasses (CABG)

Among Swiss cantons, the standardised average rate of coronary bypasses was about 39[2] per 100 000 inhabitants in 2011 (Table 13.4). The national average fluctuated somewhat over the study period. A convergence between cantons towards the national average can be observed, shown by the reduction in the deviation between the 10th percentile and the 90th percentile and the reduction in the standard deviation.

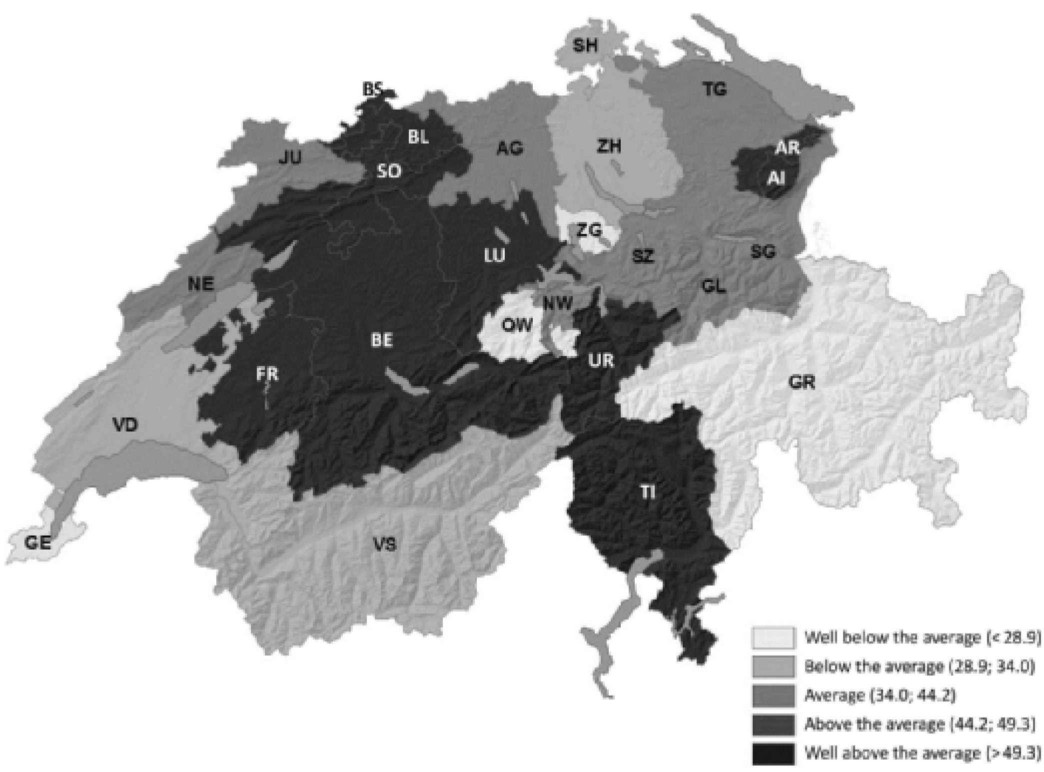
Table 13.4. CABG standardised rate per 100 000 population, Switzerland, 2005-11

	2005	2006	2007	2008	2009	2010	2011
Average	39	42	44	42	38	37	39
10th percentile	25	27	24	29	27	29	24
90th percentile	58	57	62	53	48	49	50
Coefficient of variation	0.34	0.29	0.31	0.22	0.24	0.26	0.26
Standard deviation	13	12	13	9	9	10	10

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Figure 13.6 shows the differences in practice between cantons. Three cantons (Tessin, Uri, Basel-City) recorded CABG rates above the average in 2011 (with more than 50 coronary bypasses per 100 000 population). Higher rates are also found in the cantons of Fribourg, Bern, Lucerne, Basel-Country, Solothurn and Appenzell Outer Rhodes/Appenzell Inner Rhodes, unlike in the cantons of Zurich, Valais, Vaud and Schaffhausen, where the rates for this procedure appear to be more moderate. Lastly, the canton of Geneva shows the lowest rate (about 17 coronary bypasses per 100 000 population), followed by the Graubünden and Obwalden and Zug, with rates of 24 and 28 per 100 000 respectively. The eight remaining cantons have rates within the national average.

Figure 13.6. Map of CABG standardised rate by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Coronary angioplasties (PTCA)

Since 2005, there has been a 22% rise in PTCA in Switzerland, bringing the current average rate to 188 per 100 000 inhabitants. While inter-cantonal deviations seem to be dwindling, the standardised rates still vary by up to 1.7-fold. Table 13.5, which shows the trend over time, indicates a rise in the rate accompanied by a fall in the standard deviation. Given that the rates of the 10th and 90th percentiles are moving close to the average, the rate of this intervention across Swiss cantons is tending to standardise.

Table 13.5. PTCA standardised rate, Switzerland, 2005-11

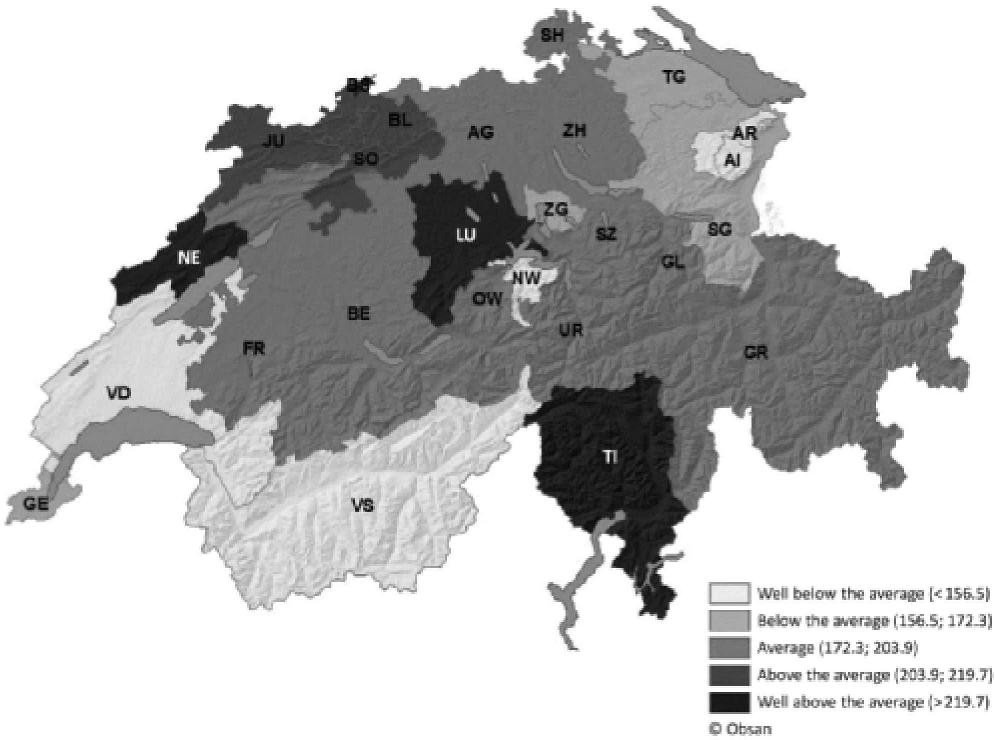
	2005	2006	2007	2008	2009	2010	2011
Average	154	174	170	187	180	190	188
10th percentile	67	123	121	151	133	151	138
90th percentile	209	225	221	231	216	221	231
Coefficient of variation	0.37	0.27	0.27	0.16	0.23	0.15	0.17
Standard deviation	57	46	46	30	41	28	32

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

The cantons of Tessin, Basel-City, Neuchâtel and Lucerne have rates that are distinctly higher than the national average, with values of between 224 (LU) and 242 (TI) per 100 000 population (Figure 13.7). In the cantons of Solothurn, Jura and Basel-Country, the rate of this procedure remains higher than the Swiss average, while ten cantons remain around the average. Finally, Zug, Thurgau, Saint-Gallen and Geneva use this medical procedure less often, while the rates recorded by Valais, Appenzell Outer Rhodes/Appenzell Inner Rhodes and Nidwalden lie far below the average, with the latter characterised by the lowest rate, with 136 per 100 000 population. Finally, the correlation between PTCA and cardiac catheterisations is on the order of 0.6, which reflects a moderate positive correlation between these two procedures.

Some of the differences in the rate of inpatient stent insertion are due to the development of this treatment on an ambulatory basis. In 2011, 13% of these procedures were performed on an ambulatory basis (tariff pool data, Sasis AG, extrapolated). However, there were differences in development between cantons, with some moving towards ambulatory care at an earlier stage. The cantons of Zurich, Valais, Bern, Geneva, Vaud and Fribourg are pioneers here, with 18-36% of stents inserted in ambulatory care (tariff pool data, Sasis AG, extrapolated). At present, half of the cantons do not perform this intervention on an ambulatory basis. The cantons of Vaud, Valais and Geneva are among those that perform inpatient stent insertion at a lower rate than average, while Zurich, Bern and Fribourg fall within the average rate, which gives some grounds for a hypothesis of a move towards ambulatory treatment. This analysis, however, is preliminary. A report currently under preparation (Roth and Pellegrini, forthcoming), based on a case study, will provide more information on this question by spring 2015.

Figure 13.7. Map of PTCA standardised rate by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Cardiac catheterisations

There is a growing tendency to perform cardiac catheterisations in Switzerland. The rate increased by 21% between 2005 and 2011, from 281 to 340 per 100 000 population, and varied across cantons between the 10th and the 90th percentile by up to 2.1-fold (Table 13.6).

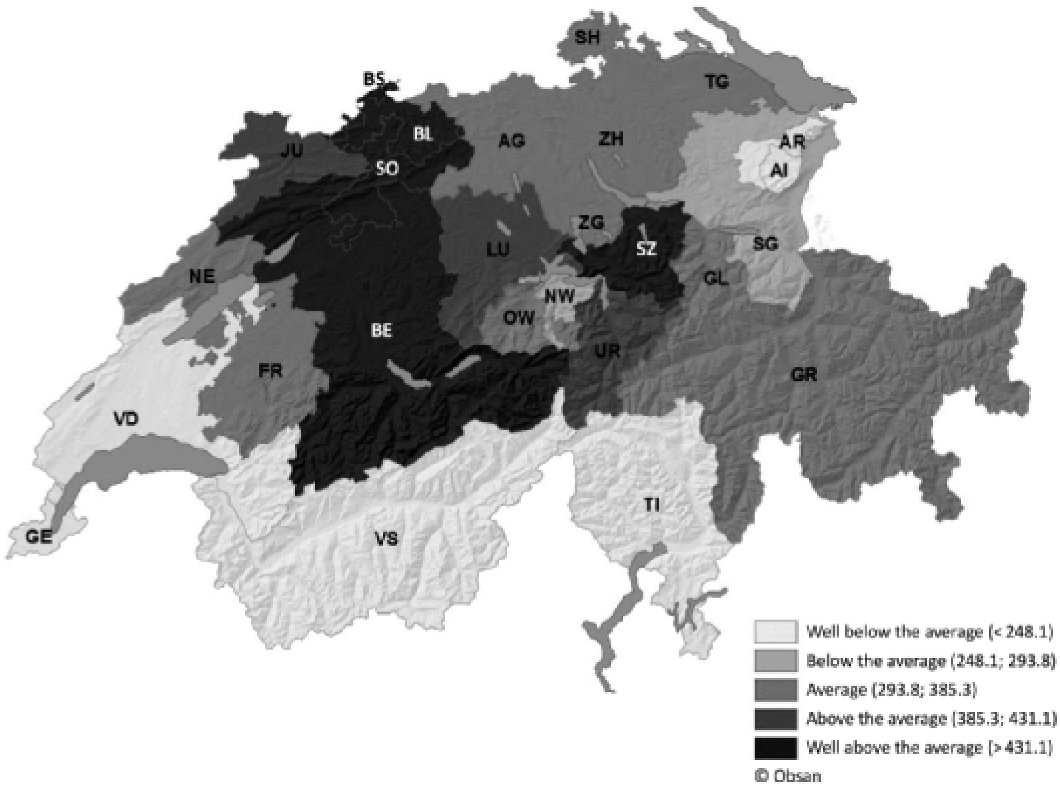
Table 13.6. Catheterisation standardised rate, Switzerland, 2005-11

	2005	2006	2007	2008	2009	2010	2011
Average	281	301	322	346	346	356	340
10th percentile	62	150	187	261	233	233	208
90th percentile	391	405	401	452	439	455	447
Coefficient of variation	0.43	0.3	0.27	0.25	0.24	0.24	0.27
Standard deviation	120	90	87	87	83	86	92

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

There is wide variability in the rates of utilisation between cantons (Figure 13.8). Ten cantons have rates around the national average, i.e. between 310 (SH) and 385 (NE) per 100 000 population. The rate of cardiac catheterisations was above the average in 2011 in three cantons (JU, UR, LU) and well above in five cantons (BL, SZ, BE, SO, BS), with rates of between 432 (BL) and 491 (BS). Lastly, two cantons (NW and SG) show rates below the average and five cantons have rates far below it (GE, AR/AI, TI, VS, VD), ranging between 138 (GE) and 246 (VD).

Figure 13.8. Map of catheterisation standardised rate by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Cardiac catheterisations are performed twice as often in the canton situated in the 90th percentile as in the 10th percentile. The second half of the 2000s saw some convergence of the regions towards the national average, with a decreasing standard error until 2009, although this increases thereafter. One factor to explain this may be that the figures presented include interventions performed only on an inpatient basis. The rate at which the practice of this intervention is developing in the ambulatory sector varies by canton.

In 2011, 22% of cardiac catheterisations were performed in the ambulatory sector (data from the Sasis AG tariff pool, extrapolated). In this regard, trends in the individual cantons varied, with some moving towards ambulatory procedures at an earlier stage. The cantons of Thurgau, Zurich, Bern, Geneva, Valais, Vaud and Fribourg were the first to do so, with 27% to 50% of catheterisations performed on an ambulatory basis (data from the Sasis AG tariff pool, extrapolated) in 2011. Conversely, nearly half of the cantons do not currently perform these on an ambulatory basis. According to the report on PTCA by the Swiss Working Group on Interventional Cardiology (Maeder et al., 2012), there were 29 centres of interventional cardiology across the country, which will have an impact on the rates observed across cantons due to their distribution: six university centres, ten public non-university centres and 13 private institutions.

The observed variations in the inpatient practice of cardiac catheterisation do not, therefore, reflect only the differences in rate of utilisation but also the differences in practice, i.e. whether it is performed on an ambulatory or inpatient basis. Some cantons that record a low rate, including Vaud, Valais and Geneva, may well have shifted towards ambulatory treatment at an earlier stage. Vaud, Valais and Geneva are among the cantons with a lower than average rate of inpatient cardiac catheterisation, while Thurgau, Zurich and Fribourg show average rates. The case of Bern, where the rate of this procedure is above average in both the inpatient and ambulatory sector, raises questions. These analyses are still very rudimentary, however. A positive correlation was found between coronary bypasses and coronary angioplasties of the order of 0.5, and of 0.4 for cardiac catheterisations. A survey under preparation (Roth and Pellegrini, forthcoming), based on a case study, should shed more light on the variations observed.

Clinical guidelines on the practice of these cardiac procedures are in place, but they are not utilised on any legal or contractual basis. The associations of specialists revise these guidelines periodically and the service providers apply them on a voluntary basis. The Swiss Cardiology Foundation provides decision support to patients.

Joint procedures

Admissions for hip fracture

The national rate of admissions with a diagnosis of hip fracture (excluding those caused by road, rail, air, water or other outdoor accidents) remained stable between 2005 and 2009, at about 139 admissions per 100 000 population (Table 13.7). Conversely, this rate rose by 18% in 2010 to 162 cases per 100 000 population, and remained at that level in 2011. This rise is due to the fact that seven cantons recorded a sudden surge of more than 30%. The current analysis cannot explain this development, and it is unclear whether it is a one-off or reflects a sustained trend. The data for coming years will help clarify this situation.

Table 13.7. Admissions for hip fracture standardised rate per 100 000 population, Switzerland, 2005-11

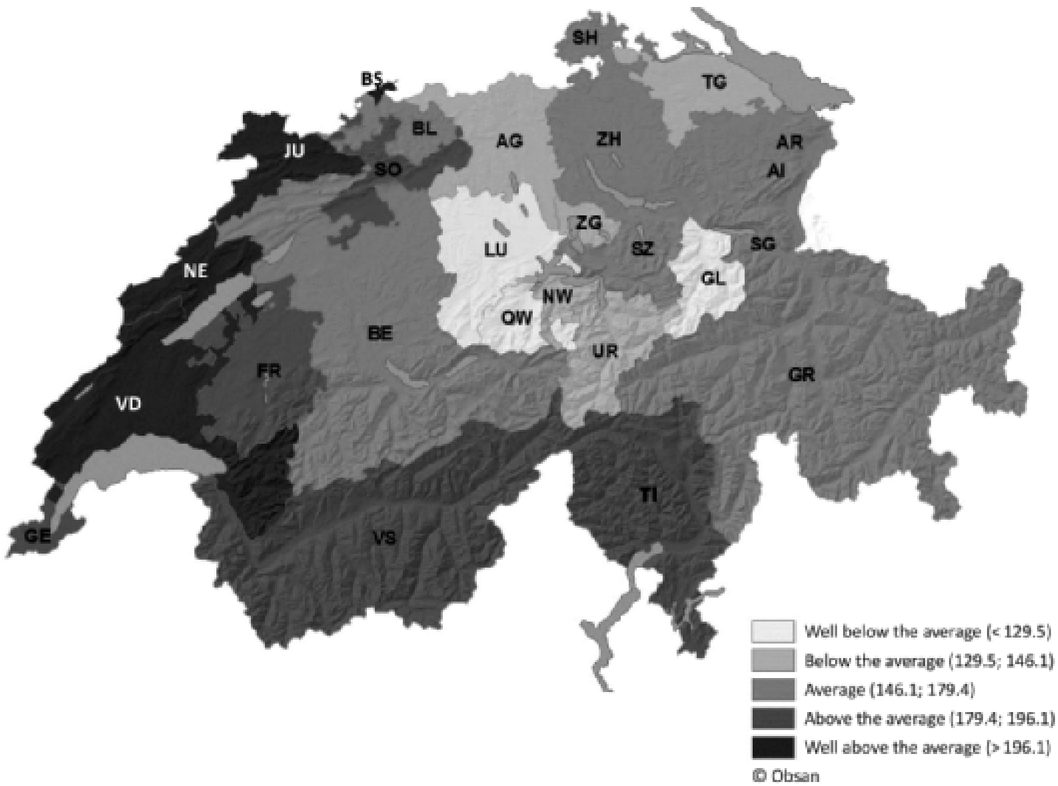
	2005	2006	2007	2008	2009	2010	2011
Average	137	133	132	133	139	162	163
10th percentile	115	109	102	115	122	126	121
90th percentile	169	157	151	154	162	226	214
Coefficient of variation	0.16	0.15	0.16	0.16	0.11	0.21	0.2
Standard deviation	23	20	21	21	15	33	33

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Parallel to this rise, the differences between rates widened in 2010, with the ratio between the 90th and the 10th percentile rising from 1.5 to 1.8. While until 2009 the deviation was among the lowest of the eight procedures examined, i.e. the expected result for a calibration procedure, this was no longer the case for the situation in the last two available years. However, the systematic component of variation over the period 2005-11 is one of the lowest, with a value of 1.8 and can still be regarded as a good calibration procedure (Table 13.2).

Nine cantons show rates around the national average, i.e. between 148 and 179 admissions per 100 000 population (Figure 13.9). The central Swiss cantons, together with Aargau and Thurgau, record rates that are below or well below average. In 2011, the highest rates of hip fracture admissions were observed in western Switzerland and in Basel-City, Solothurn and Tessin.

Figure 13.9. Map of admissions for hip fracture standardised rate, by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Knee replacements

The rate of knee replacement rose steadily between 2005 and 2011, from 154 to 218 per 100 000 population (Table 13.8). This trend results from a more or less marked overall rise in this procedure in all Swiss cantons. In general, while there is evidence of an upward trend in the national average, it is difficult to determine whether this may lead to convergence between cantons. Over the period analysed, the deviation between the 10th and the 90th percentile remained stable.

Table 13.8. Knee replacement standardised rate, Switzerland, 2005-11

	2005	2006	2007	2008	2009	2010	2011
Average	154	157	187	189	199	207	218
10th percentile	112	117	149	135	168	171	165
90th percentile	185	190	220	242	241	257	265
Coefficient of variation	0.2	0.18	0.21	0.2	0.15	0.15	0.17
Standard deviation	31	29	39	39	30	31	37

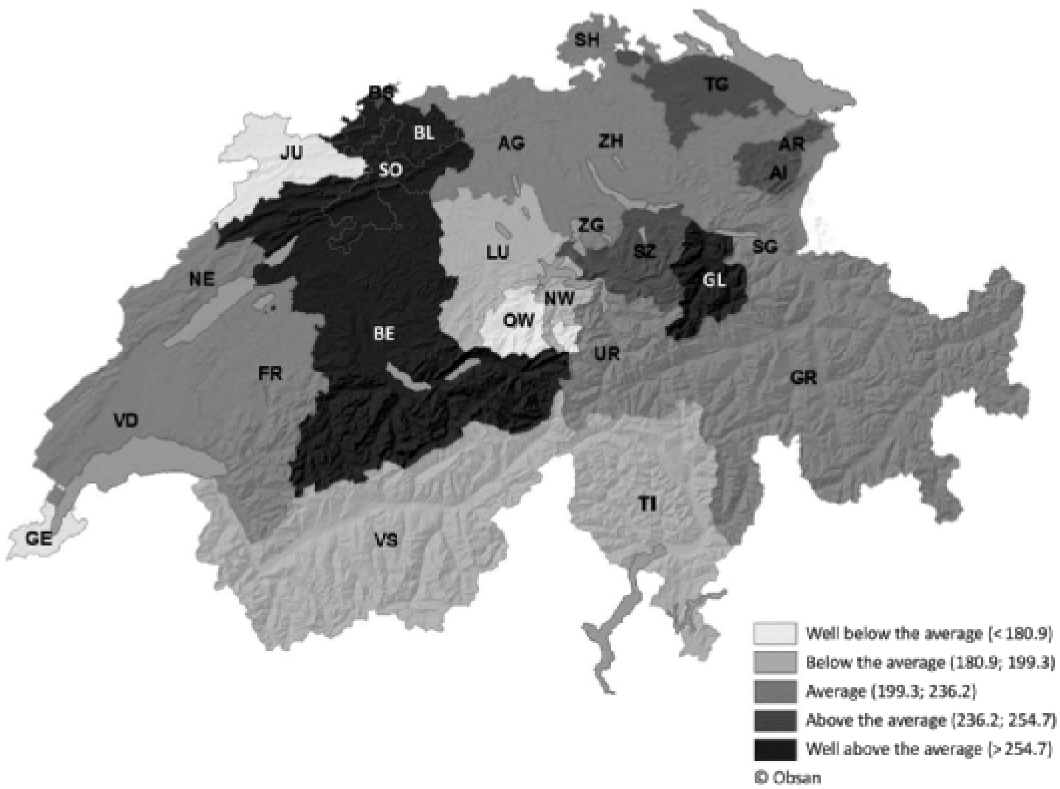
Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

The canton of Geneva had the lowest rate, with 148 per 100 000 population in 2011, and Glarus the highest, with 291 per 100 000 population (Figure 13.10). The ratio between the 10th and the 90th percentile varied up to 1.6-fold. The cantons of Jura and

Obwalden show a far below average rate for this intervention, followed by Tessin, Lucerne, Valais and Nidwalden. Ten cantons show an average rate. Four cantons perform knee replacements more often than average (BL, SO, BE, GL).

In Switzerland, there are no clinical guidelines for this intervention, nor are patients provided with decision support.

Figure 13.10. Map of knee replacement standardised rate, by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Knee arthroscopies

Since 2005, there was an increase in the practice of knee arthroscopy in Switzerland. In 2005, the standard rate was 214 per 100 000 population, rising by nearly 20% until 2011 (243) (Table 13.9). There is generally a substantial rate of dispersion between cantons for this procedure. The deviation from the average is marked and does not seem to reduce over the period of analysis. Knee arthroscopy on an inpatient basis was practised 3.4 times more often in the canton in the 90th percentile than in the 10th percentile.

Table 13.9. Knee arthroscopy standardised rate, Switzerland, 2005-11

	2005	2006	2007	2008	2009	2010	2011
Average	214	226	240	250	231	255	243
10th percentile	93	97	98	96	77	117	121
90th percentile	327	386	410	423	392	427	416
Coefficient of variation	0.49	0.49	0.49	0.48	0.53	0.47	0.49
Standard deviation	104	111	118	121	122	119	120

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

This dispersion is reflected by the relatively low number of cantons where the rate is around the national average (Figure 13.11). Most cantons are below or close to the national average rates. It should be noted that the canton of Tessin appears to have seen an explosion in this medical practice between 2009 and 2010. Over those two years, the standardised rate actually rose from 108 (far below average) to 366 (far above average). The correlation between this intervention and knee replacement is 0.4, which reflects a moderate positive relationship between these two interventions.

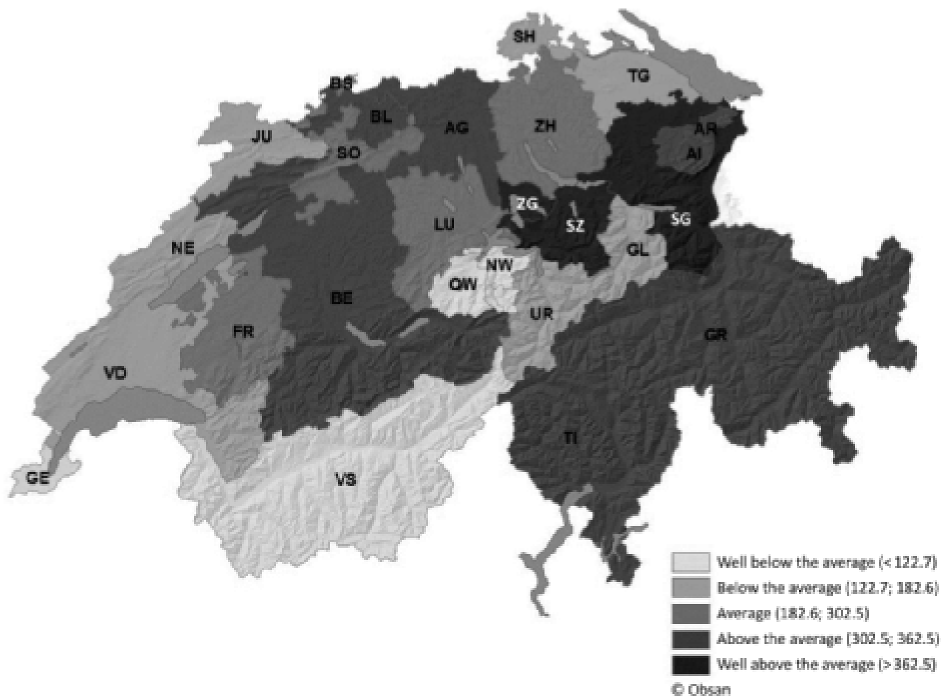
The marked differences observed between cantons probably reflect variability not only in the utilisation of this technique but also in whether it is practiced on an ambulatory or inpatient basis. Some cantons have shifted significantly towards ambulatory treatment and greatly expanded the ambulatory hospital sector (VD, TG, UR, VS, NW, OW, SH, GL in the case here), while others continue to practice it mainly on an inpatient basis. The figures presented in this study include only inpatient interventions.

About 31% of knee arthroscopies were performed in ambulatory care in 2011 (Data from the tariff pool Sasis AG, extrapolated). Yet this proportion varies widely by canton, from 16% (10th percentile) to 75% (90th percentile). A negative correlation was observed of -0.64 ($p<0.005$) between the rank of a given canton in regard to the practice of inpatient and ambulatory knee arthroscopy, which makes it plausible to assume that the differences in rates are linked *in part* to the shift of this practice towards the ambulatory sector. In fact, some cantons have a higher proportion of knee arthroscopy in ambulatory care and a lower proportion in inpatient settings, and vice versa in other cantons. This initial analysis is, however, preliminary.

The fees charged for ambulatory and inpatient interventions may also play a part in this distribution. The canton of Schwyz, for example, used to charge a high fee for ambulatory arthroscopy and as a response to this financial incentive, a large proportion of these interventions was performed on an inpatient basis. That situation has since been resolved.

At present, Switzerland does not have any clinical guidelines relating to this intervention, nor does it provide patients with decision support.

Figure 13.11. Map of knee arthroscopy standardised rate, by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

The joint procedures – knee replacement, knee arthroscopy and hip fracture[3] – were analysed in the context of a similar study carried out for the period 2002-05 (Widmer et al., 2009). The results from this study are in line with the figures obtained in that study.

In their analyses, Widmer et al. (2009, p. 3) note the same average knee replacement rate of 1.5 per 1 000 inhabitants in 2005 as in this analysis. There was a three-fold cross-canton variation among 83 service areas, compared with 1.9-fold in this study in 2010. The larger size of a canton likely contributes to the smaller variation.

Knee arthroscopy also showed the greatest variability in their study (varied by nine-fold compared with seven-fold in this study). This variation, however, does not cover all settings, as the proportion of knee arthroscopies performed on an inpatient or ambulatory basis varies from one canton to another.

Gynaecological procedures

Caesarean sections

The growing use of caesarean sections in Switzerland has become the source of an intensifying debate. In 2011, on average 323 live births out of 1 000 were delivered by caesarean section (Table 13.10), which represented a rise of 14% from the level in 2005 (283 per 1 000). Conversely, there has been some convergence between cantons in the use of the procedure, with values clustering around the country average. The peak observed in 2008 is difficult to interpret. There may have been difficulties in terms of collecting data, since for that year six cantons recorded rates far higher than the long-term trend.

The postulate (08.3935[4]) tabled in Parliament in December 2008 may have sent out a strong signal to maternity hospitals and gynaecological practices and helped slow the rise in the rate of caesarean sections. In response to the postulate, an in-depth analysis was carried out on variations in practice (OFSP, 2013). The probability of having a caesarean section was twice as high in private clinics as in public hospitals. The probability of undergoing a caesarean was found to be between 1.2 and 1.5 times higher among women of foreign origin. These outcomes are under discussion at the political level, and clinical guidelines and decision support charts may, at some stage, be drawn up for patients.

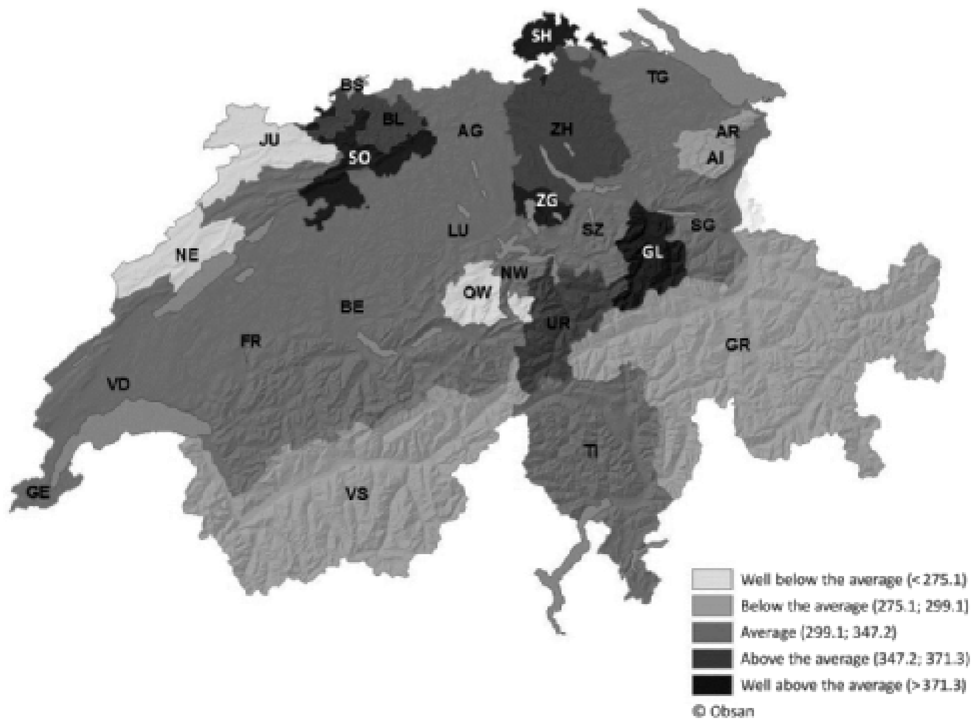
Table 13.10. Caesarean section age-standardised rate per 1 000 live births, Switzerland, 2005-11

	2005	2006	2007	2008	2009	2010	2011
Average	283	296	312	328	323	320	323
10th percentile	222	227	258	277	269	274	265
90th percentile	333	348	358	377	376	369	380
Coefficient of variation	0.18	0.15	0.14	0.14	0.15	0.14	0.15
Standard deviation	51	44	44	47	49	44	48

Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

Figure 13.12 shows the differences in practice between cantons. The rate is the lowest in Jura, which shows a steady rate of below 200 per 1 000 live births, and in Obwalden and Neuchâtel. Caesarean sections are practised far more than the average in the cantons of Solothurn, Schaffhausen, Glarus and, in particular, Zug, with a rate of around 400 per 1 000 live births. Zug and Jura, both with standard deviations from the average of more than 1.5, are outliers. When outliers are excluded (between the 10th and 90th percentile), variation across cantons varies by 1.4-fold.

Figure 13.12. Map of caesarean section standardised rate, by canton, Switzerland, 2011



Source: Authors' estimates based on *Statistique médicale des hôpitaux (2005-2011)*, Federal Statistical Office, Neuchâtel.

13.5. Conclusions

This report has shed light on the cantonal differences in health care utilisation and made it possible to identify certain trends over time. The largest variations across cantons were found for knee arthroscopy, while the procedures with the lowest variations were hospital medical admissions, hip fracture and caesarean sections. In Switzerland, the statistics on ambulatory care are still incomplete, and, in the absence of sufficiently exhaustive data, data analysis was not possible. Some inter-cantonal variations may, therefore, be due to differences in the type of care and not in rates of practice.

Although it is difficult to determine a threshold beyond which variations in practice may be regarded as "unwarranted", several guidelines have been drawn up in order to standardise certain procedures. It is primarily up to professional and academic associations to draw up and implement clinical guidelines and to promote the quality and appropriate use of the services provided. For example, a Swiss "Working Group for Interventional Cardiology and Acute Coronary Syndrome" was set up, which reports at regular intervals on the development of practices in this field (Maeder et al., 2012). An equivalent exists for orthopaedic specialists (Swiss Society for Orthopaedics and Traumatology, 2014).

The Swiss Medical Board – an association of the Swiss Conference of Cantonal Health Directors (CDS), the Federation of Swiss Physicians (FMH), the Swiss Academy of Medical Sciences (ASSM) and the Government of the Principality of Liechtenstein – analyses and evaluates diagnostic processes and therapeutic interventions from a medical, economic, ethical and legal point of view. On that basis, it draws up recommendations addressed to policy makers and service providers. Since 2009, ten specialist reports have been published, including one on the use of tomodensitometry for the diagnosis of coronary disease (Swiss Medical Board, 2013).

Data registries have also been set up for implants and myocardial infarctions. Since September 2012, the Swiss Registry of Implants (SIRIS) has collected information with a view to improving the quality of care and patient safety. Lastly, a national registry of myocardial infarctions (AMIS Plus), which was set up by the Swiss societies of cardiology, intensive care and internal medicine, collects and analyses the data on heart-attack patients during the stages of pre-admission, hospital admission and follow-up. It focuses on risk factor evaluation, diagnosis, emergency intervention strategies and treatment. The AMIS Plus data are also important in terms of quality assurance, evaluation of guidelines and improving compliance with the guidelines in clinical practice.

This report draws a picture of the variations in the rates of use regarding some specific procedures across the Swiss cantons. However, it was not possible to explain the origin of these differences. Further analysis should focus on the determinants of these variations across cantons to allow a better understanding of the features presented in this report.

Notes

1. 08.3935: Rise in the number of caesareans, Po. (Postulate) – Maury Pasquier Liliane; Socialist Group. The Federal Council is asked to study the causes and effects of the high rate of caesareans practised in Switzerland and to find means of countering their adverse effects on the mother, the child and the health system.
2. The number of cases is low in small cantons (e.g. Glarus and Obwalden with about 30 000 inhabitants), which means that the results should be interpreted with caution.
3. The codes selected are not entirely identical. Widmer et al. (2009) consider only *total* knee replacement, whereas in this study total and partial replacement are considered, and they also consider all hip fractures. The standardisation method is indirect.
4. 08.393: Rise in the number of caesareans, Po. (Postulate) – Maury Pasquier Liliane; Socialist Group. The Federal Council was tasked with studying the causes and effects of the high rate of caesareans practised in Switzerland and with finding ways of countering the adverse effects for the mother, the child and the health system.

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ANNEX 13.A1

List of procedure codes

The Medical Statistics of Hospitals records the main procedure (according to the Swiss Classificatio of Operations – CHOP) and also allows several secondary procedures to be recorded. In the context of this report, a procedure is counted if it is listed as the main treatment or among the first nine secondary treatments.

Table 13.A1.1. Mapping ICD-9-CM codes to the CHOP procedure codes of Medical Statistics of Hospitals (Federal Statistics Office)

Description	ICD-9-CM codes	CHOP 2011	CHOP 2009-2010 (version 11.0)	CHOP 2008 (version 10.0)	CHOP 2007 (version 9.0)	CHOP 2005-2006 (version 8.0)
Caesarean section	74.0-74.2; 74.4; 74.99	*idem*	*idem*	*idem*	*idem*	*idem*
Coronary artery bypass graft (CABG)	36.1, 36.11-36.19	36.1, 36.11-36.14	*idem*	*idem*	*idem*	*idem*
Percutaneous transluminal coronary angioplasty with insertion of stent(s) (PTCA)	36	*idem*	*idem*	*idem*	*idem*	*idem*
Cardiac catheterisation	37.21, 37.22, 37.23	*idem*	*idem*	*idem*	*idem*	*idem*
Knee replacement	81.54, 81.55 or 00.80-00.84	81.54, 81.55 *et* 00.80-00.84 (The two groups of positions must be extracted because one or other will have been coded as appropriate.)	*idem*	*idem*	*idem*	81.54, 81.55 (00.80-00.84 did not yet exist.)
Knee arthroscopy	80.26 and 80.6 simultaneously	80.6X.10, 80.6X.11	80.26 and 80.6 simultaneously	*idem*	*idem*	*idem*

Table 13.A1.2. Mapping of ICD-9-CM codes to other variables of Medical Statistics of Hospitals (Federal Statistics Office)

Description	OECD instructions	Variable and codes corresponding to Medical Statistic of Hospitals	Earlier years
Medical hospital admission	All medical DRGs	Variable VC_APDRG_TYP=M (medical)	*idem*
Hip fracture	Codes ICD-9-CM 820.0-820.3, 820.8, 820.9 + 733.14	Corresponding to the following *diagnosis* codes: S72.0-S72.2, except for those caused by road traffic, railway, aircraft-, watercraft- and spacecraft-related accidents (E80-E84).	*idem*

The inclusion and exclusion criteria selected for our analyses are as follows:

- The analysis covers hospital admissions from 2005 to 2011.
- It covers only inpatient cases (stays of >24h).
- It covers only patients who were discharged from hospital during the year under analysis so as to avoid cases that extend over several years being counted more than once.
- Cases of readmission to hospital are regarded as new cases.
- Cases of hospital admission are linked to the patient's canton of residence (not the canton of hospital admission).
- Patients who are resident abroad or whose canton of residence is unknown are excluded from the analysis.
- In the analysis of caesarean sections, new-borns (individuals aged 0 years) are excluded, in order to avoid double counting with the mother. The few cases where the patient's sex was wrongly coded, indicating a male patient, are excluded.
- The two demi-cantons of Appenzell Inner Rhodes (AI) and Appenzell Outer Rhodes (AR) have been considered as one entity. In view of its very small population, variations of a few cases produced significant rises in the rate of utilisation in the canton of Appenzell Inner Rhodes (AI) and created anomalies in the statistical series. This effect was greatly mitigated by regarding the two demi-cantons as a single entity.

ANNEX 13.A2

List of Swiss cantons

AG	Aargau
AI	Appenzell Innerrhoden/Appenzell Inner Rhodes
AR	Appenzell Ausserrhoden/Appenzell Outer Rhodes
BE	Bern
BL	Basel-Landschaft/Basel-Country
BS	Basel-Stadt/Basel-City
FR	Freiburg/Fribourg
GE	Geneva
GL	Glarus
GR	Graubünden
JU	Jura
LU	Luzern/Lucerne
NE	Neuenburg/Neuchâtel
NW	Nidwalden
OW	Obwalden
SG	St Gallen
SH	Schaffhausen
SO	Solothurn
SZ	Schwyz
TG	Thurgau
TI	Ticino/Tessin
UR	Uri
VD	Waadt/Vaud
VS	Wallis/Valais
ZG	Zug
ZH	Zurich
CH	Schweiz/Switzerland

Chapter 14

United Kingdom (England): Geographic variations in health care

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This chapter presents data on geographic variations in England for hospital medical admissions and a number of surgical and diagnostic procedures (caesarean sections, revascularisation procedures, knee replacements, admission after hip fracture, and CT and MRI scans) based on the ten Strategic Health Authorities and 151 Primary Care Trusts that were in place in 2010-11. As expected, admission after hip fracture has the lowest rate of regional variation, as there is little discretion to operate a patient following a hip fracture. The highest degree of regional variations are for coronary artery bypass grafts, knee replacement and MRI scans, interventions for which there is a higher degree of physician discretion and also possibly regional variations in the capacity to deliver these procedures. Since 2009, the English NHS has started to monitor patient outcomes following knee replacement and other surgical interventions such as hip replacement to assess health improvements before and after the operations. These Patient Reported Outcome Measures (PROMs) show that the vast majority of patients who had a knee replacement in 2010-11 reported positive outcomes following their operation, both in regions with high rates and low rates of knee replacement.

1. Jessica Farebrother was an intern in the OECD Health Division when she prepared this chapter. The author would like to thank Kevin Watson of Public Health England for providing most of the data reported in this chapter, and Phil DaSilva for many helpful comments in the preparation of this report. Gaétan Lafortune from the OECD Health Division also provided many comments on an earlier version. The views expressed in this chapter are those of the author and do not necessarily reflect those of the OECD.

14.1. Introduction

Variations in medical practice at different levels (geographic, hospital, individual clinician level) raise many questions surrounding equity and efficiency in health care delivery. Evidence of geographic variations in medical practice in England dates back to the 1930s, when research showed that the rates of surgical removal of the tonsils among children varied widely across districts for no apparent reason except differences in clinical practices (Glover, 1938). The objective of providing equitable access to high-quality and appropriate care remains a central goal of the English health care system today, in a context of tight budget constraints. Reducing any unwarranted variations in medical practice, whether through under-use or over-use of certain services, thus remains an important issue.

In recent years, certain organisations in England have been tasked to monitor and support efforts to address any unwarranted regional variations in the National Health Service (NHS). The work of the NHS body RightCare, responsible for the production of the NHS Atlas series, along with the development of clinical guidelines by the National Institute for Health and Care Excellence (NICE), are two notable examples of efforts to promote further harmonisation in clinical practice. Another organisation involved in this task is the newly created NHS Improving Quality (NHS IQ), which was created in April 2013 and will draw on previous work carried out by the NHS Institute for Innovation and Improvement.

This chapter documents medical practice variations across the ten Strategic Health Authorities and 151 Primary Care Trusts that were in place in England in 2010-11, for a selected set of health care activities and procedures. Section 14.2 provides a brief overview of some of the main characteristics of the NHS and English health care system that might have an impact on medical practice variations. This is followed by a description of the method and data sources underlying the analysis. The results are then presented, starting first with an overview of the geographic variations for the eight health care activities covered in this report, and then going into a more detailed presentation of variations for each of the procedure. The final section summarises the results and describes some of the interventions that have been undertaken to try to address unwarranted variations.

14.2. Overview of the English health care system

Political and organisational structure

The National Health Service (NHS) in England was formed in 1948. It provides, for the most part, free health care at point of use for people normally residing in the United Kingdom. Prior to April 2013, the NHS was accountable to the Department of Health, which was responsible for providing strategic directions and policy making, and to monitor the overall delivery of services within the NHS. Since April 2013, many of the responsibilities for the provision, regulation and monitoring the quality of health services has been transferred to three national bodies: "NHS England" (NHS-E) which is responsible for commissioning and some direct health service delivery; "Monitor" which is responsible for the regulation of Foundation Trusts; and the Care Quality Commission (CQC) which is responsible for developing standards for providers. These three organisations are accountable to government through the Secretary of State to the Department of Health.

In 2010-11, the reference year for the data in this report, the NHS in England was structured around ten regional Strategic Health Authorities (SHA), each of which had a governance structure accountable to a management board and was responsible for the quality, performance and safe delivery of health services in their geographic area. Within each SHA, there were also 151 Primary Care Trusts (PCT), covering a smaller geographical area, with a governance structure making them independent statutory organisations.

Since April 2013 when the NHS was restructured, these SHAs and PCTs were abolished, and the responsibility for the majority of commissioning now rests with Clinical Commissioning Groups (CCGs), which are formed from geographical groupings of general practices working as a governing body comprised of managers and clinicians.

Health care expenditure

Data on health care spending and financing are not available separately for England from the rest of the United Kingdom in the *OECD Health Database*. Hence, data covering the whole of the United Kingdom are presented in this and the subsequent sections (2.3 and 2.4). These data are considered to be broadly representative of the situation in England.

Health spending accounted for 9.4% of GDP in the United Kingdom in 2011, slightly above the OECD average of 9.3% (OECD, 2013). In terms of per capita spending on health, the United Kingdom also spent slightly more than the OECD average, with spending of USD 3 400 in 2011 (adjusted for purchasing power parity), compared with an OECD average of USD 3 300. Health spending per capita in the United Kingdom grew in real terms by 5.3% per year on average between 2000 and 2009, but fell by 1.8% on average between 2009 and 2011, following the recession and the need for fiscal consolidation.

Health care financing

The NHS is funded primarily via the public sector, principally through taxation and national insurance contributions across the United Kingdom. Most private spending covers over-the-counter purchases and other medical products, and private hospital care. Private insurance is supplementary to NHS services, and covers treatment in private hospitals, allowing patients quicker access to elective surgery. About 12% of the population are covered by some form of private health insurance scheme. Out-of-pocket payments accounted for about 10% of total health expenditure in 2011 and private health insurance 3% (OECD, 2013a).

Under the PCT organisation, around 80% of the annual health care budget was allocated to PCTs, amounting to GBP 164 billion in 2010-11. The allocation of resources was based on a per capita weighting. This weighting aimed for the appropriate distribution of resources based on the relative needs of each area, with the objective of reducing health inequalities between areas (Department of Health, 2011).

Health care delivery and provider payments

Physician services and payments

General practitioners (GPs) were (and are still) contracted to the NHS, and act as gatekeepers to secondary care, including both in the ambulatory sector and in hospitals, with the exception of accident and emergency services. Physician remuneration includes salary, capitation, fee-for-service (FFS) and pay-for-performance (P4P) measures (OECD Health Systems Characteristics Survey, 2012). Doctors employed in public hospitals are salaried. However, full-time NHS consultants (i.e. senior specialists) are permitted to treat patients privately for a separate fee (NHS Employers, 2013).

In 2011, the United Kingdom had 2.8 practising physicians per 1 000 population which was below the OECD average of 3.2 per 1 000. Around 30% of doctors in the United Kingdom in 2011 were generalists, with the other 70% having some form of specialty.

Hospital services and payments

Secondary and tertiary services in England are provided by NHS trusts, some of which have Foundation Trust status. They are accountable to the Department of Health (via the Monitor and the Care Quality Commission since April 2013). Trusts may be regional centres for specialised care, or may be attached to universities (teaching hospitals).

Foundation Trusts, first introduced in 2004, are not-for-profit, public benefit corporations, which now provide over half of all NHS hospital, mental health and ambulance services. Like PCTs, Foundation Trusts were created to decentralise decision making in health care to a local level. They are independent entities, can raise capital from both public and private sectors, and are free to invest surplus funds in their own trust in any way they choose. FTs are accountable to local communities through their board of governors, and directly to Parliament. They are regulated by Monitor, the independent regulator of the NHS, and the Care Quality Commission for quality standards.

Public hospitals are remunerated according to contracts that specify the services to be provided and the terms on which they are supplied. "Payment by Results" (PbR) tariffs were introduced nationally in 2004, and since then have been extended across a large variety of services. PbR links the hospital's case mix to remuneration, with payments being made per patient according to the complexity of their health care needs (National Prescribing Centre, 2010). PbR covers most of the acute care undertaken in hospitals, including some outpatient procedures and accident and emergency.

The United Kingdom had 3.0 hospital beds per 1 000 population in 2011, which was below the OECD average of about five beds per 1 000. In line with many OECD countries, the number of hospital beds per capita has fallen gradually over the past decade or so. This decline has coincided with a reduction in the average length of stay in hospital, and an increase in day surgery.

14.3. Data and methods

Geographic variations in the following health care activities and procedures are presented in this report for England: hospital medical admissions, caesarean section (c-section), revascularisation procedures (including CABG and PTCA), knee replacement, admission after hip fracture, CT scans and MRI scans. The data are presented at Primary Care Trust level, with the reference year being 2010-11. Annex 14.A1 summarises the location of each PCT according to the ten Strategic Health Authorities that existed in 2010-11.

For each procedure (except MRI and CT scans), data were extracted from the Hospital Episode Statistics (HES) database. This database, managed by the Health and Social Care Information Centre, includes patients who are treated in NHS hospitals or treated in the independent sector and funded by the NHS but excludes private patients treated in private hospitals. It is considered to be a comprehensive database, since the data collected during a patient's hospital stay are submitted to allow hospitals to be paid for the care given. The procedure codes used are those defined by the Office of Population Censuses and Surveys, version 4 (OPCS-4).

The regional unit used to document variations is the PCT, defined by the 2010 area boundaries. Episode statistics are assigned to the patient's registered GP and thus PCT of residence, regardless of whether the patient was treated in a different area than that of residence.

The reference year for all procedures is 2010-11 (1 April to 31 March), with the revascularisation data also covering additional years from 2003-04 to 2010-11.

The population data used to calculate the crude and age- and-sex-standardised rates for most procedures were the 2010 mid-year population estimates from the Office of National Statistics (ONS). Conversely, the revascularisation data were standardised using the European Standard Population, since the raw data were not readily available. For the CT and MRI scan rates, the data were standardised based on the Hospital and Community Health Services population data, which adjusted not only for age and sex differences, but also for some estimates of differences in "need", based on selected measures of socioeconomic and health status (Department of Health, 2011). For caesarean sections, the English population structure included only women aged 15-49 (by five-year age group), while for admission after hip fracture, it included only people aged 65 and over (also by five-year age group).

14.4. Description of results

Overview of results

Table 14.1 provides an overview of the results of geographic variations across PCTs in 2010-11 for the eight health care activities and procedures covered by this report.

As expected, admission after hip fracture exhibits the lowest regional variation, with the rate varying by 2.3 times between the PCTs with the lowest rates and those with the highest rates. This relatively low variation was expected given that there is very little discretion to admit to hospital and operate on a patient suffering from a hip fracture, so any variation across regions should be related mainly to the incidence of hip fracture (which is reduced by the age and sex standardisation). The regional variation in caesarean sections was also low: this reflects the fact that the rates have increased more or less at the same pace across all regions.

The regional variation was highest for CABG rates, knee replacement rates and MRI scans, with a four- to five-fold difference between the PCTs with the lowest rates and those with the highest rates.

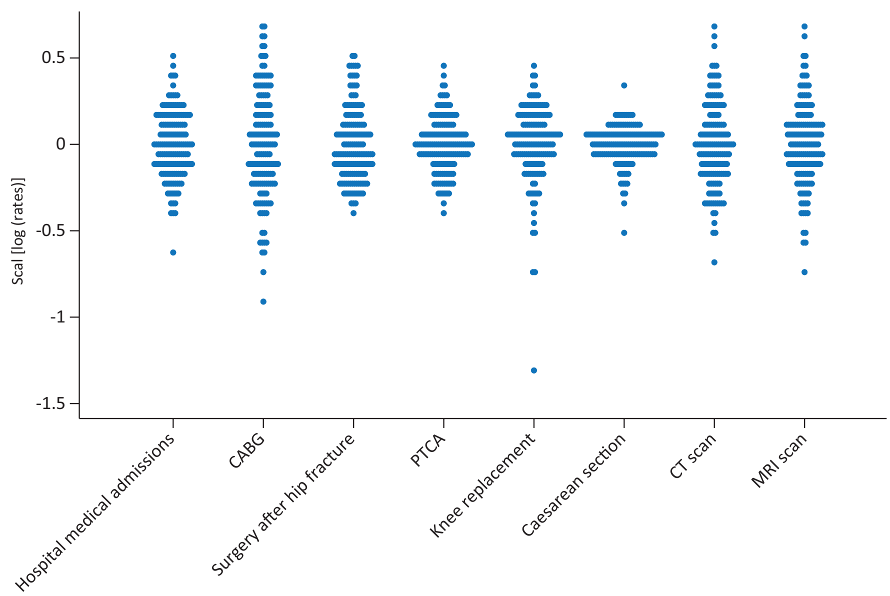
Table 14.1. Overview of geographic variations for selected health care activities and procedures by Primary Care Trust, England, 2010-11

	Hospital medical admission (per 100 000 population)	CABG (per 100 000 population)	PTCA (per 100 000 population)	Admission after hip fracture (per 100 000 population 65+)	Knee replacement (per 100 000 population)	Caesarean section (per 1 000 live births)	CT (per 1 000 needs-weighted population)	MRI (per 1 000 needs-weighted population)
Crude rate	10 276	n.a.	n.a.	711	176	n.a.	n.a.	n.a.
Unweighted average rate	10 823	31	111	695	174	237	63	39
Minimum rate	5 602	12	73	468	47	142	31	18
Maximum rate	17 259	59	182	1 065	261	324	120	77
Ratio max/min	3.1	4.9	2.5	2.3	5.6	2.28	3.8	4.2
Q10	8 448	21	84	555	133	210	45	29
Q90	13 504	44	148	837	213	266	86	51
Ratio Q90/ Q10	1.6	2.1	1.76	1.51	1.6	1.26	1.91	1.76
Coefficient of variation	0.19	0.3	0.22	0.16	0.19	0.11	0.24	0.24
Systematic component of variation	4.37	n.a.	n.a.	2.06	3.4	1.14	n.a.	n.a.

Note: All rates are age/sex standardised per 100 000 population unless otherwise stated. NA indicates that this value is not available.

Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.1. Overview of geographic variations in selected health care activities and procedure by Primary Care Trust, England, log scale, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

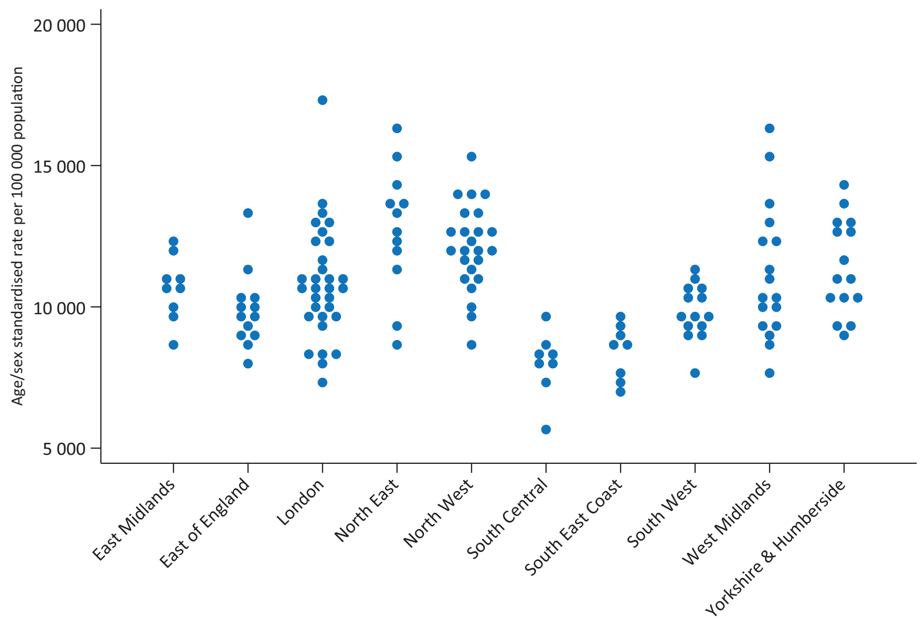
Hospital medical admissions

Hospital care still represents the largest proportion of health expenditure across the majority of OECD countries (OECD, 2013). In England, the Department of Health has estimated that each bed day cost the NHS, on average, GBP 258 in 2010-11 (Department of Health, 2013).

The average rate of hospital medical admissions across PCTs, standardised for age and sex, was 10 823 per 100 000 population in 2010-11. There was a three-fold variation between the PCTs with the lowest rates (around 5 600) and those with the highest rates (over 17 000 per 100 000 population).

Admissions rates generally diminished from the north to the south part of the country. Among the highest admission rates were in the metropolitan areas of the West Midlands, North East and North West SHAs (Figure 14.2, Figure 14.3). That said, Newham PCT in East London had the highest standardised admissions rate in 2010-11. Deprivation in Newham PCT is higher than average. In 2010, figures for the PCT suggest that over 80% of residents were among those in the most deprived quintile of the population of England (Newham Health Profile, 2012.

Figure 14.2. Hospital medical admissions rate by Strategic Health Authority and Primary Care Trust, England, 2010-11

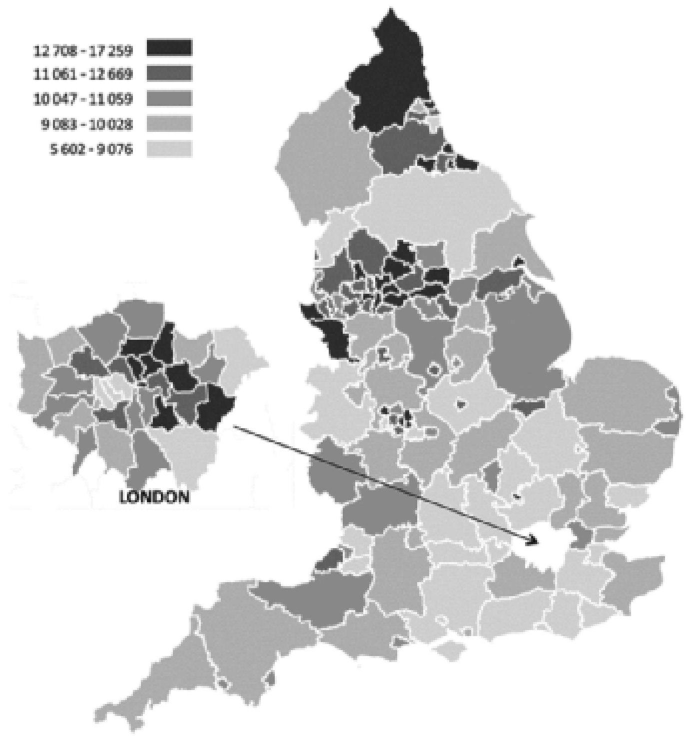


Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Research indicates that a certain proportion of admissions in England, as well as in other OECD countries, could be avoided by appropriate management of patients outside of hospital (e.g., Bottle et al., 2008; OECD, 2013b). There has been much interest in the NHS in reducing unnecessary hospital admissions, because of the impact on costs and waiting times. Some of the initiatives taken include efforts to help patients better understand and self-manage conditions such as asthma and chronic obstructive pulmonary disease (COPD). There have also been efforts to increase out-of-hours care in GP practice and quality improvement initiatives, notably through the Quality and Outcomes Framework (Purdy, 2010).

One specific example of a programme aimed at reducing unnecessary hospital admissions is provided by the North-West London Integrated Care Pilot (ICP), which was set up in January 2011. This pilot brought together more than 100 GP practices, five PCTs, two mental health care trusts, three community health trusts, five local authorities and two voluntary associations (AGE UK and Diabetes UK) to co-ordinate better the care of older adults and people with diabetes (Harris et al., 2012). Though the review by the Nuffield Trust (2013) was not able to report on changes to patient outcomes and service use, many positive points were noted, and the pilot has received national awards for innovation in its design and delivery.

Figure 14.3. Map of hospital medical admissions (age/sex standardised) rate, per 100 000 population, by Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes, Crown copyright and database rights, 2013, Ordnance Survey 100039906.

Revascularisation procedures

Revascularisation procedures, including coronary artery bypass graft (CABG) and percutaneous transluminal coronary angioplasty (PTCA), are used to treat people with ischaemic heart disease. CABG is a more invasive intervention, as it involves an open-chest surgery, whereas a PTCA is a minimally invasive procedure. In England as in other OECD countries, PTCA has gradually replaced CABG in the treatment of most patients with ischaemic heart disease over the past 20 years, though CABG is still recommended and used in certain cases.

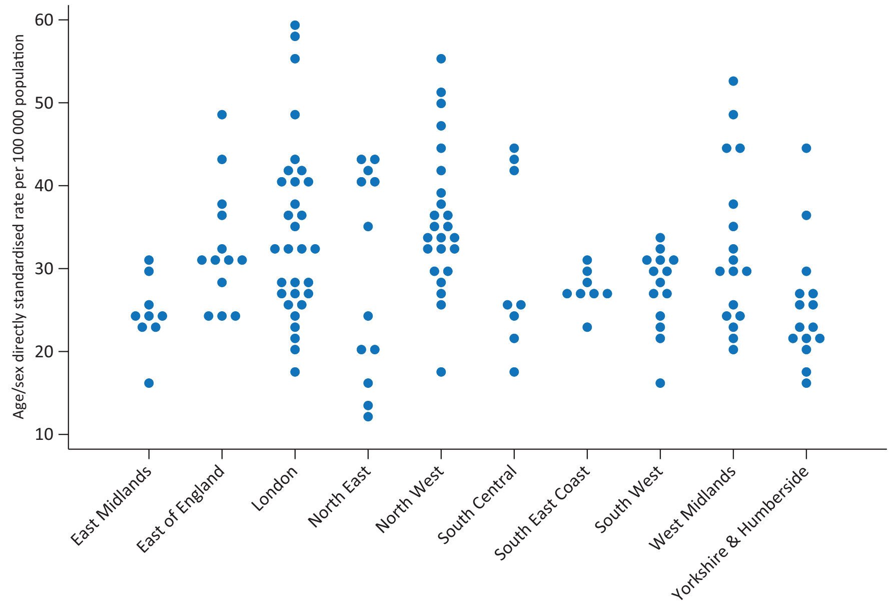
Coronary artery bypass graft (CABG)

The average CABG rate across PCTs in England in 2010-11 was 31 per 100 000 population, but this rate varied almost five-fold between PCTs with the lowest rates and those with the highest rates (Figure 14.4).

Figure 14.5 shows that the rates are generally higher in the North of England and North London, and lowest in the South-East. There are also other PCTs where rates were relatively high in 2010-11, such as Plymouth, Luton and Peterborough.

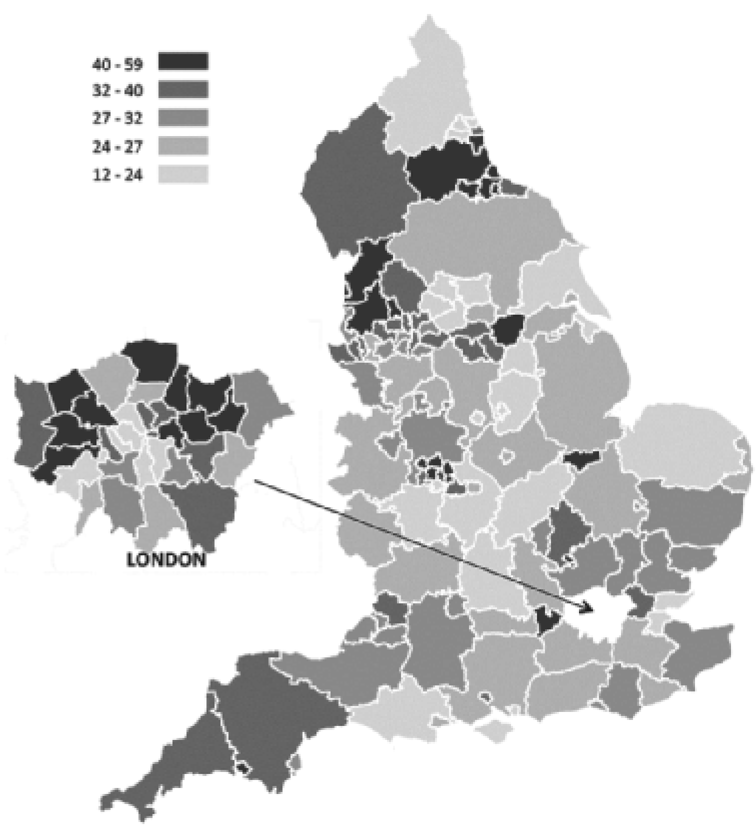
CABG rates in England decreased between 2003-04 and 2010-11, however the degree of variation has remained fairly constant during this period, until a slight increase between 2009-10 and 2010-11.

Figure 14.4. CABG rate by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.5. Map of CABG (age/sex standardised) rate, per 100 000 population, by Primary Care Trust, England, 2010-11

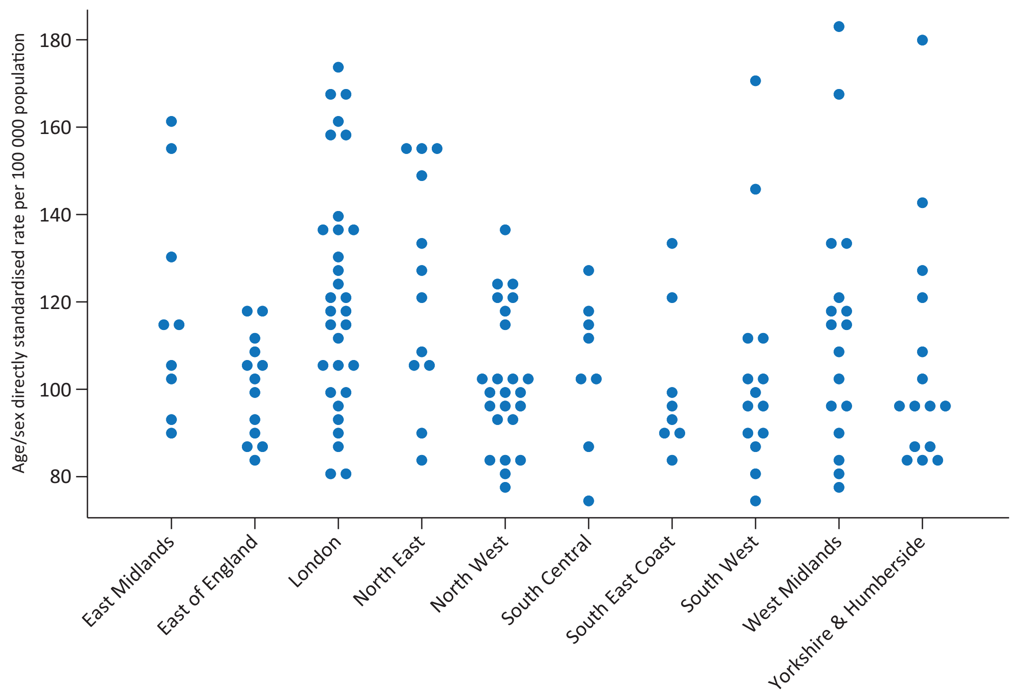


Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes, Crown copyright and database rights, 2013,. Ordnance Survey 100039906.

Percutaneous transluminary coronary angioplasty (PTCA)

The average PTCA rate across PCTs in England reached 111 per 100 000 population in 2010-11, a rate more than three-times greater than the CABG rate. The geographic variation in the PTCA rate was much lower than that for CABG, suggesting that there has been a somewhat uniform move in adopting this less invasive intervention in the treatment of ischaemic heart disease. Still, there was a 2.5-fold difference between PCTs with the lowest rates and those with the highest rates (Figure 14.6). The three PCTs that had the lowest rates of PTCA were South Gloucestershire (in the South West SHA), Isle of Wight (in the South Central SHA) and Herefordshire (in the West Midlands SHA). The PCTs with the highest PTCA rates were Heart of Birmingham Teaching (in the West Midlands SHA), Hull (in the Yorkshire and Humber SHA) and Newham (in the London SHA).

Figure 14.6. PTCA rate by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.7 shows that, in general, the rates of PTCA tend to be lower in the west part of the country, but with some exceptions.

Overall, PTCA rates in England increased significantly between 2003-04 and 2010-11, however the variation across PCTs decreased, indicating that the rise has been particularly strong in those PCTs that had a low rate in 2003-04. This harmonisation in clinical practice may be partly explained by NICE guidance issued in 2000 which recommended that patients suitable for either PTCA or CABG procedures should preferably receive PTCA with stent, rather than CABG (NICE, 2000).

The South East Public Health Observatory (2013) has produced, in conjunction with the NHS Atlas series, some “Cardiovascular Disease Profiles” for PCTs. These profiles are designed, amongst other things, to inform commissioning and planning decisions to tackle cardiovascular diseases (including ischaemic heart disease and heart attack) at the local authority level. For example, the 2010/11 profile for the Newham PCT in the London SHA noted that the elevated rates of both CABG and PTCA in this PCT were associated with much higher rates of emergency admissions for coronary heart disease (which can be used as an indicator of need) and coronary angiography (an intervention used as a first step in the diagnosis of ischaemic heart disease). The PCT profile also noted that, whilst there was a significant growth in PTCA rates in Newham between 2003/04 and 2010/11, this was also accompanied by an increase in CABG rates, despite a significant decrease in CABG rates of over 20% across England in general during that period.

Figure 14.7. Map of PTCA (age/sex standardised) rate, per 100 000 population, by Primary Care Trust, England, 2010-11

Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes, Crown copyright and database rights, 2013, Ordnance Survey 100039906.

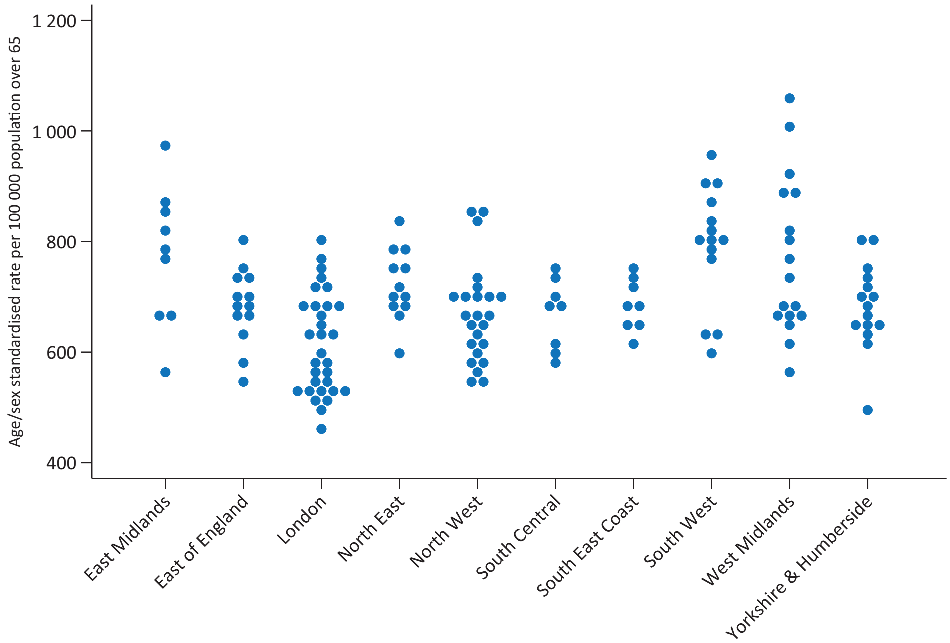
Joint procedures

Admission after hip fracture

In 2010-11, the average rate for admission after hip fracture was 695 per 100 000 population aged 65 and over, with a 2.3-fold variation across PCTs (Figure 14.8). As expected, this procedure has the lowest variation compared with other procedures, as there is little discretion to admit and operate a patient following a hip fracture.

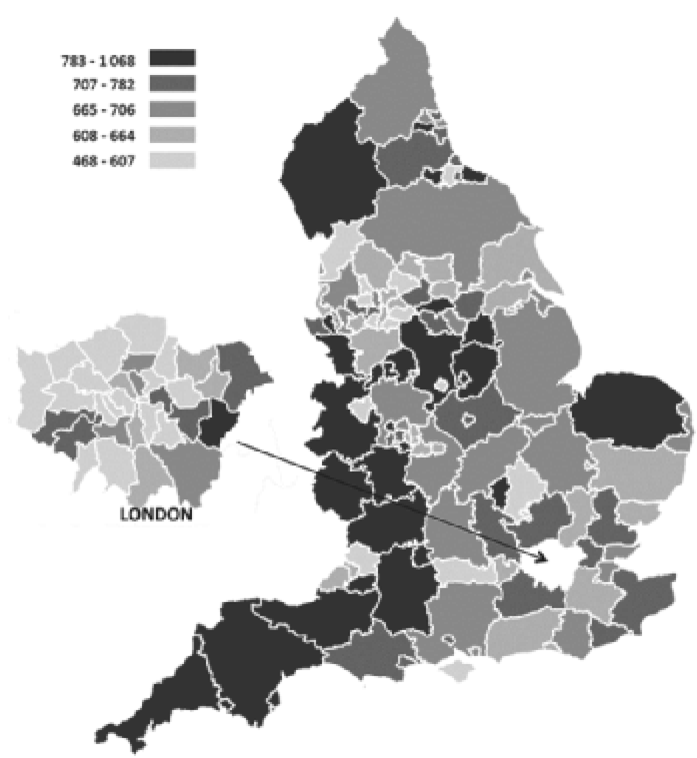
Figure 14.9 shows that the rates of admission after hip fracture are generally lower in London and the East, with rates higher in the west part of England.

Figure 14.8. Admission after hip fracture rate by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.9. Map of admission after hip fracture (age/sex standardised) rate, per 100 000 population aged 65 and over, by Primary Care Trust, England, 2010-11



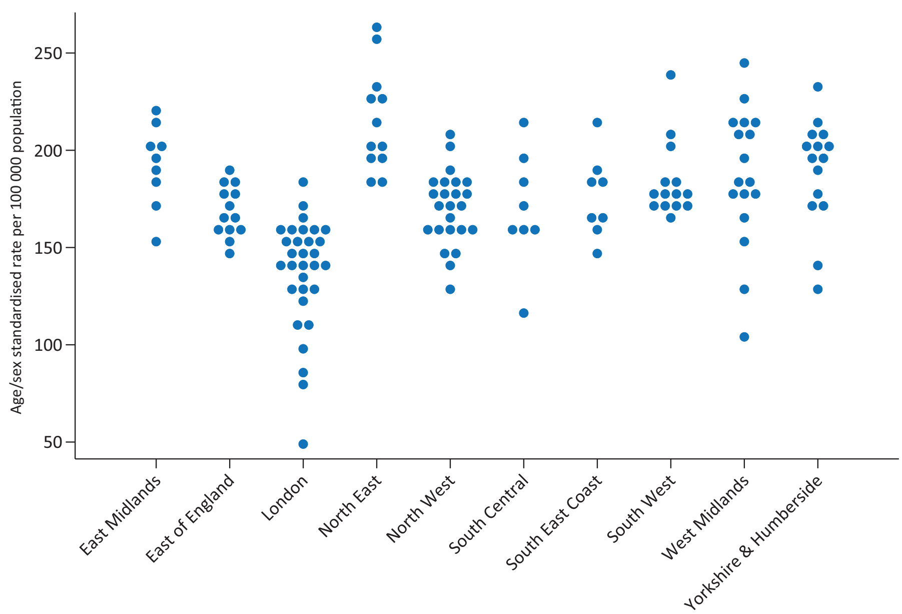
Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes, Crown copyright and database rights, 2013, Ordnance Survey 100039906.

Knee replacement

Knee replacement rates have increased over the past decade in England as in other OECD countries, although they remain well below rates in countries such as the United States, Germany and Switzerland (OECD, 2013b).

The average knee replacement rate across PCTs in England was 174 per 100 000 population in 2010-11. However, there was significant variation in knee replacement rate across PCTs, with the rate below 100 per 100 000 population in some PCTs and above 250 000 per 100 000 in other PCTs. The highest rates were in the North East Strategic Health Authorities area (Figure 14.10). Within the London area, some PCTs (Kensington and Chelsea, Hammersmith and Fulham, and Westminster) had very low rates, while others were around the national average.

Figure 14.10. Knee replacement rate by Strategic Health Authority and Primary Care Trust, England, 2010-11



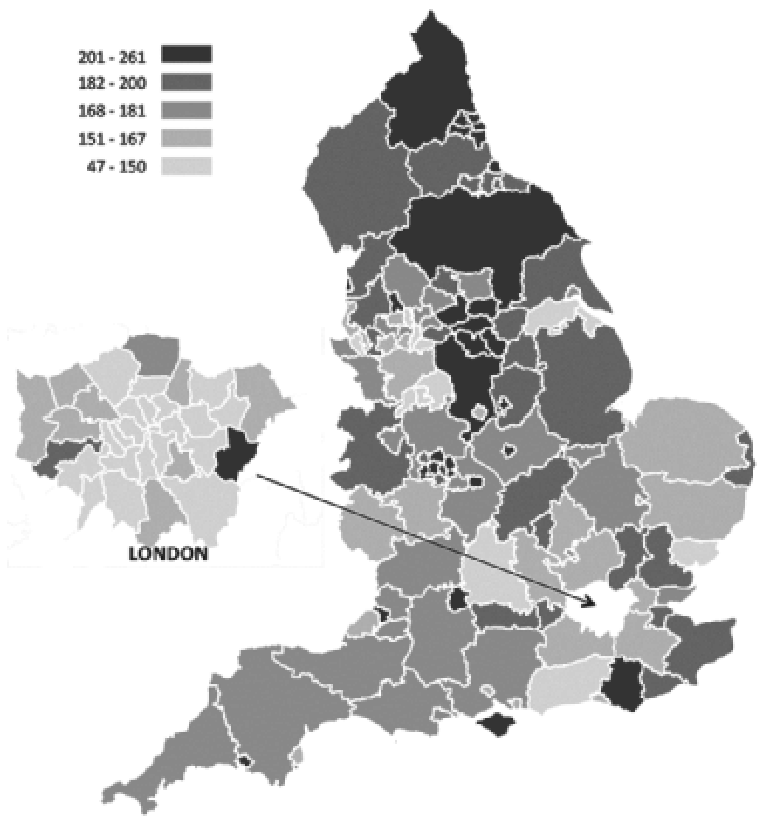
Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.11 shows that knee replacement rates tend to be higher in the north of England, with a few exceptions in the south, such as the Isle of Wight, Plymouth, as well as the Bexley PCTs in the London area.

There is evidence that geographic variations in knee replacement rates in England are not closely related to knee osteoarthritis, the primary indication for this procedure (Jayadev et al., 2012), which might indicate either an under-use of the procedure in some regions and/or an over-use in others.

Since 2009, patient outcomes following knee replacement (in addition to some other surgical interventions including hip replacement) are monitored in England by asking patients to report on different aspects of their health, functioning and pain before and after their operations (HSCIC, 2013). These Patient Reported Outcome Measures (PROMs) are publicly reported in NHS Atlases (NHS, 2011). On average across England, 91% of patients who had a knee replacement in 2010-11 reported joint-related improvements following their operation, as measured by their response to a series of questions in the Oxford Knee Score. A slightly lower share (78%) reported an increase in their general health based on the five health-related quality of life dimensions in the EQ-5D score. These positive outcomes were the same in regions with high rates of knee replacement and those with low rates, indicating no "diminishing returns" to increasing knee replacement rates. This suggests that that the population in regions with low rates might therefore benefit from increasing access to knee replacement.

Figure 14.11. Map of knee replacement (age/sex standardised) rate, per 100 000 population, by Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes, Crown copyright and database rights, 2013, Ordnance Survey 100039906.

Knee replacement is included in the NHS England Shared Decision Making programme (NHS, 2013). In 2013, this programme included 38 comprehensive decision aids for a broad range of health interventions, including treatments for knee osteoarthritis. These decision aids aim to provide patients with a better understanding of the risks and benefits associated with different therapeutic options. The decision aids are set up in a fairly standard format which allows people to compare options, note what is important to them, and consider any concessions to be made before coming to a final decision.

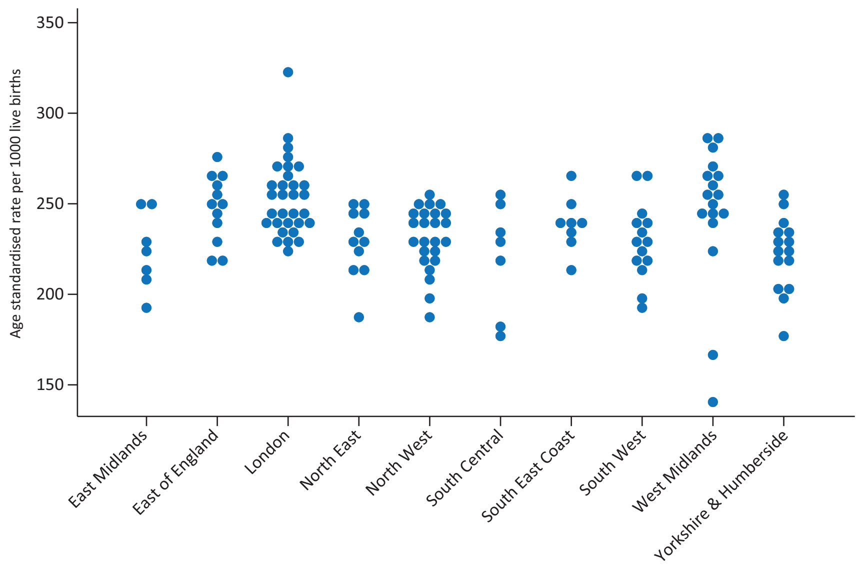
Gynaecological procedures

Caesarean section

In 2010-11, the average rate of caesarean sections across PCTs in England was 237 per 1 000 live births. The variation across PCTs was generally very low.

Newham PCT (London Strategic Health Authority) had the highest rate in England, followed by Stoke on Trent and Coventry Teaching PCTs (both in the West Midlands SHA). Newham PCT also had the highest birth rate in England in 2010-11, at twice the national average.

Figure 14.12. Caesarean section rate by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Though caesarean rates in England have increased greatly from 9% in 1980 to 23% in 2010-11, there is relatively little variation between PCTs, suggesting that the increase has been fairly uniform across different regions. This may be due to adherence to the regularly updated guidelines provided by the National Institute for Health and Care Excellence (NICE, 2011). Bragg and colleagues (2010) found that most of the variation across NHS trusts was due, at least in part, to women's preferences for example, a lack of willingness to have a vaginal birth after a previous caesarean section.

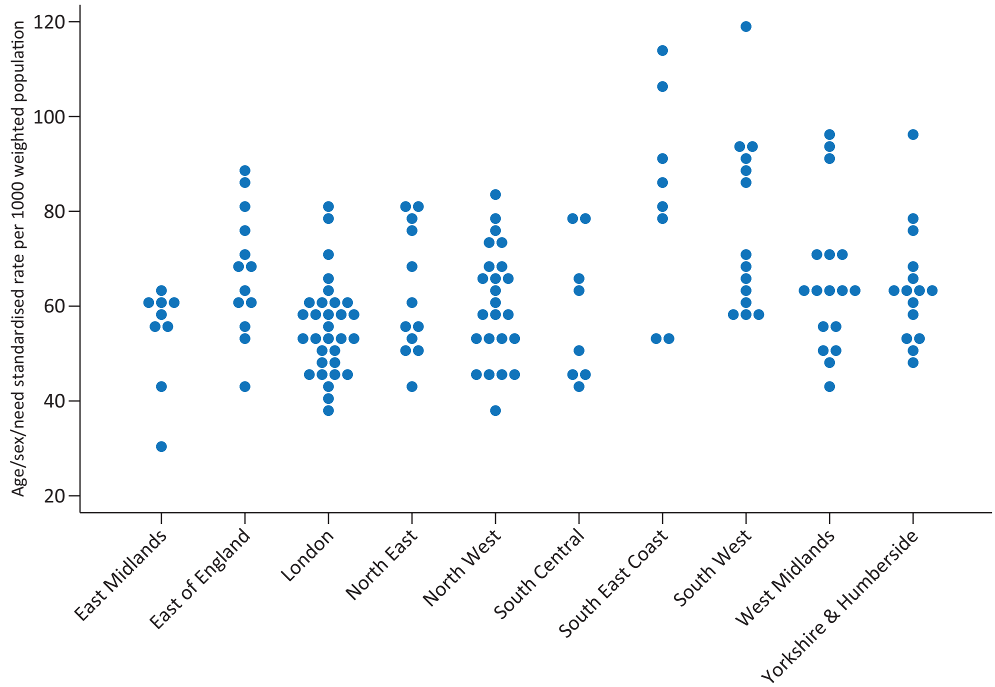
Imaging tests

CT scans

In 2010-11, the average rate of CT scans was 63 per 1 000 population (needs-adjusted), but with a 3.8-fold variation across PCTs. The PCTs with the lowest rates of CT scans were Milton Keynes (East Midlands SHA), Hillingdon (London SHA) and Blackpool (North West SHA). Those with the highest were South Gloucestershire (South West SHA), Eastern and Coastal Kent, and Hastings and Rother (both part of South-East Coast SHA) (Figure 14.13).

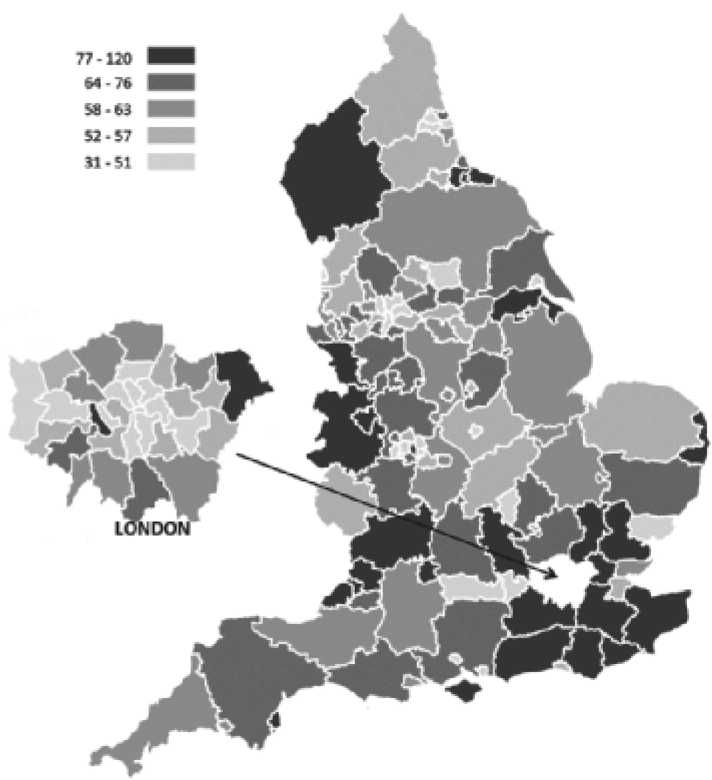
Figure 14.14 shows that there is a concentration of PCTs with elevated rates of CT scans in the South-East of England, however excluding most of London.

Figure 14.13. CT scans by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.14. Map of CT scans, per 1 000 weighted population, by Primary Care Trust, England, 2010-11

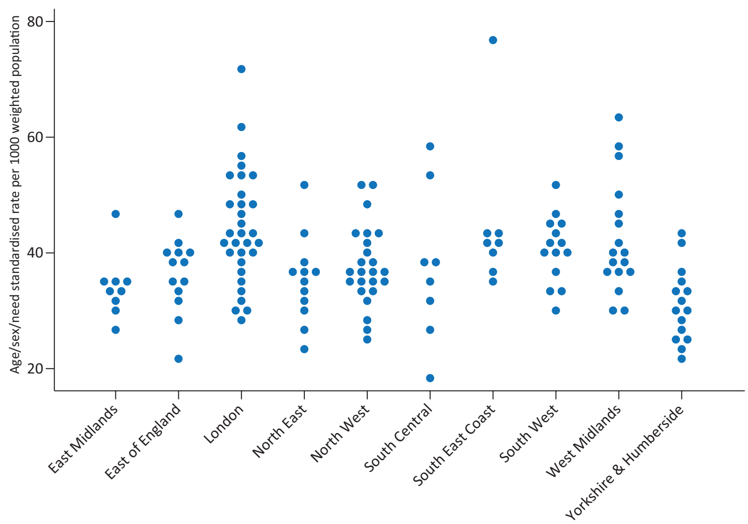


Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

MRI scans

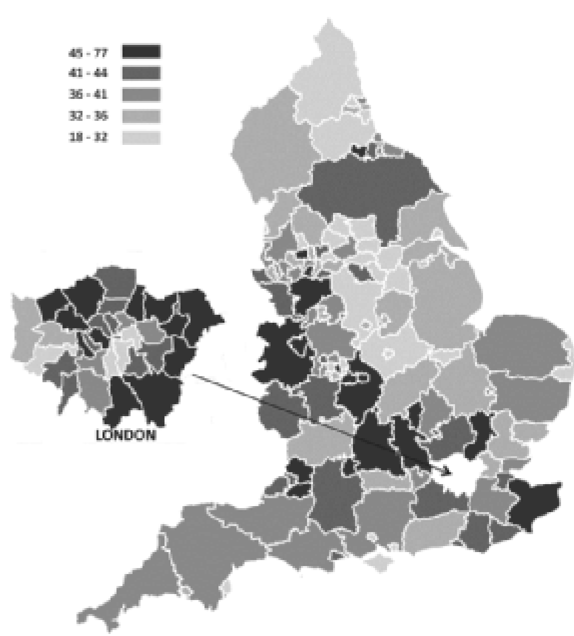
In 2010-11, there was an average of 39 MRI scans per 1 000 population, however the variation across PCTs was high (4.2-fold). The PCTs with the lowest rates of MRI scans were Portsmouth City Teaching (South Central SHA), Hull (Yorkshire and Humber SHA) and Great Yarmouth and Waveney (East of England SHA). The PCTs with the highest rates of activity were Coventry Teaching (West Midlands SHA), Hammersmith and Fulham (London SHA) and Eastern and Coastal Kent (South East Coast SHA) (Figures 14.15 and 14.16).

Figure 14.15. MRI scans by Strategic Health Authority and Primary Care Trust, England, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

Figure 14.16. Map of MRI scans, per 1 000 weighted population, by Primary Care Trust, 2010-11



Source: Hospital Episode Statistics, Health and Social Care Information Centre, England, www.hscic.gov.uk/hes.

The 2011 NHS Atlas suggests that variations in MRI and CT scans across England may be due not only to the availability of the equipment and trained personnel, but also to local clinical practices, which may have evolved in an inappropriate way over time.

14.5. Conclusions

This chapter presented regional variations in the rates of hospital medical admissions and eight surgical and diagnostic procedures in England in 2010-11, based on the organisational structure at that time: ten Strategic Health Authorities and 151 Primary Care Trusts.

Admission after hip fracture had the lowest variation across regions, which was expected given that there is little discretion but to operate a patient following a hip fracture. The regional variation in caesarean section rates was also relatively low, in a context where caesarean section rates have generally increased in England over the past few years, but still remain below the OECD average. The low variations in caesarean section rate may be due at least partly to adherence to the guidelines provided by the National Institute for Health and Care Excellence which are regularly updated (NICE, 2011).

The regional variations are much larger for coronary artery bypass grafts (CABG), knee replacement and MRI scans, with rates being 4 to 5 times higher in some PCTs compared with others. These large variations might possibly reflect either an under-use of these procedures in some regions or an over-use in regions with higher rates.

The development of Patient Reported Outcome Measures (PROMs) for knee replacement and other surgical procedures since 2009 is an important step to determine to what extent these interventions bring health benefits to patients. In 2010-11, the vast majority of patients who had a knee replacement in England reported positive health outcomes (91% based on the Oxford Knee Score and 78% based on the more general EQ-5D questionnaire). These positive outcomes were the same in regions with high rates of knee replacement and those with low rates, suggesting therefore that that the population in regions with low rates might benefit from greater access to knee replacement. Decision aids for people suffering from knee osteoarthritis might also help them to make more informed decisions about the possible benefits and risks of a knee replacement, based on their own preferences.

Public reports on medical practice variations have been presented in the NHS Atlases of Variation in Healthcare. Initially, the Atlas was mainly targeted at clinicians and managers responsible for resource utilisation and allocation. It sought to highlight variations in activity, outcomes and expenditure across a range of clinical areas at the PCT level, while avoiding an overall ranking of PCTs. The 2010 Atlas covered 34 indicators across a number of clinical areas, including cancer, mental health, circulatory diseases, end-of-life care and diagnostic exams. The 2011 edition expanded the coverage to 71 indicators, and further "themed" Atlases were launched; covering clinical areas such as health care for children and young people, kidney disease, diabetes, respiratory diseases and liver diseases.

Schang and colleagues (2014) attempted to assess how health care payers in England were using the information presented in the NHS Atlas of Variation in Healthcare (2010 edition) in their decision-making processes. While the degree to which the Atlas was used varied, all PCTs reported that they were paying attention to the position of their own PCT compared with the national average in their planning process. In some cases, this prompted further investigation, for example in some PCTs that had high rates of MRI scans. Another PCT was able to determine that their clinical thresholds for the provision of cataract surgery were lower than those of neighbouring PCTs, thus explaining why their cataract surgery rates were higher. In two PCTs, the Atlas had been used to engage a dialogue with local GPs to improve care for people with diabetes, which was lower in their PCTs in many respects than the care provided in other PCTs. Schang and colleagues concluded that the information available in the NHS Atlas may be useful for strategic planning purposes, however, additional information, including a greater understanding of the causes of these variations, would be useful to identify more precisely the issues and engage discussions with clinicians on possible solutions.

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ANNEX 14.A1

Primary Care Trust per Strategic Health Authority

East Midlands SHA
- Derby City
- Derbyshire County
- Leicester City
- Leicestershire County and Rutland
- Lincolnshire
- Milton Keynes
- Northamptonshire
- Nottingham City
- Nottinghamshire County

East of England SHA
- Bedfordshire
- Cambridgeshire
- East and North Hertfordshire
- Great Yarmouth and Waveney
- Luton
- Mid Essex
- Norfolk
- North East Essex
- Peterborough
- South East Essex
- South West Essex
- Suffolk
- West Essex

London SHA
- Barking and Dagenham
- Barnet
- Bexley
- Brent Teaching
- Bromley
- Camden
- City and Hackney Teaching
- Croydon
- Ealing
- Enfield
- Greenwich Teaching
- Hammersmith and Fulham

North East SHA
- County Durham
- Darlington
- Gateshead
- Hartlepool
- Middlesbrough
- Newcastle
- North Tees
- North Tyneside
- Northumberland
- Redcar and Cleveland
- South Tyneside
- Sunderland Teaching

North West SHA
- Ashton, Leigh and Wigan
- Blackburn with Darwen
- Blackpool
- Bolton
- Bury
- Central and Eastern Cheshire
- Central Lancashire
- Cumbria
- East Lancashire
- Halton and St Helens
- Heywood, Middleton and Rochdale
- Knowsley
- Liverpool
- Manchester
- North Lancashire
- Oldham
- Salford
- Sefton
- Stockport
- Tameside and Glossop
- Trafford
- Warrington
- Western Cheshire
- Wirral

South West SHA
- Bath and North East Somerset
- Bournemouth and Poole
- Bristol
- Cornwall and Isles of Scilly
- Devon
- Dorset
- Gloucestershire
- North Somerset
- Plymouth Teaching
- Somerset
- South Gloucestershire
- Swindon
- Torbay
- Wiltshire

West Midlands SHA
- Birmingham East and North
- Coventry Teaching
- Dudley
- Heart of Birmingham Teaching
- Herefordshire
- North Staffordshire
- Sandwell
- Shropshire County
- Solihull Care Trust
- South Birmingham
- South Staffordshire
- Stoke on Trent
- Telford and Wrekin
- Walsall Teaching
- Warwickshire
- Wolverhampton City
- Worcestershire

Yorkshire and Humber SHA
- Barnsley
- Bassetlaw
- Bradford and Airedale

Haringey Teaching
Harrow
Havering
Hillingdon
Hounslow
Islington
Kensington and Chelsea
Kingston
Lambeth
Lewisham
Newham
Redbridge
Richmond and Twickenham
Southwark
Sutton and Merton
Tower Hamlets
Waltham Forest
Wandsworth
Westminster

South Central SHA
Berkshire East
Berkshire West
Buckinghamshire
Hampshire
Isle of Wight National Health Service
Oxfordshire
Portsmouth City Teaching
Southampton City

South East Coast SHA
Brighton and Hove City
East Sussex Downs and Weald
Eastern and Coastal Kent
Hastings and Rother
Medway
Surrey
West Kent
West Sussex

Calderdale
Doncaster
East Riding of Yorkshire
Hull
Kirklees
Leeds
North East Lincolnshire
North Lincolnshire
North Yorkshire and York
Rotherham
Sheffield
Wakefield District

Source: Hospital Episode Statistics, Health and Social Care Information Centre, England.

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