

What patients pay for medicines: a comparison of six countries

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Abstract

Introduction

Pharmaceutical expenditure is rising in high-income countries. Some countries choose to pass some of these costs on to patients through various cost-sharing strategies. In many countries, patients pay an out-of-pocket cost for prescription medicines. Out-of-pocket costs vary between different countries, the medicines being used and the patient themselves. Out-of-pocket costs for medicines can represent a significant financial burden for some patients.

Aim

The aim of this thesis is to examine the costs of prescription medicines incurred by patients in a variety of high-income Organisation for Economic Co-operation and Development (OECD) countries.

Methods

A series of model patient scenarios were used to demonstrate the cost of prescription medicines as a proportion of patient income. The model patients were placed in one of six countries; Australia, Canada, England, Finland, Germany or New Zealand. The model patients had a range of ages, income types, and medical conditions. The medical conditions included were; asthma, type 2 diabetes mellitus, schizophrenia and metastatic renal cell carcinoma. The prescription prices paid for medicines by each model patient were then compared using purchasing power parities.

Results

The proportion of income spent on prescription medicines by the model patients ranged from 0% to over 50%. Patients with the lowest incomes spent proportionally more of their income on the same medicines compared with high-income patients. Some of the model patients were exempt from prescription charges depending upon their age, medical condition or income type. Patients in Canada generally paid more than any of the other countries, while patients in England paid the least.

Discussion/conclusions

This is the first study to compare prescription charges for patients across a range of countries, patient income types and medical conditions. There was considerable variation in patient out-of-pocket costs for medicines across the countries and conditions included. The co-payment systems used for prescription medicines in each country had many advantages and disadvantages for patients. The study was somewhat limited by missing data from some countries. Further research using real patient data should be considered.

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List of abbreviations

FDA	Federal Drug Administration (USA)
Kela	Kansaneläkelaitos, the Social Insurance Institution of Finland
MHRA	Medicines and Healthcare products Regulatory Agency
MSAH	Ministry of Social Affairs and Health (Finland)
NIHBP	Non-Insured Health Benefits Program (Canada)
NLPDP	Newfoundland and Labrador Prescription Drug Program
NHS	National Health Service (UK)
OECD	Organisation for Economic Co-operation and Development
PBS	Pharmaceutical Benefits Scheme (Australia)
PHARMAC	Pharmaceutical Management Agency
USA	United States of America
UK	United Kingdom
WHO	World Health Organisation

Glossary

Co-insurance	A type of variable co-payment
Co-payment	The amount a patient pays towards goods or services, with an insurer or government agency paying the remainder. The amount a patient contributes may be fixed, or variable
Deductible	A fixed amount up to which a patient must pay part of the cost or the full cost of prescription medicines
Dispensing fees	The portion of a prescription charge that pays for pharmacy services
Formulary	A list of medicines
Generic medicine	A generic medicine is a copy of a medicine made by a company that did not develop the drug themselves
Generic substitution	Substituting a generic medicine for a branded medicine
List prices	The prices of medicines agreed to by price regulators or agencies that purchase medicines on behalf of the public
Out-of-pocket (OOP) payment/cost	The patient contributions towards goods or services that will not be reimbursed by an insurer or funding agency
Prescription charges	The amount a patient must pay to collect a prescription
Price regulator	An agency that sets the list prices of medicines
Purchasing power parities	Price relatives showing the ratio of the prices in national currencies of the same good or service in different countries
Reference pricing	Grouping together pharmaceuticals with similar effects or the same effect and setting the price for the whole group to that of the medicine with the lowest price
Subsidy	The proportion an insurer or funding agency will pay for a commodity such as a medicine
Tendering processes	A process where pharmaceutical suppliers to provide pricing proposals for off-patent medicines to a medicine funding agency

Introduction

The costs associated with providing healthcare present a huge burden for health systems, governments and the general public.(1, 2) Health expenditure is rising in high-income countries. This is due to multiple factors, including aging populations, increased chronic illnesses and obesity, increased use of new health technologies and increased pharmaceutical expenditure. For example, in the United States of America (USA), healthcare costs have increased faster than the rate of inflation between 1960 and 2013.(3)

In New Zealand, public spending on health has risen substantially. In 1995, the percentage of gross domestic product (GDP) spent on healthcare was 6.95%.(4) By 2015, that figure had risen to 9.41%. This is a similar increase in health spending over the last 20 years to most other countries in the Organisation for Economic Co-operation and Development (OECD).(4) Current projections by the New Zealand Treasury estimate that New Zealand will be spending 10.8% of GDP on healthcare by 2060 if increases in healthcare expenditure persist.(5) Similar projections in spending have been forecast for other OECD countries.(4)

The price of pharmaceuticals contributes to increased healthcare expenditure.(2) As costs for healthcare increase, some of the costs will be directly incurred by patients. In many developed countries, patients already contribute directly or pay “out-of-pocket” (OOP) payments towards goods and services such as prescription medicines and doctors’ fees.(2) As with healthcare costs, pharmaceutical expenditure is increasing faster than economic growth.(2) In OECD countries, the proportion of health spending on pharmaceuticals ranges between 6.7% (Denmark) to 30.2% (Hungary) (2014).(6) Most of the expenditure is on prescription medicines, which are used both in and out of hospital. How pharmaceuticals are paid for varies markedly between different countries.(2)

This thesis examines the costs associated with pharmaceutical expenditure that are incurred by patients in public healthcare systems. A group of model patients is used, with different ages and levels of income to demonstrate the proportion of income patients may have to spend on prescription medicines. The model patients are then placed in different high-income countries, with different medical conditions, to give examples of what patients might pay for prescription medicines

in various scenarios. This gives real-life settings of the prescription costs patients face, and allows comparisons between the selected countries. Few studies have compared patient prescription charges between countries, for multiple medical conditions and different patient types, or investigated these charges in relation to proportion of income spent on medicines. It does not investigate the direct impact of patient costs for prescription medicines, or the health outcomes for patients choosing to use prescription medicines. High-income countries with some level of prescription drug coverage are focused on for the purposes of this research.

Approaches to paying for pharmaceuticals

The simplest method is user-pays. In this, the consumer or patient will pay the full cost of obtaining a prescription medicine.(7) Over-the-counter medicines are usually paid for in this way.(2) However, in most OECD countries, patient prescription medicines costs are usually off-set by public funding of pharmaceuticals or private insurance schemes.(2) The coverage provided for prescription medicines varies widely between different countries and the types of schemes used to pay for pharmaceuticals. Where public coverage is available, some form of price regulation by the institutions responsible for pharmaceuticals is often in place.(2)

Most public coverage of prescription medicines is funded through general taxation.(8) Social insurance schemes may also be used, where employees or employers on behalf of their employees make contributions to an insurance scheme which includes drug coverage.(7) Patients may also turn to private insurers for drug coverage.(8)

Cost containment methods

Cost containment methods used by price regulators include the use of generic medicines, reference pricing and formularies.

A brand name or innovator medicine is a new medicine, which has been developed by a particular pharmaceutical company. A new medicine is developed under patent protection, but there will be a patent expiry date, after which other pharmaceutical companies are able to copy the innovator medicines.(9, 10) These copies are called generic medicines. They are tested to make sure that the chemical

structure is identical to the innovator medicine and that the clinical effects are the same (bioequivalence).(9, 10) The research and development costs associated with the production of generic medicine are lower than that of an innovator medicine. This means that companies offering generic medicines are usually able to do so at a lower price than the innovator medicine.(9) There may also be several pharmaceutical companies producing the same generic medicine, which increases competition and thus lowers prices.(9) In countries where generic substitution of a medicine is allowed, price regulators are able to use tendering processes to encourage lower prices.(2)

Reference pricing is often used in conjunction with generic medicines. Reference pricing groups together pharmaceuticals with similar effects or the same effect.(2, 11) This could be for a single generic medicine (for example, salbutamol), or for all the medicines belonging to a particular therapeutic group (such as statins).(2) Whichever pharmaceutical has the lowest price will then set the benchmark for the other medicines, forcing pharmaceutical manufacturers to provide medicines at lower prices.(2)

A formulary is a list of medicines. In this context, a formulary may be used by a price regulator to define a list of medicines for which there is some form of coverage available to help patients pay for prescription medicines.(2) This helps to limit the number of medicines which are to be funded by a plan. Usually this is a “positive” list, meaning that all prescription medicines on the list will be covered in some way. Alternatively, there may be a “negative” list, where anything on the list will not be funded, and all other available prescription medicines will have some degree of coverage.(2)

Cost-sharing strategies

Most OECD countries have some form of cost-sharing strategy for prescription medicines.(2) Countries may also use several cost-sharing strategies in concert. There may be some benefits in patients contributing to the cost of pharmaceutical products, for example, discouraging the use of unnecessary medicines and medicines waste.(12, 13) Cost-sharing is also another cost-containment method.(14) However, for many patients, contributing to pharmaceutical costs is a barrier to receiving effective treatment.(15, 16)

Types of cost-sharing

Co-payments

Co-payments are one of the most common forms of cost-sharing. The incentive to use co-payments may be to give patients insight into the cost of their medicines.(15) There are two main types of co-payment, fixed co-payments and variable co-payments. Fixed co-payments are a fixed price per item per prescription.(12, 17) With variable co-payments, patients usually pay a percentage of the prescription cost, with the insurer or funder paying the remainder.(12, 17) This is also known as “co-insurance”.(18) What percentage is paid may depend on the patients’ medical condition/s, whether the medicine is an innovator or generic medicine, or how essential the medicine is (life-saving medicines will usually have a lower patient co-payment).(12, 17) When variable co-payments are used, the original price for the medicine paid for or negotiated by the funding agency also becomes a factor. This means that if a funding agency has paid a high price for a medicine, the patient, through the co-payment will also be paying more. Reduced co-payments may also be available for patients on low-incomes or receiving government benefits.(17)

Contribution limits

Many schemes have a maximum contribution limit or “safety net”.(2, 17) Before reaching the contribution limit, a patient may be responsible for all or part of the medicine cost. Once a patient or their family has reached this limit, the patient will pay nothing, or a minimal co-payment for access to any further medicines needed.(2) Usually, contribution limits are for one year’s pharmaceutical expenditure.(2) Some contribution limits may be targeted to more vulnerable populations, such as the elderly.(2, 17)

Deductibles

A deductible is a fixed amount up to which a patient must pay part of the cost or the full cost of prescription medicines.(17) Deductibles are often combined with a fixed or variable co-payment.(12) Once the deductible amount is reached, the required co-payments are lower.(12)

All of these types of cost-sharing may also be influenced by other factors, such as the patient’s medical condition, age, or income.(1, 12, 17)

Why people are vulnerable to health costs?

Accessing healthcare can be difficult for patients for many reasons, including distance to services, especially for patients living in rural areas, and language barriers. A considerable factor is that the direct cost to patients may delay or restrict a patient's access to healthcare.(15) Some patients may find it particularly difficult to meet these direct or OOP costs, including those for prescription medicines.

Who is most vulnerable to health costs?

People most vulnerable to health costs include; those who are unemployed or have low income, the elderly, children under 5 years, those with chronic medical conditions and those unable to work due to illness or disability.(2, 19) The design of the health coverage system also impacts who the most vulnerable people are, for example, in some systems children or the elderly are exempt from health costs.(8) For pharmaceutical product costs, the main OOP costs patients face are those related to obtaining a prescription from a prescriber and costs for collecting a prescription from a pharmacy (prescription charge).(14) Patients who have multiple medical conditions, or comorbidities often need to take many medicines. This places a considerable financial burden on patients if they are required to make an OOP payment for each medicine, potentially all at one time. The model patients used in the thesis help to show which groups of patients are more susceptible to prescription costs, and which patients are likely to have high costs relative to their income.

Indigenous peoples' access to healthcare

Health disparities are often present between indigenous people and the rest of a country's population.(8) Australia, Canada and New Zealand all have indigenous populations with lower life expectancies than the rest of the population.(8) In New Zealand, Māori patients are less likely to be able to afford prescription medicines than New Zealand Europeans.(20) In Australia and New Zealand, there are some regional health programmes aimed at reducing health disparities.(8) Canada is the only country of these three with a specific programme for prescription drug coverage for the indigenous population which is the Non-Insured Health Benefits Program (NIHBP).(21)

What happens when people cannot pay for their medicines

Previous studies have explored the ways patients may mitigate or reduce the costs of their medicines.(16, 22) The methods patients may use include; going without food, taking a lower dose of a prescribed medicine to make the supply last longer, only collecting part of a prescription, delaying collection of medicines until money is available, buying a cheaper over-the-counter (OTC) product and not collecting their medicines at all.(16, 22) At an individual level, this behaviour will have a detrimental effect on a patient's health, either by depriving them of life's essentials, receiving sub-therapeutic doses of medicines, or missing out on a medicine. Not taking a medicine as prescribed, or going without basic necessities, may result in poorer health outcomes and increased use of secondary care services.(18, 23) In a survey of people with cardiovascular disease, those people who reported not taking all their medicines as prescribed (due to cost), were more likely to be hospitalised in the next two years.(24) Another study, of patients with chronic obstructive pulmonary disease, reported people going without medicines and medical services due to financial hardship. As a result, people had to use savings or take out loans to meet financial obligations.(25)

In the wider population, patients not taking their prescribed medicines has further implications for healthcare-related costs. For some people with chronic medical conditions who might not take their medicines, their condition may exacerbate, which may result in days off work and more hospital admissions.(26) This has economic implications, such as, the loss of productivity for workplaces, and the increased healthcare costs associated with deterioration of their condition and subsequent hospital care.(26)

While this thesis focuses on the amount patients pay for medicines when they are collected from a pharmacy, it is important to remember that there may be other costs associated with obtaining medicines. This includes, but is not limited to; doctors' fees, the cost of associated over-the-counter medicines, and private insurance costs. In this thesis, only public coverage is investigated, with the assumption that patients with additional private insurance will generally absorb prescription fee costs as part of their insurance premiums.

Profiles of countries to be included in the study

The countries chosen for this study are Australia, Canada, England, Finland, Germany and New Zealand. Population and spending information data for each country is outlined in Table 1. These countries are high-income countries with universal health coverage for secondary care and above.(8) However, there is more variation in health coverage in primary care and often prescription medicine costs may not be fully covered.

Table 1. Population and health spending data for countries included in the study (USD)(6, 8, 27-29)

Country	Population	GDP (USD 2015)	GDP spending on health (USD 2014)	GDP spending on medicines	Funding systems for health
Australia	23.5 million (2014)	Total: \$1,102,733 million Per capita: \$45,821	Total: 9% of GDP Per capita: \$2,804	Total: 15% of health spending Per capita: \$588 (2014)	Mixture of public and private funding
Canada	35.5 million (2014)	Total: \$1,588,597 million Per capita: \$44,284	Total: 10% of GDP Per capita: \$4,496	Total: 17.2% of health spending Per capita: \$772 (2014)	Public and private insurance plans
England (UK data unless specified)	63.7 million (2012) England 54.8 million (2015 estimate)	Total: \$2,691,808 million Per capita: \$41,351	Total: 9.9% of GDP Per capita: \$3,971	Total: 12.2% of health spending Per capita: \$485 (2014)	Mostly public
Finland	5.5 million (2014)	Total: \$224,647 million Per capita: \$40,990	Total: 9.5% of GDP Per capita: \$3,871	Total: 12.3% of health spending Per capita: \$476 (2014)	Mostly public
Germany	80.9 million (2014)	Total: \$3,848,270 million Per capita: \$47,113	Total: 11% of GDP Per capita: \$5,119	Total: 14.5% of health spending Per capita: \$741 (2014)	Private providers funded through special levies
New Zealand	4.5 million (2014)	Total: \$169,960 million Per capita: \$36,780	Total: 9.4% of GDP Per capita: \$3,537	Total: 9.4% of health spending Per capita: \$297 (2012)	Mixture of public and private funding

Further detail of the rationale for choosing these countries is in the Methods chapter. Each country's healthcare system and funding for pharmaceuticals will be briefly introduced here.

Australia

Australia's healthcare is mostly publicly funded through general taxation.(8) Australia's governmental system is made up of a federal government and state governments. Most of the funding for healthcare is provided by the federal government through general taxation.(8) Meanwhile the states have the responsibility of providing services to patients.(8) Treatment in hospitals is free and there are subsidies for most medical services, including prescription medicines.(30) Private hospitals and services are available, though access to private care requires either OOP payments by patients or for patients to pay for private health insurance.

The Pharmaceutical Benefits Scheme (PBS) subsidises the cost of medicines for most Australians.(31) Medicines that are subsidised are listed in the Schedule (Australia's version of a formulary). Medicines that are not on the Schedule may be prescribed, but the patient must pay the full cost. However, more than 90% of prescriptions are covered by the PBS.(30) New medicines are added to the PBS after assessment by the Pharmaceutical Benefits Advisory Committee (PBAC).(30) The PBAC is made up of a group of health professionals, economists and consumer representatives. They examine clinical effectiveness, safety and cost-effectiveness of new medicines.(32)

A co-payment for a prescription medicine is required at the time of dispensing.(32) One month's supply of an item is usually dispensed.(33) For most patients, the co-payment can be up to \$37.70 AUD per item(2015).(34) The co-payment will be reduced if the original price of the medicine is less than \$37.70 AUD. For patients with a concession card the co-payment is \$6.10 AUD per item (2015).(34) People eligible for a concession card include those receiving some government benefits, those on low incomes, those over 65 years of age, and veterans.(35) For non-concession patients, the maximum amount to pay (the "Safety Net") for PBS prescription medicines annually is \$1453.90 AUD (2015), after which co-payments

are at the concession card rate.(34) For concession card patients, the “Safety Net” is \$366.00 AUD (2015), after which all PBS prescription medicines are free of charge.(34)

Canada

Canada’s publicly funded healthcare system (Medicare) covers most hospital and physician services for Canadian residents.(36) Healthcare in Canada is funded through general taxation at both the federal and provincial levels.(8) The federal government regulates and helps to fund Medicare. Provinces and territories in Canada are responsible for providing and managing healthcare services to their residents. Each province/territory has its own public healthcare plan and residents who are insured through their home province/territory plan have access to healthcare anywhere in Canada.(36) Each of the provinces included in this study will be considered separately, as each province has its own public plan. This is different to Australia, where there is only one prescription drug coverage scheme for the whole country.

Medicare cover does not include prescription medicines outside of hospitals.(8, 37) Therefore, each province/territory has its own prescription drug plan. Residents may use the provincial/territorial plan, or buy private health insurance which includes prescription medicine coverage.(8) There are also Federal Public Drug Benefit Programs, which provide coverage for the following groups; First Nations and Inuit people, people serving in the Royal Canadian Mounted Police, people serving in the military, veterans, and inmates in federal prisons.(38) People enrolled with the NIHBP are able to have any fees sent directly to the Program, and so they do not pay directly for prescription costs.(39)

The provinces and territories have drug plans which contribute to the cost of medicines. Each drug plan has a list of medicines covered known as a formulary.(40) Private insurance plans in Canada have similar formularies. The Canadian Agency for Drugs and Technologies in Health (CADTH) reviews new medicines to be added to provincial/territorial formularies for all regions except Québec.(41) CADTH reviews both the clinical- and cost-effectiveness of new medicines.(41) Most provincial/territorial drug plans include provision for generic

substitution of medicines, which lowers pharmaceutical costs. However, prescription charges are not regulated across Canada and vary from pharmacy to pharmacy.(41)

Drug coverage varies between provinces/territories. How patients pay for their prescription medicines also varies. Not all provinces/territories require their residents to be part of a drug plan (public or private). This means that some people may have no drug coverage and must pay all fees OOP.(41) In this study, the provinces and public drug plans included are; British Columbia (PharmaCare),(42) Newfoundland and Labrador (Newfoundland and Labrador Prescription Drug Program (NLPDP)),(43) and Québec (Public Prescription Drug Insurance Plan).(44) Each of these provinces will now be considered in turn.

British Columbia

In British Columbia, public coverage is provided by PharmaCare.(42) The main plan provided by PharmaCare is the “Fair PharmaCare” plan, which is income-tested.(45) There are other public plans available to specific patient groups in British Columbia, such as those patients with cystic fibrosis or patients receiving palliative care.(46)

With the “Fair PharmaCare” plan, the net amount a family earns is used to calculate a “deductible”. The deductible is an amount that must be paid in full before PharmaCare contributes to medicine costs. After the deductible is reached, PharmaCare pays a proportion of medicine costs up to an “annual family maximum”. Thereafter, PharmaCare pays all prescription medicine costs, so long as these medicines are listed in the PharmaCare formulary.(47)

For example, a family on the median income in British Columbia in 2014 would have earned \$76,770 (CAD).(48) The annual deductible for this income would be \$2,250 (CAD). After paying the deductible, this family would then pay for 30% of their prescription medicine costs, and PharmaCare would pay the remainder.(49) Once the family has contributed a total of \$3000 (CAD), all prescription medicine costs are fully paid for by PharmaCare.(49) The costs patients must pay until they

reach the annual family maximum include dispensing fees (set by the pharmacy) and the cost of the medicine.(50)

Newfoundland and Labrador

The province of Newfoundland and Labrador provides public drug plans to people over 65 years, people on low incomes, people who have high prescription costs (at least 5% of net annual income), and those with specific illnesses (such as cystic fibrosis).(51) The potential co-payment varies depending on which plan a patient is enrolled in, for example a person over 65 years in the 65Plus Plan would pay a maximum of \$6 (CAD) per item, whereas a family covered under the Assurance Plan earning up to \$30,000 (CAD) would need to pay the first \$1,500 (CAD) of prescription costs before the plan would contribute.(51) Again, both dispensing fees and the cost of the drug would be part of the prescription cost,12 and the drugs covered are limited to the Newfoundland and Labrador formulary.(51)

Québec

In Québec it is mandatory to have some form of prescription drug insurance, whether it be public or private coverage.(52) The public drug plan is for people over 65 years, people not eligible for a private plans, and those in need of financial assistance.(52) Private drug plans are often available for employees or professional groups.(53) Children are usually included in the same plan as their parents.(53) Most people on the public plan must pay an income-test annual premium (up to \$640 (CAD) in 2015), whether or not they purchase any prescription drugs in that year.(54) When a patient does pay for a medicine, they must pay a monthly deductible and co-insurance. The co-insurance is calculated on the dispensing fee, drug cost and the deductible, with the plan contributing the remaining proportion. There is a maximum monthly contribution of \$85.75 (2015), after which drugs on the plan are free for the rest of the month. After a maximum yearly contribution of \$1,029 (2015), all drugs on the plan are free of charge for the rest of the year.(54) Patients over 65 years for whom 94% or more of their annual income is from government benefits receive prescription medicines free of charge. Children under 18 years whose parents are insured under the Public Prescription Drug Insurance Plan also receive prescription medicine free of charge.(54) Eighteen to twenty-five year olds in full-time education and still living

with their parents who are insured under the public plan also receive medicines free of charge.(54) Again, this applies only to drugs on the Québec “List of medicines” or formulary.(55)

England

Healthcare in England is provided through the National Health Service (NHS) England.(56) The NHS England is funded through general taxation.(8) NHS England is responsible for all aspects of healthcare, including hospital care, emergency services, mental health care and primary care.(57) Treatment is generally free of charge for all services, though there are some OOP costs for prescription medicines, dental care and medical devices.(56, 58) Around 10% of people purchase private healthcare, which allows quicker access to some services.(8)

The Medicines and Healthcare Products Regulatory Agency (MHRA) in the United Kingdom is the licensing agency for prescription medicines.(59) Prescription medicines must be licensed by the MHRA to be funded by the NHS. Therefore, when a licensed prescription medicine is prescribed by a doctor or other approved prescriber for a patient it will be funded by the NHS.(60) Prescription medicines are free in the other countries of the United Kingdom (Scotland, Wales and Northern Ireland). In England however, patients must contribute a co-payment of £8.20 (2015) per item for a three-month supply.(61) If patients have more than three prescriptions per month or if 12 prescriptions per year are likely to be needed, patients may then purchase a prescription prepayment certificate (PPC) for either a month (£29.10 in 2015) or a year (£104.00 in 2015). The cost of a PPC can also be made by monthly instalments, so patients do not need to meet the full cost of the PPC as a lump sum.(61)

Many patients in England are exempt from prescription costs.(61) The exemptions include; people over 60 years of age, children under 16 years of age, young people 16-18 years of age in full-time education, people receiving some government benefits, pregnant women and new mothers, and people with certain medical conditions. The medical conditions qualifying for the exemption include; people

with fistulas, diabetes mellitus, epilepsy, cancer and permanent physical disabilities.(61)

Finland

Finland's health system is largely decentralised.(62) The Finnish government is responsible for their health strategy, the Ministry of Social Affairs and Health (MSAH) for health policy, while the municipalities (administrative regions) are responsible for providing their residents with primary and secondary healthcare.(63, 64) The municipalities are jointly responsible for the running of hospitals across twenty different health districts.(65) The Finnish health system is mostly funded through general taxation and statutory insurance, these funds are largely passed on to the municipalities for the provision of healthcare.(66) Patients may then be required to pay some OOP costs for services, including doctors' appointments, out-patient appointments and prescription medicines.(66)

Pharmaceutical services are overseen by the MSAH.(67) Kansaneläkelaitos (Kela), the Social Insurance Institution of Finland, is responsible for reimbursing patients for their medicines, if the medicine is on the list set by the Kela Pharmaceutical Pricing Board.(67, 68) A patient must pay for any prescription medicine at a pharmacy, but may then apply to Kela for reimbursement. The amount reimbursed by Kela depends on the medicine and the patient's medical condition/s. In 2015 there were three grades of reimbursement; basic reimbursement, where 35% of the cost of the medicine is reimbursed to the patient; special reimbursement, where 65% of the cost is reimbursed; and full reimbursement where 100% of the medicine cost is reimbursed and the patient is only required to make a €3 co-payment.(67) For example, a patient prescribed the medicine metformin, who also had type 2 diabetes mellitus (T2DM) would be reimbursed 65% of the cost, but a patient without T2DM would only be reimbursed 35% of the cost.(68) There is an annual maximum on OOP prescription payments of €612.62 (2015).(67) After the annual maximum is reached, all medicines are 100% reimbursed by Kela, although the patient is required to contribute a €1.50 co-payment per item.(69)

Germany

All residents in Germany must have health insurance.(8, 70) About 85% of people have the default statutory health insurance, also known as “sickness funds” (German: *gesetzliche Krankenversicherung, GKV*).(70, 71) People who earn over the threshold (€54,900 per year in 2015), civil servants or those who are self-employed, may opt out of statutory health insurance and purchase private health insurance.(72) Statutory health insurance is based on the principle of solidarity and that spreading the cost of healthcare will result in the whole population being healthier.(70, 71) To achieve this, members of the statutory health insurance must contribute 14.6% of their gross income, though this payment is usually split between an employee and employer, each contributing 7.3%.(72) All residents of Germany are entitled to the same care, no matter how much they pay into statutory health insurance.(70, 72) The spouse and children of a person with statutory health insurance may be insured at no additional cost, if they have no earnings or earn too little to contribute to statutory health insurance.(72) There are several providers of statutory health insurance. Individuals may choose which statutory plan they belong to, though all statutory insurers have similar plans.(70, 72) Pensioners must also have statutory health insurance, but half of the contribution is paid by pension insurance.(70)

Prescription medicines that have been given market authorisation in Germany are usually covered by statutory insurance plans.(2, 72) A 10% co-payment is usually required, up to a maximum of €10 per item.(72) Some groups of people are exempt from prescription charges, for example, children under the age of 18.(72) Some medicines are also free of charge. Germany is the only country in this study providing some coverage for over-the-counter medicines, but this is only for children under 12 years of age with disabilities.(70-72) Prescription charges are capped at 2% of gross income, or 1% of gross income for people with chronic diseases.(71) Those with serious illnesses may be eligible to have further costs reimbursed.(71)

New Zealand

Public healthcare in New Zealand is available to all citizens and permanent residents. The New Zealand government pays for publicly funded healthcare from

general taxation.(8) Public funding for healthcare is managed by the Ministry of Health and District Health Boards (DHBs). The Ministry of Health is responsible for health strategy and policy, and the purchase of some services on behalf of patients.(73) DHBs are responsible for most of the provision of healthcare and the management of hospitals in twenty different districts of New Zealand.(73) All hospital services are free to New Zealand citizens and permanent residents, and primary care is largely subsidised by the government and DHBs.(74)

The Accident Compensation Corporation (ACC), is the only separate government entity providing access to healthcare. In New Zealand, ACC pays for accident- and injury-related medical costs (including prescription medicines), for any person legally in the country.(75) ACC is funded through a combination of levies and general taxation.(75) Private spending on healthcare in New Zealand is mostly in the form of co-payments for services in primary care. Patients may choose to purchase private insurance. Private insurance in New Zealand is often used to fund elective surgery.(8)

The Pharmaceutical Management Agency of New Zealand (PHARMAC) is responsible for the funding of prescription medicines in New Zealand.(76) It decides on behalf of DHBs which medicines and other products will be subsidised for use. PHARMAC is legislated “to secure for eligible people in need of pharmaceuticals, the best health outcomes that are reasonably achievable from pharmaceutical treatment and from within the funding provided”.(77) The list of subsidised medicines is called the Pharmaceutical Schedule.(78) There are several parts to the Schedule, including a list for prescription medicines in primary care, and a list of medicines available for use in hospitals. Hospital medicines are paid for by DHBs.(78) In primary care, PHARMAC pays the subsidy for prescription medicines to pharmacies, so patients are only required to pay a co-payment of \$5 NZD at the time of dispensing for fully subsidised medicines for a three-month supply.(78) If a medicine is not fully subsidised, a larger co-payment will be required, usually the amount over which an equivalent generic medicine is available. Prescription medicines on the Pharmaceutical Schedule are free for children under 13 years.(78) There is a maximum co-payment of \$100 NZD (20 items) per family per year, after which all fully subsidised prescription medicines

are free of charge.(78) Prescription medicines that are not on the Pharmaceutical Schedule will not be subsidised by PHARMAC and the patient has to meet the full cost (including dispensing fees) of these medicines.

Summary of medical conditions to be included in the study

Four medical conditions are included in the study to investigate patient costs for real medical conditions. The conditions included are: asthma, type 2 diabetes mellitus, schizophrenia and metastatic renal cell carcinoma. Further detail of the rationale for choosing these medical conditions is in the Methods chapter.

Asthma

Asthma is a chronic obstructive airway disease.(79) It is a major non-communicable disease, with prevalence varying around the world, and increasing with increasing urbanisation.(80) Recent estimates suggest that 334 million people worldwide suffer from asthma.(81) Asthma causes around 250,000 deaths annually worldwide, and mortality is higher in countries with decreased access to medicines.(82) Most of the burden of asthma is in young children and the elderly. (81) In developed countries, Australia, England and New Zealand have some of the highest rates of asthma.(82)

Asthma and its symptoms are caused by a variety of factors, including genetic, epigenetic and environmental factors.(83) Patients experience wheezing and shortness of breath, due to inflammation and constriction of the smooth muscle and bronchi.(84) Uncontrolled asthma can result in serious morbidity and hospitalisation when acute attacks occur.(82) Acute attacks can be caused by emotional stress, exposure to some medicines and environmental factors (such as allergens, cold, smoking and air pollution).(79) The most effective controls for asthma currently are medicines.(79, 83) Lifestyle and dietary interventions appear to have a limited effect on asthma symptoms.(79, 83) To control acute attacks and chronic asthma symptoms, medicines such as selective beta-2-adrenoreceptor agonists (salbutamol, salmeterol) and inhaled or oral corticosteroids (fluticasone, prednisolone) are usually used.(85) Selective beta-2-adrenoreceptor agonists cause bronchodilation, opening the airways, and are used in the relief of acute symptoms. Corticosteroids reduce airway inflammation and are used to prevent

symptoms and acute attacks.(85) The need for medicines to control symptoms is usually higher during an acute attack, when either increased doses or additional medicines may be required. This means that the cost to control asthma symptoms and attacks can change depending on how well controlled the patient's asthma is. More visits to a general practitioner may also be necessary during an acute attack, further increasing potential costs to the patient.(81)

Type 2 diabetes mellitus

The number of people suffering from type 2 diabetes mellitus (T2DM) is rising rapidly around the world. Around 422 million people are thought to have some form of diabetes,(86) and of these 90-95% have T2DM.(87) In developed countries (including those included in this study), diabetes prevalence ranges from 7.2–8.5%.(88) People with diabetes have an increased risk of premature death, with 43% of all diabetes-related deaths occurring in people under the age of 70.(88) This is because of the interaction between diabetes and cardiovascular disease, with diabetics 2–3 times more likely to have a stroke or heart attack.(86, 88) In developed countries, low-income people are more likely to have diabetes, contributing to health disparities.

T2DM is as a chronic metabolic disease, where inadequate production of, or response to insulin leads to high blood sugars.(89) It is different to type 1 diabetes mellitus (T1DM), where autoimmune destruction of the pancreatic islet beta cells results in no endogenous production of insulin.(87) Various factors contribute to the decreased production and response to insulin, including age, increased weight, lack of physical activity, ethnicity and the chronic use of some medicines.(87)

T2DM has a long asymptomatic period, where blood sugars may be high.(90) The World Health Organisation (WHO) defines diabetes as a fasting plasma glucose concentration of greater than or equal to 7 mmol/L, a 2-hour plasma glucose concentration of greater than or equal to 11 mmol/L, or a glycated haemoglobin (HbA1c) level of 6.5%.(91) Persistently high blood sugars can result in complications such as microalbuminuria and peripheral vascular disease, which in turn may lead to renal failure, blindness and amputation of limbs.(86, 88, 92) Changes in lifestyle such as maintaining a healthy weight and regular exercise often can normalise blood sugars, but if this is inadequate drug therapy may be required to manage high blood sugars.(92) The first-line oral drug treatment is

metformin,(86, 92, 93) a biguanide, which increases peripheral utilisation of glucose and decreases the production of glucagon.(94) If high blood glucose concentrations continue despite treatment with metformin, a second oral medicine may be added, such as a sulfonylurea (glicazide), a dipeptidyl peptidase-4 inhibitor (sitagliptin) or pioglitazone.(93) If these medicines are still unsuccessful in lowering blood glucose concentrations, subcutaneous insulin may be required.(87, 92, 93)

Patients with T2DM have an increased risk of cardiovascular disease and commonly present with comorbidities such as hypertension and dyslipidaemia.(87) First-line treatment of hypertension in patients with T2DM is usually an angiotensin-converting enzyme (ACE) inhibitor, such as cilazapril, perindopril or ramipril, or an angiotensin receptor blocker (ARB), such as losartan, as these medicines appear to be renal-protective compared to other anti-hypertensives.(87, 92) In dyslipidaemia, the first-line treatment is a statin, such as simvastatin or atorvastatin.(86, 87, 92)

Schizophrenia

There are 21 million people worldwide with schizophrenia.(95) It is one of the top twenty conditions contributing to the global disease burden.(96) Schizophrenia has a higher incidence in men (15 per 100,000) than women (10 per 100,000).(97) People with schizophrenia have a decreased life expectancy by 10-20 years and a 6.5 % lifetime risk of suicide.(97) Decreased life expectancy is due to the effects of schizophrenia on physical health as well as mental health, as many people with schizophrenia have significant co-morbidities and reduced access to medical care.(98)

The aetiology of schizophrenia is not well understood. Multiple genes appear to contribute to the risk of developing schizophrenia, and no single underlying cause has yet been found. Environmental factors are thought to contribute, such as disruptions to neurodevelopment during pregnancy, socioeconomic factors, immigration and cannabis use during adolescence.(97, 98) The pathophysiology of schizophrenia is also not well understood and there are no biological markers that can definitively diagnose the disease.(98) Schizophrenia is diagnosed on the basis of symptoms experienced by the patient, the first symptom noticed often being an

episode of acute psychosis.(97) Symptoms include the experience of delusions, hallucinations, disordered thought, cognitive impairment, depressed mood and social withdrawal, a presentation with a combination of these symptoms is used to diagnose schizophrenia.(98, 99) Some of these symptoms can also occur with other mental illnesses, making diagnosis complicated.(98) Changes in brain chemistry, particularly the regulation of dopamine and glutamate, are thought to contribute to symptoms, and the medicines currently available for schizophrenia relieve symptoms through dopamine blockade.(97) There are no medicines to treat the cause of schizophrenia.(98) Second-generation or atypical antipsychotic medicines, such as risperidone, olanzapine or quetiapine, are the mainstay of treatment. They are usually used during the initial acute phase of illness to control symptoms, and are often continued as maintenance treatment long-term. Second-generation antipsychotics are preferred over first-generation antipsychotics as they are better tolerated and have reduced extrapyramidal effects. However, second-generation antipsychotic medicines also have serious long-term effects, such as weight gain, dyslipidaemia and hyperglycaemia.(98) Antipsychotic medicines do not combat all of the symptoms of schizophrenia, tending to alleviate only the positive symptoms (such as delusions and hallucinations) and not the negative symptoms (changed affect and mood).(97) The antipsychotic medicine someone is started on may have to be changed if adverse effects become intolerable, or if symptoms are not adequately controlled.(98) Clozapine is reserved for patients with treatment-resistant schizophrenia (usually treatment failure on two other second-generation antipsychotics), as it can cause agranulocytosis and neutropenia, which require long-term monitoring.(97-99)

Metastatic renal cell carcinoma

Renal cell cancers are the 7th most common cancer in developed countries, with 337,680 new cases diagnosed worldwide in 2012.(100) Renal cell carcinoma (RCC) is a subtype of renal cancer, making up 90% of all renal cancers.(101) Around 17% of patients with RCC have metastatic disease (metastatic RCC) at the time of diagnosis.(102) RCC is more common in men, older people and in developed countries, though the reason for this is unknown.(103) Overall survival rates for RCC in developed countries have increased in the last 30 years, with mortality rates in developed countries varying between 2.4-12.7%.(104)

RCC is a malignancy of the epithelium of the renal tubules.(101) The mainstay of treatment for RCC is surgery to remove the tumour, but this is not always possible with metastatic RCC.(103, 105) Drug therapy is therefore required to prevent disease progression. Previously, patients were treated with immune modulators such as interferon alfa and interleukin 2, but these treatments were limited by toxicity and poor response.(105, 106) New drug therapies targeting the vascular endothelial growth factor (VEGF) and platelet-derived growth factor (PDGF) pathways have been developed in the last 10 years(105) and these have become the first-line drug treatment for metastatic RCC. Sunitinib is a tyrosine kinase inhibitor, which inhibits both BEGF and PDGF receptors. It has been shown to improve both progression-free survival and overall survival compared with interferon alfa.(107, 108) It is one of the first-line drugs for the treatment of metastatic RCC.

Summary

As health and pharmaceutical expenditures rise, some of the costs will be passed on to patients. There are a variety of strategies to contain costs and to share costs with patients. Some groups of people are less able to meet the challenges of rising healthcare and prescription costs. There are few studies which have investigated how much patients are expected to pay for medicines outside of a single medical condition or age group, and also compared costs to patients between different countries. This thesis aims to examine patient costs of prescription medicines in Australia, Canada, England, Finland, Germany and New Zealand for model patients with asthma, type 2 diabetes mellitus, schizophrenia and metastatic renal cell carcinoma, and describe what proportion of patients' income is spent to treat these conditions.

The aim of this thesis is to examine costs of prescription medicines incurred by patients in a variety of high-income Organisation for Economic Co-operation and Development (OECD) countries. This thesis reviews the literature related to pharmaceutical pricing policy and patient prescription charges. The methods of gathering information to compare medicine prices for in the different countries are then outlined. Results for what patients may pay in each scenario, and what proportion of their income this could be, are then presented. How this research

contributes to current pharmaceutical policies and funding schemes is then discussed.

Literature Review

Aim

The objective of the literature review was to identify and summarise studies describing pharmaceutical pricing policy and patient prescription charges in OECD countries.

Method

A review of the literature was performed to assess the available information on the topic of medicine prices in OECD countries. The databases used were Medline, Embase and Scopus. The search string “drug therapy” OR “prescription” OR “prescription drug” OR “medication” AND “drug cost” OR “price” OR “fee” OR “cost” OR “charge” OR “finance” OR “co-payment” OR “out of pocket” OR “payment” OR “prescription charge” AND “OECD” OR “organisation for economic co-operation AND development” was used and mapped to Medline Medical Subject Headings (MeSH) terms where available. The term “pharmaceutical” was not specifically searched for, as it was included under the MeSH heading for “drug therapy”.

The search yielded 72 studies (once duplicates were removed). Results for all countries in the OECD were included. Searching for the individual countries to be included in this thesis produced no additional results. Studies not relevant to medicine costs, dealing with non-OECD countries, not in English or not available in full-text were excluded from the review. After these exclusions, 30 papers were included in the review. As the search resulted in many heterogeneous descriptive studies, the following results are discussed with reference to the key emerging themes.

Results

Three key themes were identified in the papers reviewed. “Pharmaceutical expenditure in different countries” contains papers where pharmaceutical expenditures were compared across different countries and explored for individual countries. “Pharmaceutical Policies for Funding Medicines” includes

papers discussing the various policies and strategies used by different countries and health systems to contain pharmaceutical costs. “Out-of-pocket costs” reviews the papers that investigated direct healthcare costs to patients, rather than overall costs to health systems. Some papers included elements from more than one theme.

Pharmaceutical expenditure in different countries

Pharmaceutical expenditure comparisons between countries

Comparisons of national expenditure are useful for policy makers and health funding agencies, but comparing national expenditures can be very difficult.(109) This is due to the multiplicity of systems providing healthcare in different countries and the databases reporting this information are difficult to compare.(109, 110) The diverse ways of expressing drug prices, such as ex-manufacturer price, public price, and the currency exchange rate, have advantages and disadvantages. However, giving prices in United States Dollars (USD) using Purchasing Power Parities (PPP), based on OECD data, was the most common method used to compare expenditure.(109, 111, 112)

High-income countries are increasingly concerned about the amount of money spent on healthcare and particularly on medicines.(110, 113) This has led to comparisons of national expenditure between different high-income countries in the OECD.(111, 112, 114) LeLorier et al compared cardiovascular drug expenditure for Canada, Australia and New Zealand. They found that Canada spent the most on pharmaceuticals, as well as healthcare in general.(112) Both Squires and Kanavos included the USA in their studies of pharmaceutical expenditure.(111, 114) They found that, compared to the other high-income countries, the USA spent more on pharmaceuticals, used more pharmaceuticals and also paid more for the same pharmaceuticals when compared with other countries. Higher spending by the USA did not necessarily result in better health outcomes for patients.(114) People with chronic conditions fared worse in the USA compared to other high-income countries.(114) For the countries in this thesis, Australia, Canada, England, Finland, Germany and New Zealand, health and pharmaceutical spending information is given in Table 1.

Pharmaceutical expenditure in individual countries

Studies on the expenditure of individual countries, were identified for; Belgium,(115) Canada,(116, 117) Ireland,(118) Japan(119) and the USA.(120) In Belgium, public, private and out-of-pocket (OOP) drug costs all increased over the period 1990-1999.(115) Canada is the second highest spender on medicines in the OECD after the USA.(116) Canada's prescription drug costs are not covered by the public health system, which leaves patients vulnerable to high costs for medicines.(117) In Ireland, despite the increased use of generic medicines and other cost-containment strategies, drug costs have increased and this cost has been passed on to consumers with an increase in the standard prescription price.(118) Overall healthcare costs are increasing in Japan, though drug costs were not particularly focused on by Sasaki.(119) In the USA, Reinhardt et al identified that overall healthcare costs and pharmaceutical costs are rising at a greater rate than other countries due to multiple factors unique to the USA.(120) These factors included; disjointed organisation and multiple layers of administration that are not present in other countries.(120)

Pharmaceutical expenditure for specific drugs

Three studies explored expenditures for specific groups of drugs. Two studies focused on the increasing expenditure on antimicrobials.(121, 122) They discussed the clinical impacts and appropriateness of use of antimicrobials. (121, 122) These were also considered from a prescribing and clinical point of view rather than expenditure or direct costs to patients. Litchenberg (2009) concentrated on new and expensive drugs, particularly cardiovascular drugs and concluded that expenditure on these drugs should increase to give better health outcomes.(123)

These studies established that drug costs are rising at both national and international levels. While this may be appropriate, few of these studies investigated further into whether and how these costs may be passed on to patients in each country.

Pharmaceutical Policies for Funding Medicines

Pharmaceutical policies vary widely between different OECD countries. Most high-income countries in the OECD have some form of social insurance system to cover healthcare, exceptions being the USA and Mexico.(124) Alongside these systems, most high-income countries also have an agency responsible for assessing both the

clinical- and cost-effectiveness of new prescription medicines,(125) such as the Canadian Agency of Drugs and Technology (CADTH) in Canada,(126) and the National Institute for Health and Care Excellence (NICE) in the United Kingdom.(125)

Many countries have employed cost-reduction strategies in their pharmaceutical policy to contain rising pharmaceutical expenditure. Cost reduction strategies include the use of reference pricing, generic medicines, the use of a formulary, insurance plans and patient co-payments. For example, Austria uses a formulary, insurance, contribution limits and means testing.(127) Universal healthcare in Canada does not cover prescription medicine use outside of hospitals(126) and so the provinces each have different approaches to cost containment for their public drug plans. These include the use of the above-mentioned strategies.(128)

Reference pricing is employed by many countries as a cost-saving strategy.(124) The use of reference pricing and generic medicines generally decreases pharmaceutical expenditure.(129) Australia's Pharmaceutical Benefits Scheme (PBS) and New Zealand's Pharmaceutical Management Agency (PHARMAC) both use reference pricing and brand substitution to reduce costs and improve patient access to medicines.(130, 131) However, the outcomes for patients when reference pricing is used are less well known. Acosta et al found some evidence to suggest that reference pricing may reduce medicine prices for patients, but little is known as to whether this leads to improved health outcomes.(132)

Cost-sharing between funders and patients, often taking the form of a co-payment, is another strategy used in many OECD countries. Angus states that cost-sharing is justified because it reduces patient demand, increases appropriate use and increases efficiency.(128) The amount of cost-sharing, usually in the form of a co-payment, may be subject to further criteria, such as socio-economic class, age or presence of a chronic condition.(133) Other cost-sharing mechanisms include contribution limits, co-insurance, and deductibles. These systems are difficult to compare in terms of their effect on expenditure and on patients.(134) However, increasing the patient's share of the cost (by increasing the co-payment), may prove a barrier to treatment and decrease patient use of medicines.(133, 134) This in turn may lead to patients requiring more costly interventions later in their care.(133)

Out-of-pocket (OOP) costs

A small number of studies focused on OOP costs to patients. Three studies investigated patient OOP costs associated with healthcare. OECD countries are increasing OOP costs for healthcare in order to contain rising expenditures. However, this can lead to inequalities in access, as low income individuals over 65 years were found to pay the highest OOP costs in relation to income.(135) Corrieri et al also found other groups more vulnerable to healthcare costs included those with less education and women.(135) Of the OOP healthcare costs, prescription medicines made up the biggest proportion of costs. This could result in patients not taking their medicines to keep their costs down. Kemp et al looked at a sample of OECD countries and related OOP prescription medicine costs to income.(136) Using OECD data on per capita expenditure of medicines, they found that the average percentage of household income spent on medicines in OECD countries varied from 0.15% in Spain, to 1.66% in the USA.(136) New Zealand was not included in the study due to lack of data available on private expenditure.(136)

In Australia, Carpenter et al conducted a survey of household expenditure on healthcare in people over 50 years.(137) Those with the highest income had a mean spend of \$151 AUD on medicines over a 3-month period, while those with the lowest income had a mean spend of \$542 AUD over 3 months. This further demonstrates that people with lower incomes are more vulnerable to OOP costs. Strategies to be able to pay for medical care included using savings, borrowing money and selling assets.(137)

One study specifically examined the OOP costs of a chronic disease and compared those costs between different countries. The costs associated with rheumatoid arthritis in industrialised countries were investigated by Pugner et al 2000.(138) They compared direct costs between countries using purchasing power parities, and the mean total cost to patients across the countries was \$5054 USD. Of this, drug costs were a median of 16% of the total cost to treat rheumatoid arthritis.(138) As with other chronic diseases, people with rheumatoid arthritis represent a patient group vulnerable to rising OOP costs, as 70% of these patients were no longer able to work.(138)

Limitations of the review

Grey literature was included for analysis in some of the papers reviewed. The process of publishing grey literature may be less rigorous than with scientific papers, but some of the information on pharmaceutical policy, is unlikely to be found from sources other than grey literature. Grey literature was not included directly as part of the literature review, which means useful information on high-income countries' pharmaceutical policies and expenditure may have been missed. Some of the papers were more than 15 years old and the policies discussed may have changed since publication. Papers in languages other than English were not included, and so the perspectives and cost-containment strategies of some high-income countries may not have been considered. Low and middle-income countries were not included in the review and they may have offered different approaches to pharmaceutical policy and spending. Patient and physician views on prescription charges are not well studied. Few of the papers reviewed included the impact of pharmaceutical policies or prescription charges on patient health outcomes or the ability of patients to access prescription medicines.

Conclusion

The literature reviewed established that high-income countries are concerned about their pharmaceutical expenditure. Data from the OECD is frequently used to compare high-income countries and is seen as reliable. Using Purchasing Power Parities is considered a better means to compare pricing between countries at a given point in time, rather than converting prices into a common currency. While many cost-containment strategies have been developed, the impact of these strategies on patients has not been well assessed.

Methods

The aim of this thesis is to examine patient costs of prescription medicines in a variety of high-income Organisation for Economic Co-operation and Development (OECD) countries. Model patient scenarios are used, with different medical conditions, ages and incomes, to explore the financial burden that patients may face for prescription medicines. No studies were found when reviewing the literature that compared different countries' patient co-payments for prescription medicines in patients with different medical conditions, ages and incomes. This research explores the differences in payment methods and co-payments between different countries, but not the direct impacts on real patients or their health.

Country selection

Six countries were selected to be included in this study. The inclusion criteria for countries were that; each country included should be a high-income country belonging to the OECD, and countries should have a public health system, which subsidises the costs of medicines for at least some groups of patients and attempts to protect patients from excessive prescription charges.

This meant that the United States of America (USA) was not included. The USA healthcare system is extremely complicated and there is no universal coverage for the general population.(8) While there is some public coverage of prescription medicines for certain groups of patients, there are also many different policies and formularies that regulate this, making comparison with other countries extremely difficult.(8) There are also coverage gaps for prescription medicines, which are not present in most other high-income countries.(8)

To assist with locating data sources, provide local knowledge and to verify that information on each country was correct and current, a collaborator from each country was approached. The collaborators needed to be able to translate the local language if information could not be obtained in English. The collaborators also needed excellent knowledge of the pharmaceutical system at a policy level as well as knowledge about drug prices or links to other reliable sources of this

information. The countries where potential collaborators were found were; Australia, Canada, England, Finland and Germany. In Canada, collaborators were found in British Columbia, Newfoundland and Labrador, and Québec. The Canadian Federal system was also included. This provided a range of different arrangements for funding medicines. Only England was included from the United Kingdom, as patients in England pay for some prescription medicines. Patients in Northern Ireland, Scotland and Wales, receive all medicines free of charge from their pharmacy.(139-141) Background information on prescription medicine policies and co-payments for each country has been outlined in the introduction.

The international collaborators for this project were:

- Professor Elizabeth Roughead, a research professor in the School of Pharmacy and Medical Sciences at the University of South Australia. She has an expertise in problems with medicines use and pharmaceutical policy development(142);
- Professor Steven Morgan, professor of health policy at the School of Population and Public Health, University of British Columbia, Canada. Professor Morgan's field of research includes equitable access to medicines and pharmaceutical policy(143);
- Ms. Jennifer Donnan, Drug Information pharmacist and doctoral candidate at the School of Pharmacy, Memorial University of Newfoundland, Canada(144);
- Dr John Hawboldt, associate professor at the School of Pharmacy, Memorial University of Newfoundland, Canada. His research experience includes pharmacy practice(145);
- Professor Robyn Tamblyn, Department of Medicine and Department of Epidemiology and Biostatistics, McGill University, Montreal, Canada. She holds the positions of Medical Scientist at the McGill University Health Center Research Institute, and the Scientific Director of the Clinical and Health Informatics Research Group at McGill University. Professor Tamblyn has expertise in prescription drug use and improving the safety and quality of health care(146, 147);
- Dr Ellen Schafheutle, senior lecturer at the Manchester Pharmacy School, University of Manchester, England, who is a pharmacy policy

researcher(148). Dr Schafheutle is originally from Germany, and was also able to advise on healthcare in Germany; and

- Ms. Katri Aaltonen, researcher with Kela – the Social Insurance Institution in Finland, who has an expertise in cost-related barriers to prescription medicine use(149). Katri is also completing her PhD studies in the affordability of medicines in Finland and New Zealand.

Information on the public health systems, mechanisms for the funding of medicines and patient co-payment systems was obtained. The primary sources for this were the government organisations responsible for healthcare and the funding of medicines in each country or province:

- the Pharmaceutical Benefits Scheme (PBS) in Australia(150);
- Pharmacare in British Columbia(42);
- the National Health Service in England(57);
- *Kansaneläkelaitos* (Kela), the Social Insurance Institution, in Finland(151);
- *Bundesministerium für Gesundheit* (BMG), the Federal Ministry of Health Germany,(152) and *Spitzenverband*, the National Association of Statutory Health Insurance Funds,(153) in Germany;
- the Newfoundland and Labrador Prescription Drug Program (NLPDP) in Newfoundland and Labrador(43);
- the Pharmaceutical Management Agency (PHARMAC) in New Zealand(77);
- and
- *Régie de l'assurance maladie du Québec (RAMQ)* in Québec(44).

The collaborators provided further information when it could not be obtained from the above sources. The prices of the medicines and patient co-payments to be included in the study were also found from these sources where prices are publicly available, or sought from the collaborators. They were then converted into United States Dollars using Purchasing Power Parities from the OECD for 2015 to allow for price comparisons.

Additional background information was sought from the OECD, the World Bank, the World Health Organisation (WHO) and other governmental and non-governmental organisations.

Medical conditions to be investigated

The medical conditions investigated were discussed with the collaborators. Each medical condition needed to be treatable with medicines. The medical conditions should be treated with similar, if not the same medicine or group of medicines, in each country to allow for comparison of what patients might pay to treat their conditions. The medical conditions should be chronic conditions, with on-going need for treatment with medicines to prevent complications or symptoms. Ideally this would include a medical condition that might have exacerbations (as therefore the cost of medicines might vary rather than being constant over a given time period), a medical condition affecting children, a mental health condition (as these patients can be particularly vulnerable to the cost of medicines), a medical condition that was relatively rare, and a medical condition for which drug treatment is currently very expensive.

Information on which medicines are used for the medical conditions in each country were then gathered from national guidelines or other local sources such as, the National Institute for Health and Care Excellence (NICE). These were then checked with the local collaborators for each country. The conditions chosen are listed here with a discussion of the rationale for their inclusion. Clinical information about each condition was described in the introduction.

Asthma

Asthma and chronic obstructive pulmonary disease (COPD) were considered as patients with either of these medical conditions are prone to acute exacerbations and the requirement for treatment may vary over time.⁽⁸⁵⁾ Asthma was chosen as a medical condition for this study for two reasons. The first is that it is a condition for which the medicine requirements can fluctuate and the same medicines may not be required in the same amounts year-round. These two factors are different from the treatment regimens for other chronic conditions. Secondly, asthma is a condition that affects children as well as adults, unlike COPD. This allows the study to assess the medicine costs that a family may have to bear with a sick child. Asthma usually begins in childhood, can persist into adulthood, but can also begin in adulthood.⁽⁷⁹⁾ Childhood asthma can interfere with schooling and social interactions. Adult asthma can result in missed work and loss of productivity.⁽⁸³⁾

Asthma has a significant impact on sufferers both socially and financially. In New Zealand, hospital admissions for asthma occur most often in Māori, Pacific Island peoples and those living in deprived areas.(154) The cost of medicines to control asthma may contribute to the number of hospital admissions and morbidity, particularly for low-income people.

Type 2 diabetes mellitus

Type 2 diabetes mellitus (T2DM) was chosen as a condition for this study because it can cause serious morbidity, such as blindness and renal failure, and mortality, these outcomes may be prevented by adherence to lifestyle changes and the use of medicines.(87) There is an increasing burden of T2DM in both the developed and developing worlds as obesity increases.(86) T2DM presents significant economic losses for both countries and individuals. The estimated loss of income due to diabetes from 2011–2030 is \$900 million USD in developed countries, and \$1.7 trillion USD for the world.(88) For an individual, complications due to diabetes can result in lost work, disability and catastrophic medical expenditure.(87) As complications can be prevented using medicines, removing barriers to treatment is important for these patients.

Schizophrenia

In the context of this study, schizophrenia was chosen as a condition because patients with mental illness are a vulnerable group.(95) Schizophrenia is associated with social stigma and human rights abuses.(95) Half of patients diagnosed have long-term mental health problems, coupled with an increased risk of other conditions such as metabolic syndrome, smoking and obstructive sleep apnoea.(98) This impacts on participation in work and education,(95) resulting in 80-90% of people with schizophrenia needing some form of income support.(97, 98) This means that co-payments for medicines may be a barrier for patients with schizophrenia accessing treatment and lack of access to treatment can be detrimental to patients.(96)

Metastatic renal cell carcinoma

Metastatic renal cell carcinoma (RCC) was chosen as a condition for this study as it is relatively rare.(97) With cancer being the most common cause of death in

countries such as New Zealand,(155) it also reflects the increasing cancer burden that developed countries are facing. There are also considerable financial implications in the treatment of cancers.(105) For example, sunitinib, one of the main drug therapies used in the treatment of metastatic RCC is currently still under patent and a generic is unlikely to be available for several years. The treatment of metastatic RCC therefore is also representative of the cost of new medicines, and how they can be extremely expensive when first released to the market.(156) This is particularly important in cancer treatment, as some health insurers do not cover the cost of oral cancer treatment, increasing the financial burden on patients and public health systems.(156)

Comparing prices

There is no worldwide common currency. Therefore, a way to compare prices was required. One option is to pick one currency and use exchange rates to convert other currencies. While this results in a common currency, it does not reflect how much one currency may be worth in another market, or what the “buying power” of a currency is.(157) Exchange rates can also change rapidly.(157) Purchasing power parities (PPPs) take into account economic growth and size of countries. They are “price relatives that show the ratio of the prices in national currencies of the same good or service in different countries”.(158) PPPs are calculated by taking a sample of goods and services in different countries. (158) This means that PPPs fluctuate less and are a fairer way to compare prices of items, such as prescription prices, between different countries. This has been amusingly demonstrated by *The Economist's* “Big Mac Index”.(159) The PPPs at the time of the study are shown in Table 2.

Table 2. Purchasing Power Parities for actual individual consumption, 2015(158)

Country	Unit	National currency per US dollar
Australia	Australian Dollar (AUD)	1.510725
Canada	Canadian Dollar (CAD)	1.309193
Finland	Euro (EUR)	0.931363
Germany	Euro (EUR)	0.778824
New Zealand	New Zealand Dollar (NZD)	1.454794
United Kingdom	Pound Sterling (GBP)	0.755031
United States	US Dollar (USD)	1.000000

Initially only the cost to the patient or what a patient would pay at a pharmacy was considered. However, in four of the countries; Australia, Canada, Finland and Germany, the price the patient pays for the medicine changes depending on the list price (the price the drug buying agency has provided). For this reason, the list price is also included in the data gathered. The period of collection for this data was 2015-2016. Prices for the medicines to be included were then sought from funding agencies, insurers and other sources such as the British National Formulary (BNF) in each country and province.

Model patients

To best demonstrate the burden of prescription costs on patients, it was decided that a range of model patients would be used. The model patients reflect different age groups and income types. In particular, some of the model patients needed to be from groups vulnerable to prescription costs. In discussion with the collaborators, a range of ages, income types and family situation were agreed upon, as shown in Table 3.

Table 3. Model patient scenarios

Age (years)	Income type
70	National pension
70	National pension + supplementary income (“average wage” for a 70-year-old)
35	Minimum wage, working 30 hours per week*
35	Median individual wage
35	Unemployed – receives a benefit/welfare payment
35	Invalid – receives an invalid or sickness benefit (living in the community)
20	Student – full-time student
20	Working – median wage for employed people this age
5	In a family of 4 – earning minimum wage, 40 hours per week
5	In a family of 4 – earning median income
5	In a single parent family, on unemployment benefit

*In some countries, including Canada, Finland, and New Zealand 30 hours work per week is considered to be full-time work by government agencies.(160, 161)

These patients have a variety of different income levels. Income level is also affected by age and family situation. The proportion of income spent on prescription medicines for the different medical conditions is likely to vary between each patient scenario and country, revealing how the financial burden may be quite different given the patient, medical condition or country the patient lives in. As they are not “real” patients, this will not result in a true financial impact or discussion of health outcomes. Patient incomes are reported in the results chapter.

The main sources for patient incomes were national statistics offices and agencies responsible for government benefits and income support. Median incomes for individuals were found in census and other statistical data from the Australian Bureau of Statistics, Statistics Canada, the Office for National Statistics UK, Her Majesty’s Revenue and Customs UK, Statistics Finland and Statistics New Zealand.(162-167) The years of census data collection were 2010-2015. Incomes for people receiving government benefits were sourced from local government sources for 2015-2016.(151, 168-173) When incomes were unable to be obtained

from local government agencies, OECD data was used.(174) This information was also verified with the collaborators.

Results

Model patient incomes

Table 4 gives the incomes for each model patient in 2015, in both the local currency and in United States Dollars (USD), calculated using purchasing power parities (PPPs) for 2015.(158) The PPPs used were the “actual individual consumption” and are shown in Table 2. Once converted to USD using PPPs, some of the incomes are generally comparable, such as the 70-year-old on a national pension, or those on minimum wage. However, for some of the other model patients, there is far more variation in income, such as the 35-year-old on an invalid’s benefit.

The incomes identified for German patients receiving benefits are likely to be an under-estimate. The reason for this is most people in Germany will have access to other funds through social insurance.(72) There are limited public funds available in many countries for students, and in the UK the income specified is for a standard student loan amount for living costs, rather than true income.(175)

Model patient prescriptions

The combinations of medicines used to treat the conditions in each country were based on regional/national guidelines where available. This information was also checked by the collaborators. Where regional guidelines were not available, the collaborators provided information on what medicines would be used for each condition. The doses given for all medicines included are within the recommended dose ranges for the specified conditions.

The medicines used in the treatment and control of asthma are the same in all countries.(85, 176-180) The short-acting beta-agonist (SABA) salbutamol is used as needed to relieve acute asthma symptoms. An inhaled corticosteroid and long-acting beta-agonist (LABA) are used in all countries to prevent asthma symptoms. A combination inhaler of fluticasone (corticosteroid) and salmeterol (LABA) is available in all countries. Fluticasone and salmeterol are also available as separate inhalers, but a combination inhaler is preferred as this aids patient adherence.

Table 4. Annual incomes for model patients

Age and income type	Gross annual income by country or province given in local currency (PPPs given in USD (2015))(151, 162-173)								
	Australia (AUD)	Canada (CAD)	British Columbia	Newfoundland and Labrador	Quebec	United Kingdom (GBP)	Finland (EUR)	Germany (EUR)	New Zealand (NZD)
70 – national pension	\$22,804.60 (\$15,094.74)	\$17,311.44 (\$13,222.99)	\$17,311.44 (\$13,222.99)	\$17,311.44 (\$13,222.99)	\$17,311.44 (\$13,222.99)	£16,497.00 (\$21,849.43)	€15,012.00 (\$16,118.31)	€4140.00 (\$5315.71) ^a	\$23,058.36 (\$15,849.91)
70 – median individual income	\$18,200.00 (\$12,047.20)	\$27,866.00 ^b (\$21,284.87)	\$27,100.00 (\$20,700)	\$21,100.00 (\$16,116.80)	\$23,300.00 (\$17,797.22)	£28,881.00 (\$38,251.41)	Not available	Not available	\$22,400.00 (\$15,397.37)
35 – 30 hours' minimum wage	\$26,972.40 (\$17,853.94)	\$16,302.00 (\$12,451.95)	\$16,302.00 (\$12,451.95)	\$15,990.00 (\$12,213.63)	\$16,380.00 (\$12,511.52)	£10,452.00 (\$13,843.14)	No universal minimum wage	€13,260.00 (\$17,025.67)	\$23,010.00 (\$15,816.67)
35 – median individual income	\$44,200.00 (\$29,257.48)	\$27,866.00 ^b (\$21,284.87)	\$48,000.00 (\$36,663.81)	\$46,900.00 (\$35,823.60)	\$42,800.00 (\$32,691.89)	£26,800 (\$35,495.23)	€35,556.00 (\$38,176.31)	Not available	\$33,600.00 (\$23,096.05)
35 – unemployed, receives a benefit/welfare payment	\$13,746.20 (\$9,099.07)	\$27,225.00 ^c (\$20,795.25)	\$7,320.00 (\$5,591.23)	\$6,408.00 (\$4,894.62)	\$7,392.00 (\$5,646.22)	£7,602.40 (\$10,069)	€8,496.80 (\$9,122.97)	€4140.00 (\$5,315.71) ^a	\$15,640.56 (\$10,751.05)
35 – invalid, receives an invalid or sickness benefit (living in the community)^d	\$22,804.60 (\$15,094.74)	\$27,225.00 ^c (\$20,795.25)	\$11,801.04 (\$9,013.98)	\$6,408.00 (\$4,894.62)	\$11,244.00 (\$8,588.50)	£10,946.00 (\$14,974.42)	€15,012.00 (\$16,118.31)	€4140.00 (\$5,315.71) ^a	\$22,005.88 (\$15,126.46)
20 – student with government assistance	\$11,375.00 (\$7,529.50)	\$3,000.00 (\$2,291.49)	\$3,000.00 (\$2,291.49)	\$3,000.00 (\$2,291.49)	\$3,000.00 (\$2,291.49)	£10,702.00 ^e (\$14,174)	€6,460.32 (\$6,936.41)	Not available	\$10,173.28 (\$6,992.94)

Table 4. cont'd

Age and income type	Gross annual income by country or province given in local currency (PPPs given in USD (2015))(151, 162-173)								
	Australia (AUD)	Canada (CAD)	British Columbia	Newfoundland and Labrador	Quebec	United Kingdom (GBP)	Finland (EUR)	Germany (EUR)	New Zealand (NZD)
20 – median individual income	\$18,200.00 (\$12,047.20)	\$10,200.00 (\$7,791.06)	\$8,900.00 (\$6,798.08)	\$11,900.00 (\$9,089.56)	\$10,600.00 (\$8,096.59)	£28,204.00 (\$37,354.76)	Not available	Not available	\$9,800.00 (\$6,736.35)
5 – family of 4, 40 hours' minimum wage	\$35,963.20 (\$23,805.26)	\$21,736.00 (\$16,602.60)	\$21,736.00 (\$16,602.60)	\$21,320.00 (\$16,284.84)	\$21,944.00 (\$16,761.47)	£13,936.00 (\$18,457.52)	No universal minimum wage	€17,680.00 (\$22,700.89)	\$30,680.00 (\$21,088.90)
5 – family of 4, median income	\$51,376.00 (\$34,085.92)	\$27,866.00 ^b (\$21,284.87)	\$76,770.00 (\$58,639.18)	\$77,040.00 (\$58,845.41)	\$73,870.00 (\$56,424.07)	£41,027.00 (\$54,338.17)	\$31,106.00 [USD, net adjusted]	\$36,176.00 [USD, net adjusted]	\$32,292.00 (\$22,197)
5 – single parent family of 2, on invalid or sickness benefit (living in the community)^d	\$22,804.60.00 (\$15,094.74)	\$27,225.00 ^c (\$20,795.25)	\$11,801.04 (\$9,013.98)	\$8,328.00 (\$6,361.17)	\$11,244.00 (\$8,588.50)	£15,332.20 (\$20,306.72)	€16,935.55 (\$18,183.62)	Not available	\$29,434.60 (\$20,232.87)

^a In Germany, people pay into insurance schemes for loss of income and pensions. The amount paid out depends on what the individual has paid into the scheme and the length of employment and unemployment. The amount given here is the minimum basic assistance provided by the German government, but most people would have access to further funds.

^b Median income for aboriginal individuals in Canada

^c In Canada, unemployment and sickness benefits depend on previous earnings/hours worked and the regional unemployment rate. The maximum income that could be insured for in 2015 was \$49,500. The amount given is for the maximum.

^d Some have non-taxable components.

^e This is for a student loan living costs payment, few are eligible for benefits

For type 2 diabetes mellitus (T2DM), there was some variation in the medicines used in each country. All countries use metformin as a first-line anti-diabetic medicine.(92, 93, 181-183) The add-on treatment is usually a sulfonylurea (gliclazide), but in Europe, a dipeptidyl peptidase-4 (DPP-4) inhibitor (sitagliptin) is used.(92, 93, 181-183) Other add-on anti-diabetic medicines are available in all countries. An angiotensin-converting enzyme (ACE) inhibitor is used first-line for the treatment of hypertension in T2DM patients in all countries, though the choice of ACE inhibitor varies. Cilazapril is used in New Zealand, perindopril in Australia, England and Finland, and ramipril in Canada and Germany, though there are a variety of ACE inhibitors available in each country.(92, 93, 181-183) Atorvastatin, a statin used to control hyperlipidaemia in T2DM, is used in all countries.(92, 93, 181-183)

There is a range of anti-psychotic medicines available in all countries for the treatment of schizophrenia.(98, 184-186) Risperidone is often used in all countries except Finland as a first-line treatment. In Finland, olanzapine is more likely to be used.(187) All countries use clozapine for treatment-resistant schizophrenia (second-line therapy).

Several oral medicines are available for the treatment of metastatic renal cell cancer. Sunitinib is one of the preferred medicines currently, and is used in all countries in the study.(105)

Drug prices

List prices

Where available, list prices for medicines in each country/province were obtained from the public funder or public plan.(34, 78, 188-191) This was with the exception of England, where prices were found in the British National Formulary,(192) and Germany, where prices were found through the National Association of Statutory Health Insurance Funds.(193) These are presented in local currency and unit of funding (usually pack size or dose unit) in Table 5. Prices given are for 2015. Table 6 gives the prices in USD using PPPs, per unit dose, i.e. per tablet, capsule or inhalation. This allows for comparison of list prices between the different countries/provinces. New Zealand consistently has the lowest prices

for all medicines except sunitinib, which is the most expensive medicine included in the study, and New Zealand pays the highest price for it. Prices for Canada's Non-Insured Health Benefits Program (NIHBP) are not included as these prices are confidential,(194) as was the price of sunitinib in British Columbia.(195) Prices were unable to be sourced for Germany, as there is no public plan for medicines.

Patient prices

The prescription charges for medicines are usually sourced from the funding agency responsible for the list price or the supply of medicines.(34, 78, 188-192, 196) However, for additional charges, such as pharmacy mark-ups and dispensing fees, the collaborators involved in this study provided the information. Additional information, whereby which patients are eligible for reduced prescription charges, were found in the information from the agencies responsible for funding medicines. Further information was found from other government organisations, such as the organisation responsible for benefit payments.

Exact prices could not be obtained for all medicines in Germany, as there is no public drug plan. However, prescription charges in Germany are set at €5-10.(196) For the purposes of this study, all prescription charges for Germany were estimated at €10 (\$12.84 USD using 2015 PPPs) where applicable. The exceptions apply to the child aged 5 years, who would be exempt from prescription charges,(197) and some of the medicines are available free of charge; salbutamol, ramipril, atorvastatin, risperidone, clozapine and olanzapine.(193, 197)

Table 5. Local list prices for selected medicines (34, 78, 188-193)

Countries /provinces	Australia DPMQ price Aug 2015 (AUD)	Canada - Federal system Price (CAD)	British Columbia Pharmacare price 2015 (CAD)	Newfound-land and Labrador NLPDP price 2015 (CAD)	Quebec price 2015 (CAD)	England price Sep 2015 (GBP)	Finland list price Aug 2015 (EUR)	Germany price 2016 (EUR)	NZ PHARMAC list price Aug 2015 (NZD)
Asthma									
Salbutamol 100 microgram metered dose inhaler (200 actuations)	\$13.63 per inhaler	Price not available	\$0.0324 per dose	\$0.0327 per dose	\$13.17 per inhaler	£1.50 per inhaler	€2.74 per inhaler	€14.18 per inhaler	\$3.80 per inhaler
Fluticasone 250 microgram metered dose inhaler (120 actuations)	\$49.22 per inhaler	Price not available	\$0.7429 per dose	\$0.7463 per dose	\$76.11 per inhaler	£36.14 per inhaler	€30.60 per inhaler	Price not available	\$27.20 per inhaler
Salmeterol 50 microgram accuhaler (60 actuations)	\$37.70 per inhaler	Price not available	\$0.8964 per dose	\$1.0145 per dose	Not available	£29.26 per inhaler	€21.35 per inhaler	Price not available	\$24.46 per inhaler
Combined inhaler fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	\$54.65 per inhaler	Price not available	\$0.8769 per dose	\$0.8679 per dose	\$90.69 per inhaler	£35.00 per inhaler	€34.51 per inhaler	Price not available	\$49.69 per inhaler

Table 5. cont'd

Countries /provinces Conditions/ medicine cost	Australia DPMQ price Aug 2015 (AUD)	Canada - Federal system Price (CAD)	British Columbia Pharmacare price 2015 (CAD)	Newfound- land and Labrador NLPDP price 2015 (CAD)	Quebec price 2015 (CAD)	England price Sep 2015 (GBP)	Finland list price Aug 2015 (EUR)	Germany price 2016 (EUR)	NZ PHARMAC list price Aug 2015 (NZD)
Type 2 diabetes with hypertension and hyperlipidaemia									
Metformin 500 mg tablets	\$15.65 per 90 tablets	Price not available	\$0.048 per tablet	\$0.0484 per tablet	\$0.044 per tablet	£1.00 per 84 tablets	€7.50 per 100 tablets	Price not available	\$12.30 per 1000 tablets
Gliclazide 80 mg tablets	\$16.28 per 100 tablets	Price not available	\$0.1005 per tablet	\$0.1015 per tablet	\$0.0931 per tablet	£1.61 per 60 tablets	Not used	Price not available	\$11.50 per 500 tablets
Sitagliptin 100 mg tablets	\$58.09 per 28 tablets	Price not available	Not used	Not used	Not used	£33.26 per 28 tablets	€122.29 per 98 tablets	Price not available	Not used
Cilazapril 2.5 mg tablets	Not used	Price not available	Not used	Not used	Not used	Not used	Not used	Price not available	\$4.31 per 90 tablets
Perindopril 4 mg tablets	\$15.10 per 30 tablets	Price not available	Not used	Not used	Not used	£1.56 per 30 tablets	€20.59 per 90 tablets	Price not available	Not used
Ramipril 10 mg tablets	\$15.46 per 30 tablets	Price not available	\$0.2011 per tablet	\$0.203 per tablet	\$0.1862 per tablet	£1.32 per 28 tablets	Not used	€14.14 per 100 tablets	Not used
Atorvastatin 20 mg tablets	\$16.39 per 30 tablets	Price not available	\$0.4236 per tablet	\$0.4275 per tablet	\$196.10 per 500 tablets	£1.41 per 28 tablets	€67.53 per 100 tablets	€15.91 per 100 tablets	\$2.52 per 90 tablets

Table 5. cont'd

Countries /provinces Conditions/ medicine cost	Australia DPMQ price Aug 2015 (AUD)	Canada - Federal system Price (CAD)	British Columbia Pharmacare price 2015 (CAD)	Newfound- land and Labrador NLPDP price 2015 (CAD)	Quebec price 2015 (CAD)	England price Sep 2015 (GBP)	Finland list price Aug 2015 (EUR)	Germany price 2016 (EUR)	NZ PHARMAC list price Aug 2015 (NZD)
Schizophrenia									
Risperidone 4 mg tablets	\$65.18 per 60 tablets	Price not available	\$1.249 per tablet	\$1.3661 per tablet	\$1.1565 per tablet	£116.67 per 60 tablets	Not used	€32.92 per 100 tablets	\$3.50 per 60 tablets
Clozapine 100 mg tablets	\$551.09 per 200 tablets	Price not available	\$2.8564 per tablet	\$2.869 per tablet	\$2.6446 per tablet	£33.88 per 84 tablets	€50.33 per 100 tablets	€19.05 per 20 tablets	\$29.45 per 100 tablets
Olanzapine 10 mg tablets	\$46.72 per 28 tablets	Price not available	Not used	Not used	Not used	£87.40 per 28 tablets	€59.05 per 28 tablets	€55.43 per 70 tablets	\$2.55 per 28 tablets
Metastatic renal cell carcinoma									
Sunitinib 50 mg capsules	\$6,897.95 per 28 capsules	Price not available	Price not available	\$279.5623 per tab	\$7,073.05 per 28 capsules	£3,138.80 per 28 capsules	€4,583.45 per 28 capsules	Price not available	\$9,261.54 per 28 capsules

Table 6. Medicine prices per dose unit in USD (2015) using PPPs (34, 78, 158, 188-193)

Countries /provinces	Australia DPMQ price Aug 2015	Canada - Federal system Price	British Columbia Pharmacare price 2015	Newfound-land and Labrador NLPDP price 2015	Quebec price 2015	England price Sep 2015	Finland list price Aug 2015	Germany price 2016	NZ PHARMAC list price Aug 2015
Conditions/ medicine cost									
Asthma									
Salbutamol 100 microgram metered dose inhaler (200 actuations)	\$0.045	Price not available	\$0.025	\$0.025	\$0.052	\$0.010	\$0.015	\$0.091	\$0.013
Fluticasone 250 microgram metered dose inhaler (120 actuations)	\$0.272	Price not available	\$0.567	\$0.570	\$0.484	\$0.399	\$0.274	Price not available	\$0.156
Salmeterol 50 microgram accuhaler (60 actuations)	\$0.416	Price not available	\$0.685	\$0.775	Not available	\$0.646	\$0.382	Price not available	\$0.28
Combined inhaler fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	\$0.301	Price not available	\$0.670	\$0.663	\$0.577	\$0.386	\$0.309	Price not available	\$0.285

Table 6. cont'd

Countries /provinces	Australia DPMQ price Aug 2015	Canada - Federal system Price	British Columbia Pharmacare price 2015	Newfound-land and Labrador NLPDP price 2015	Quebec price 2015	England price Sep 2015	Finland list price Aug 2015	Germany price 2016	NZ PHARMAC list price Aug 2015
Conditions/ medicine cost									
Type 2 diabetes with hypertension and hyperlipidaemia									
Metformin 500 mg tablets	\$0.115	Price not available	\$0.037	\$0.037	\$0.034	\$0.016	\$0.081	Price not available	\$0.008
Gliclazide 80 mg tablets	\$0.108	Price not available	\$0.077	\$0.078	\$0.071	\$0.036	Not used	Price not available	\$0.016
Sitagliptin 100 mg tablets	\$1.373	Price not available	Not used	Not used	Not used	\$1.573	\$1.340	Price not available	Not used
Cilazapril 2.5 mg tablets	Not used	Price not available	Not used	Not used	Not used	Not used	Not used	Price not available	\$0.033
Perindopril 4 mg tablets	\$0.333	Price not available	Not used	Not used	Not used	\$0.069	\$0.246	Price not available	Not used
Ramipril 10 mg tablets	\$0.341	Price not available	\$0.154	\$0.155	\$0.142	\$0.062	Not used	\$0.182	Not used
Atorvastatin 20 mg tablets	\$0.362	Price not available	\$0.324	\$0.327	\$0.300	\$0.038	\$0.725	\$0.204	\$0.019

Table 6. cont'd

Countries /provinces	Australia DPMQ price Aug 2015	Canada - Federal system Price	British Columbia Pharmacare price 2015	Newfound-land and Labrador NLPDP price 2015	Quebec price 2015	England price Sep 2015	Finland list price Aug 2015	Germany price 2016	NZ PHARMAC list price Aug 2015
Conditions/ medicine cost									
Schizophrenia									
Risperidone 4 mg tablets	\$0.719	Price not available	\$1.635	\$1.043	\$0.883	\$2.575	Not used	\$0.423	\$0.040
Clozapine 100 mg tablets	\$1.824	Price not available	\$2.182	\$2.191	\$2.020	\$0.534	\$0.540	\$1.223	\$0.202
Olanzapine 10 mg tablets	\$1.104	Price not available	Not used	Not used	Not used	\$4.134	\$2.264	\$1.017	\$0.063
Metastatic renal cell carcinoma									
Sunitinib 50 mg capsules	\$163.071	Price not available	Price not available	\$213.538	\$192.95	\$148.471	\$175.758	Price not available	\$227.365

In Australia (for patients with concession cards), England, Germany (as outlined above) and New Zealand, all prescriptions have a fixed co-payment prescription charge. In Canada, Finland and for all other patients in Australia, prescription charges are based on the list price of the medicine. In Australia, this is the whole cost of the medicine up to a maximum prescription charge of \$37.70 AUD. In British Columbia and Newfoundland and Labrador, the prescription charge comprises of: the whole cost of the drug, mark-up (if applicable) and the dispensing fee. The average dispensing fee for British Columbia is \$11 CAD and for Newfoundland and Labrador \$14 CAD. In Québec, prescription charges are 34% of the dispensing fee (\$11 CAD average) and cost of the drug, with a deductible of \$18 added on to this. A maximum of \$85.75 CAD per month may be charged in Québec. In Finland, the prescription charge depends on the level of reimbursement assigned to the medicine. This may be basic reimbursement (35% of the cost of the medicine); special reimbursement, (65% of the cost of the medicine); and full reimbursement where the patient is only required to make a €3 co-payment.

All patients under the NIHBP in Canada receive prescriptions free of charge. In Québec, patients over 65 years receiving 94-100% of the pension, and children under 18 years are exempt from prescription charges. Patients receiving benefits in British Columbia and Newfoundland and Labrador receive prescription medicines free of charge. Patients exempt from prescription charges in England are; patients over 60 years of age, patients under 16 years of age, patients with diabetes or cancer, patients on benefits and patients on low incomes. In New Zealand, patients under 13 years of age are exempt from prescription charges.

For tables 7-41 the prescription charges are usually for one month's supply of a medicine. The prescription charges are calculated for the first prescription of the year.

Tables 7-17 give the prescription charges and proportion of income spent on prescription charges for patients with asthma. Those patients on the lowest income, not eligible for additional funding, had the largest proportion of income spent on medicines. The 20-year-old student in Québec would spend the most on prescription charges. Many of the model patients aged 5 years were entitled to free prescriptions. Where children aged 5 years were subject to prescription charges,

British Columbia and Newfoundland and Labrador had the highest charges, ranging between 0.13-0.19% of total family income.

Tables 18-25 give the prescription charges for patients with T2DM, hypertension and hyperlipidaemia. Twenty-year-old model patients were again the most affected by prescription charges. Where the prescription for these patients was not free of charge, New Zealand has the lowest prescription charge with 0.06% of income for a 35-year-old patient on median individual income.

Tables 26-33 show the prescription charges for patients with schizophrenia. The second-line treatment, clozapine, is quite expensive. When the prescription is not free or subject to a fixed co-payment, many more patients spent a high proportion of income on this medicine.

Tables 34-41 give the prescription charges for sunitinib in the treatment of metastatic renal cell carcinoma (RCC). Many of the model patients would receive this treatment free of charge. However, patients not receiving sunitinib free of charge or without some kind of prescription charge limit would spend a very high proportion of their income on this medicine, particularly in Newfoundland and Labrador.

The average proportion of income spent by model patients in each country and province is given in Table 42. This shows the mean and median proportion of income spent by all of the model patients for each country and province.

Summary of the main results

The results for prescription charges range from 0% to over 50% of total annual income, depending on the medicine cost, level of income and funding system. People on the lowest incomes, such as the 20-year-old patients and those earning a minimum wage are most at risk of paying high prescription charges as a proportion of their income. Of the medical conditions included in this study, metastatic RCC is the most expensive medical condition to treat, followed by schizophrenia. The provincial Canadian plans, where patients pay a mixture of variable co-payments and deductibles to obtain medicines, also put patients at risk of higher prescription charges.

Table 7. Patient aged 70 years, on national pension with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$15,094.74	0.05%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$13,222.99	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$30.64 (Patient pays 30%)	\$13,222.99	0.23%
Canada - Newfoundland and Labrador	\$4.58	\$4.58	\$9.16	\$13,222.99	0.07%
Canada - Québec	\$0.00	\$0.00	\$0.00	\$13,222.99	0.00%
England	\$0.00	\$0.00	\$0.00	\$21,849.43	0.00%
Finland	\$1.03	\$12.97	\$14	\$16,118.31	0.09%
Germany*	\$0.00	\$12.84	\$12.82	\$5315.71	0.24%
New Zealand	\$3.44	\$3.44	\$6.88	\$15,849.91	0.04%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 8. Patient aged 70 years, with median income, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$12,047.20	0.07%
Canada – NIHP	\$0.00	\$0.00	\$0.00	\$21,284.87	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$102.13	\$20,700	0.49%
Canada - Newfoundland and Labrador	\$4.58	\$4.58	\$9.16	\$16,116.80	0.06%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$17,797.22	0.27%
England	\$0.00	\$0.00	\$0.00	\$38,251.41	0.00%
Finland	\$1.03	\$12.97	\$14	Not available	Unknown
Germany*	\$0.00	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6.88	\$15,397.37	0.04%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 9. Patient aged 35 years, working 30 hours earning minimum wage, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$20.59	\$24.95	\$45.54	\$17,853.94	0.26%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$12,451.95	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$30.64 (Patient contributes 30%)	\$12,451.95	0.25%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$21.19 (Patient contributes 20%)	\$12,213.63	0.17%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$12,511.52	0.38%
England	\$0.00	\$0.00	\$0.00	\$13,843.14	0.00%
Finland	\$1.03	\$12.97	\$14	No universal minimum wage	Unknown
Germany*	\$0.00	\$12.84	\$12.84	\$17,025.67	Unknown
New Zealand	\$3.44	\$3.44	\$6.88	\$15,816.67	0.04%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 10. Patient aged 35 years, median individual income, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$20.59	\$24.95	\$45.54	\$29,257.48	0.16%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$102.13	\$36,663.81	0.28%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$105.93	\$35,823.60	0.30%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$32,691.89	0.15%
England	\$10.86	\$10.86	\$21.72	\$35,495.23	0.06%
Finland	\$1.03	\$12.97	\$14	\$38,176.31	0.04%
Germany*	\$0.00	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6.88	\$23,096.05	0.03%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 11. Patient aged 35 years, unemployed, receives a benefit/welfare payment, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$9,099.07	0.09%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$0.00	\$5,591.23	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$5,646.22	0.85%
England	\$0.00	\$0.00	\$0.00	\$10,069	0.00%
Finland	\$1.03	\$12.97	\$14	\$9,122.97	0.15%
Germany*	\$0	\$12.84	\$12.84	\$5,315.71	0.24%
New Zealand	\$3.44	\$3.44	\$6.88	\$10,751.05	0.06%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 12. Patient aged 35 years, receives an invalid or sickness benefit (living in the community), with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$15,094.74	0.05%
Canada - NIHP	\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$0.00	\$9,013.98	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%
Canada - Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$8,588.50	0.56%
England	\$0.00	\$0.00	\$0.00	\$14,974.42	0.00%
Finland	\$1.03	\$12.97	\$14	\$16,118.31	0.09%
Germany*	\$0.00	\$12.84	\$12.84	\$5,315.71	0.24%
New Zealand	\$3.44	\$3.44	\$6.88	\$15,126.46	0.05%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 13. Patient aged 20 years, student receiving government support, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$7,529.50	0.11%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$2,291.49	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$30.64 (Patient contributes 30%)	\$2,291.49	1.34%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$21.19 (Patient contributes 20%)	\$2,291.49	0.92%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$2,291.49	2.09%
England	\$0.00	\$0.00	\$0.00	\$14,174	0.00%
Finland	\$1.03	\$12.97	\$14	\$6,936.41	0.20%
Germany*	\$0.00	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6.88	\$6,992.94	0.10%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 14. Patient aged 20 years, median income, with asthma. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$12,047.20	0.07%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$7,791.06	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$30.64 (Patient contributes 30%)	\$6,798.08	0.45%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$21.19 (Patient contributes 20%)	\$9,089.56	0.23%
Canada – Québec	\$6.28	\$23.55	\$47.83 (includes deductible)	\$8,096.59	0.59%
England	\$0.00	\$0.00	\$0.00	\$37,354.76	0.00%
Finland	\$1.03	\$12.97	\$14	Not available	Unknown
Germany*	\$0.00	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6.88	\$6,736.35	0.10%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 15. Patient aged 5, with asthma, in a family of four, earning minimum wage, 40 hours per week. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$23,805.26	0.03%
Canada – NIHB	\$0.00	\$0.00	\$0.00	\$16,602.60	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$30.64 (Patient contributes 30%)	\$16,602.60	0.19%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$21.19 (Patient contributes 20%)	\$16,284.84	0.13%
Canada – Québec	\$0.00	\$0.00	\$0.00	\$16,761.47	0.00%
England	\$0.00	\$0.00	\$0.00	\$18,457.52	0%
Finland	\$1.03	\$12.97	\$14	No universal minimum wage	Unknown
Germany	\$0.00	\$0.00	\$0.00	\$22,700.89	0.00%
New Zealand	\$0.00	\$0.00	\$0.00	\$21,088.90	0.00%

Table 16. Patient aged 5, with asthma in a family of four, median family income. 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$20.59	\$24.95	\$45.54	\$34,085.92	0.13%
Canada – NIHP	\$0.00	\$0.00	\$0.00	\$21,284.87	0.00%
Canada - British Columbia	\$13.35	\$88.78	\$102.13	\$58,639.18	0.17%
Canada - Newfoundland and Labrador	\$15.69	\$90.24	\$105.93	\$58,845.41	0.18%
Canada – Québec	\$0	\$0	\$0	\$56,424.07	0%
England	\$0	\$0	\$0	\$54,338.17	0%
Finland	\$1.03	\$12.97	\$14	\$31,106	0.05%
Germany	\$0.00	\$0.00	\$0.00	\$36,176	0.00%
New Zealand	\$0.00	\$0.00	\$0.00	\$22,197	0.00%

Table 17. Patient aged 5 years, with asthma, with a single parent receiving an invalid or sickness benefit (living in the community). 1-month supply, values given in USD PPP for 2015. Doses: salbutamol 100 micrograms as required (1 inhaler) + fluticasone 250 micrograms/salmeterol 50 micrograms twice daily (1 inhaler)

Medicine/cost Country or Province	Salbutamol 100 microgram inhaler (200 actuations)	Fluticasone 125 micrograms + salmeterol 25 micrograms (120 actuations)	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$8.08	\$15,094.74	0.05%
Canada - NIHP	\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$0.00	\$9,013.98	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00	\$0.00	\$6,361.17	0.00%
Canada - Québec	\$0.00	\$0.00	\$0.00	\$8,588.50	0.00%
England	\$0.00	\$0.00	\$0.00	\$20,306.72	0.00%
Finland	\$1.03	\$12.97	\$14	\$18,183.62	0.08%
Germany	\$0.00	\$0.00	\$0.00	Not available	0.00%
New Zealand	\$0.00	\$0.00	\$0.00	\$15,126.46	0.00%

Table 18. Patient aged 70 years, on national pension, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$15,094.74	0.11%
Canada – NIHP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$13,222.99	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$16.39 (Patient contributes 30%)	\$13,222.99	0.12%
Canada - Newfoundland and Labrador	\$4.58	\$4.58				\$4.58	\$4.58	\$18.33	\$13,222.99	0.14%
Canada – Québec	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$13,222.99	0.00%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$21,849.43	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	\$16,118.31	0.12%
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	\$5315.71	0.48%
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$15,849.91	0.09%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 19. Patient aged 70 years, with median income, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$12,047.20	0.13%
Canada - NIHP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$21,284.87	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$54.62	\$20,700	0.26%
Canada - Newfoundland and Labrador	\$4.58	\$4.58				\$4.58	\$4.58	\$18.33	\$16,116.80	0.11%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$17,797.22	0.2%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$38,251.41	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	Not available	Unknown
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	Not available	Unknown
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$15,397.37	0.09%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 20. Patient aged 35 years, working 30 hours earning minimum wage, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine /cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$13.96	\$14.38			\$13.60		\$14.45	\$56.40	\$17,853.94	0.32%
Canada - NIHBP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$12,451.95	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$16.39 (Patient contributes 30%)	\$12,451.95	0.13%
Canada - Newfoundland and Labrador	\$15.13	\$13.02				\$15.35	\$20.49	\$12.80 (patient contributes 20%)	\$12,213.63	0.1%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$12,511.52	0.28%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$13,843.14	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	No universal minimum wage	Unknown
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	\$17,025.67	0.15%
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$15,816.67	0.09%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 21. Patient aged 35 years, median individual income, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$13.96	\$14.38			\$13.60		\$14.45	\$56.40	\$29,257.48	0.19%
Canada - NIHP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$54.62	\$36,663.81	0.15%
Canada - Newfoundland and Labrador	\$15.13	\$13.02				\$15.35	\$20.49	\$63.99	\$35,823.60	0.18%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$32,691.89	0.4%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$35,495.23	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	\$38,176.31	0.05%
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	Not available	Unknown
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$23,096.05	0.06%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 22. Patient aged 35 years, unemployed, receives a benefit/welfare payment, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$9,099.07	0.18%
Canada – NIHBP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$5,591.23	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$5,646.22	0.62%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$10,069	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	\$9,122.97	0.20%
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	\$5,315.71	0.48%
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$10,751.05	0.13%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 23. Patient aged 35 years, receives an invalid or sickness benefit (living in the community), with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$15,094.74	0.11%
Canada – NIHBP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$9,013.98	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$8,588.50	0.41%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$14,974.42	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	\$16,118.31	0.12%
Germany*	\$12.84		\$12.84			\$0	\$0	\$25.68	\$5,315.71	0.48%
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$15,126.46	0.09%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 24. Patient aged 20 years, student receiving government support, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$7,529.50	0.21%
Canada – NIHP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$2,291.49	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$16.39 (Patient contributes 30%)	\$2,291.49	0.72%
Canada - Newfoundland and Labrador	\$15.13	\$13.02				\$15.35	\$20.49	\$12.80 (patient contributes 20%)	\$2,291.49	0.56%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$2,291.49	1.52%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$14,174	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	\$6,936.41	0.27%
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	Not available	Unknown
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$6,992.94	0.19%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 25. Patient aged 20 years, median income, with type 2 diabetes mellitus, hypertension and hyperlipidaemia. 1-month supply, values given in USD PPP for 2015. Doses: Metformin 1 g twice daily + gliclazide 80 mg once daily OR sitagliptin 100 mg once daily + cilazapril 2.5 mg once daily OR perindopril 4 mg once daily OR ramipril 10 mg once daily + atorvastatin 20 mg once daily

Medicine/cost Country or Province	Metformin 500 mg tablets	Gliclazide 80 mg tablets	Sitagliptin 100 mg tablets	Cilazapril 2.5 mg tablets	Perindopril 4 mg tablets	Ramipril 10 mg tablets	Atorvastatin 20 mg tablets	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04			\$4.04		\$4.04	\$16.15	\$12,047.20	0.13%
Canada – NIHP	\$0.00	\$0.00				\$0.00	\$0.00	\$0.00	\$7,791.06	0.00%
Canada - British Columbia	\$12.80	\$10.71				\$13.01	\$18.10	\$16.39 (Patient contributes 30%)	\$6,798.08	0.24%
Canada - Newfoundland and Labrador	\$15.13	\$13.02				\$15.35	\$20.49	\$12.80 (patient contributes 20%)	\$9,089.56	0.14%
Canada - Québec	\$4.23	\$3.58				\$7.38	\$5.91	\$34.85 (includes deductible)	\$8,096.59	0.43%
England	\$0.00		\$0.00		\$0.00		\$0.00	\$0.00	\$37,354.76	0.00%
Finland	\$3.22		\$3.22		\$3.73		\$8.51	\$18.68	Not available	Unknown
Germany*	\$12.84		\$12.84			\$0.00	\$0.00	\$25.68	Not available	Unknown
New Zealand	\$3.44	\$3.44		\$3.44			\$3.44	\$13.75	\$6,736.35	0.2%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 26. Patient aged 70 years, on national pension, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$15,094.74	0.03%	0.03%
Canada - NIHB	\$0.00		\$0.00	\$0.00	\$0.00	\$13,222.99	0.00%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$11.11 (Patient contributes 30%)	\$81.07 (Patient contributes 30%)	\$13,222.99	0.08%	0.6%
Canada - Newfoundland and Labrador	\$4.58		\$4.58	\$4.58	\$4.58	\$13,222.99	0.04%	0.04%
Canada - Québec	\$0.00		\$0.00	\$0.00	\$0.00	\$13,222.99	0%	0.00%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$21,849.43	0%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	\$16,118.31	0.02%	0.02%
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	\$5315.71	0%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$15,849.91	0.02%	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 27. Patient aged 70 years, with median income, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$12,047.20	0.03%	0.03%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$21,284.87	0.00%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$37.02	\$270.22	\$20,700	0.18%	1.31%
Canada - Newfoundland and Labrador	\$4.58		\$4.58	\$4.58	\$4.58	\$16,116.80	0.03%	0.03%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$17,797.22	0.13%	0.38%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$38,251.41	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	Not available	Unknown	Unknown
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	Not available	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$15,397.37	0.02%	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 28. Patient aged 35 years, working 30 hours earning minimum wage, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$24.95		\$24.95	\$24.95	\$24.95	\$17,853.94	0.13%	0.13%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$12,451.95	0.00%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$11.11 (Patient contributes 30%)	\$81.07 (Patient contributes 30%)	\$12,451.95	0.09%	0.09%
Canada - Newfoundland and Labrador	\$42.00		\$273.66	\$8.40 (Patient contributes 20%)	\$54.73 (Patient contributes 20%)	\$12,213.63	0.07%	0.45%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$12,511.52	0.18%	0.54%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$13,843.14	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	No universal minimum wage	Unknown	Unknown
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	\$17,025.67	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$15,816.67	0.02%	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 29. Patient aged 35 years, median individual income, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$24.95		\$24.95	\$24.95	\$24.95	\$29,257.48	0.09%	0.09%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$20,795.25	0%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$37.02	\$270.22	\$36,663.81	0.10%	0.74%
Canada - Newfoundland and Labrador	\$42.00		\$273.66	\$42.00	\$273.66	\$35,823.60	0.12%	0.76%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$32,691.89	0.07%	0.21%
England	\$10.86		\$10.86	\$10.86	\$10.86	\$35,495.23	0.03%	0.03%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	\$38,176.31	0.01%	0.01%
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	Not available	0%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$23,096.05	0.01%	0.01%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 30. Patient aged 35 years, unemployed, receives a benefit/welfare payment, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$9,099.07	0.04%	0.04%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%	0.00%
Canada - British Columbia	\$0.00		\$0.00	\$0.00	\$0.00	\$5,591.23	0.00%	0.00%
Canada - Newfoundland and Labrador	\$0.00		\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%	0.00%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$5,646.22	0.40%	1.19%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$10,069	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	\$9,122.97	0.04%	0.04%
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	\$5,315.71	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$10,751.05	0.03%	0.03%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 31. Patient aged 35 years, receives an invalid or sickness benefit (living in the community), with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$15,094.74	0.03%	0.03%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$20,795.25	0.00%	0.00%
Canada - British Columbia	\$0.00		\$0.00	\$0.00	\$0.00	\$9,013.98	0.00%	0.00%
Canada - Newfoundland and Labrador	\$0.00		\$0.00	\$0.00	\$0.00	\$4,894.62	0.00%	0.00%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$8,588.50	0.27%	0.78%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$14,974.42	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	\$16,118.31	0.02%	0.02%
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	\$5,315.71	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$15,126.46	0.02%	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 32. Patient aged 20 years, student receiving government support, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$7,529.50	0.05%	0.05%
Canada – NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$2,291.49	0.00%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$11.11 (Patient contributes 30%)	\$81.07 (Patient contributes 30%)	\$2,291.49	0.48%	3.54%
Canada - Newfoundland and Labrador	\$42.00		\$273.66	\$8.40 (Patient contributes 20%)	\$54.73 (Patient contributes 20%)	\$2,291.49	0.37%	2.39%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$2,291.49	0.99%	2.93%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$14,174	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	\$6,936.41	0.05%	0.05%
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	Not available	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$6,992.94	0.05%	0.05%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 33. Patient aged 20 years, median income, with schizophrenia. 1-month supply, values given in USD PPP for 2015. Doses: First-line: risperidone 4 mg once daily OR olanzapine 10 mg once daily; second-line: clozapine 400 mg daily

Medicine/cost Country or Province	First-line treatment		Second-line treatment Clozapine 100 mg tablets	Total spent on first-line treatment prescription	Total spent on second-line treatment prescription	Annual gross income	Proportion of income spent on medicine for first-line treatment	Proportion of income spent on medicine for second-line treatment
	Risperidone 4 mg tablets	Olanzapine 10 mg tablets						
Australia	\$4.04		\$4.04	\$4.04	\$4.04	\$12,047.20	0.03%	0.03%
Canada - NIHP	\$0.00		\$0.00	\$0.00	\$0.00	\$7,791.06	0.00%	0.00%
Canada - British Columbia	\$37.02		\$270.22	\$11.11 (Patient contributes 30%)	\$81.07 (Patient contributes 30%)	\$6,798.08	0.16%	1.19%
Canada - Newfoundland and Labrador	\$42.00		\$273.66	\$8.40 (Patient contributes 20%)	\$54.73 (Patient contributes 20%)	\$9,089.56	0.09%	0.60%
Canada - Québec	\$22.76		\$96.15	\$22.76 (includes deductible)	\$67.03 (maximum monthly contribution)	\$8,096.59	0.28%	0.83%
England	\$0.00		\$0.00	\$0.00	\$0.00	\$37,354.76	0.00%	0.00%
Finland		\$3.22	\$3.22	\$3.22	\$3.22	Not available	Unknown	Unknown
Germany*	\$0.00		\$0.00	\$0.00	\$0.00	Not available	0.00%	0.00%
New Zealand	\$3.44		\$3.44	\$3.44	\$3.44	\$12,047.20	0.03%	0.03%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 34. Patient aged 70 years, on national pension, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$15,094.74	0.03%
Canada - NIHP	\$0.00	\$0.00	\$13,222.99	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$13,222.99	0.00%
Canada - Newfoundland and Labrador	\$4.58	\$4.58	\$13,222.99	0.03%
Canada - Québec	\$0.00	\$0.00	\$13,222.99	0.00%
England	\$0.00	\$0.00	\$21,849.43	0.00%
Finland	\$3.22	\$3.22	\$16,118.31	0.02%
Germany*	\$12.84	\$12.84	\$5315.71	0.24%
New Zealand	\$3.44	\$3.44	\$15,849.91	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 35. Patient aged 70 years, with median income, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$12,047.20	0.03%
Canada - NIHBP	\$0.00	\$0.00	\$21,284.87	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$20,700	0.00%
Canada - Newfoundland and Labrador	\$4.58	\$4.58	\$16,116.80	0.03%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$17,797.22	0.38%
England	\$0.00	\$0.00	\$38,251.41	0.00%
Finland	\$3.22	\$3.22	Not available	Unknown
Germany*	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$15,397.37	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 36. Patient aged 35 years, working 30 hours earning minimum wage, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$24.95	\$24.95	\$17,853.94	0.13%
Canada - NIHBP	\$0.00	\$0.00	\$12,451.95	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$12,451.95	0.00%
Canada - Newfoundland and Labrador	\$5,989.75	\$1197.95 (Patient contributes 20%)	\$12,213.63	9.81%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$12,511.52	0.54%
England	\$0.00	\$0.00	\$13,843.14	0.00%
Finland	\$3.22	\$3.22	No universal minimum wage	Unknown
Germany*	\$12.84	\$12.84	\$17,025.67	0.08%
New Zealand	\$3.44	\$3.44	\$15,816.67	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 37. Patient aged 35 years, median individual income, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$24.95	\$24.95	\$29,257.48	0.09%
Canada - NIHP	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$36,663.81	0.00%
Canada - Newfoundland and Labrador	\$5,989.75	\$5,989.75	\$35,823.60	16.72%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$32,691.89	0.21%
England	\$0.00	\$0.00	\$35,495.23	0.00%
Finland	\$3.22	\$3.22	\$38,176.31	0.01%
Germany*	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$23,096.05	0.01%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 38. Patient aged 35 years, unemployed, receives a benefit/welfare payment, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$9,099.07	0.04%
Canada - NIHP	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$5,591.23	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00	\$4,894.62	0.00%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$5,646.22	1.19%
England	\$0.00	\$0.00	\$10,069	0.00%
Finland	\$3.22	\$3.22	\$9,122.97	0.04%
Germany*	\$12.84	\$12.84	\$5,315.71	0.24%
New Zealand	\$3.44	\$3.44	\$10,751.05	0.03%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 39. Patient aged 35 years, receives an invalid or sickness benefit (living in the community), with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$15,094.74	0.03%
Canada - NIHP	\$0.00	\$0.00	\$20,795.25	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$9,013.98	0.00%
Canada - Newfoundland and Labrador	\$0.00	\$0.00	\$4,894.62	0.00%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$8,588.50	0.78%
England	\$0.00	\$0.00	\$14,974.42	0.00%
Finland	\$3.22	\$3.22	\$16,118.31	0.02%
Germany*	\$12.84	\$12.84	\$5,315.71	0.24%
New Zealand	\$3.44	\$3.44	\$15,126.46	0.02%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 40. Patient aged 20 years, student receiving government support, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015. Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$7,529.50	0.05%
Canada - NIHP	\$0.00	\$0.00	\$2,291.49	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$2,291.49	0.00%
Canada - Newfoundland and Labrador	\$5,989.75	\$1197.95 (Patient contributes 20%)	\$2,291.49	52.28%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$2,291.49	2.93%
England	\$0.00	\$0.00	\$14,174	0.00%
Finland	\$3.22	\$3.22	\$6,936.41	0.05%
Germany*	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6,992.94	0.05%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 41. Patient aged 20 years, median income, with metastatic renal cell carcinoma. 28-day supply, values given in USD PPP for 2015.
Dose: sunitinib 50 mg daily for 4 weeks

Country or Province	Medicine/cost Sunitinib 50 mg capsule	Total spent on prescription	Annual gross income	Proportion of income spent on medicines
Australia	\$4.04	\$4.04	\$12,047.20	0.03%
Canada - NIHP	\$0.00	\$0.00	\$7,791.06	0.00%
Canada - British Columbia	\$0.00	\$0.00	\$6,798.08	0.00%
Canada - Newfoundland and Labrador	\$5,989.75	\$1197.95 (Patient contributes 20%)	\$9,089.56	13.18%
Canada - Québec	\$1,853.49	\$67.03 (maximum monthly contribution)	\$8,096.59	0.83%
England	\$0.00	\$0.00	\$37,354.76	0.00%
Finland	\$3.22	\$3.22	Not available	Unknown
Germany*	\$12.84	\$12.84	Not available	Unknown
New Zealand	\$3.44	\$3.44	\$6,736.35	0.05%

*As specific pricing information for Germany was not obtained for all medicines, prices for Germany are estimated at €10, the highest co-payment level (converted to \$12.84 USD using 2015 PPPs), where a co-payment applies.

Table 42. Average proportion of income spent by model patients in study countries

Average proportion of income	Australia	Canada - all	Canada - NIHBP	British Columbia	Newfoundland and Labrador	Québec	England	Finland	Germany	New Zealand
Mean	0.095	0.980	0.000	0.434	2.843	0.642	0.003	0.079	0.141	0.052
Median	0.070	0.200	0.000	0.130	0.130	0.410	0.000	0.050	0.040	0.040

Discussion

The results show great variation across the countries/provinces included in the study. This is seen in how much countries pay for medicines and how much patients spend on out-of-pocket (OOP) prescription charges. The model patients who spend the largest proportion of income on prescription medicines were generally those on the lowest incomes, particularly young people and those earning a minimum wage. The co-payment systems for prescription charges used in each country have advantages and disadvantages for both the patient and funder. This is the first study to attempt comparison of prescription charges across multiple countries for patients with different medical conditions and types of income. There are several limitations to this study, key of which is that real patient data was not used, and that some data (particularly for Germany) is missing.

Countries paying the highest prices for medicines

Canada and Australia spend the largest proportion of GDP on medicines, as shown in Table 1. This is reflected in the per dose unit prices for the medicines included in this study in Table 6. To some extent, these costs are passed on to patients. Canada has the highest overall proportion of prescription charges passed on to patients. This was particularly seen in the model patient of 20-year-old student on sunitinib, as shown in Table 40. New Zealand has the lowest per dose unit prices on all medicines with the exception of sunitinib, where New Zealand paid the most per dose unit, seen in Table 6.

Canada has been shown previously to spend more than other countries on medicines.(112) This may be due in part to the many purchasers of medicines in Canada. This study examined four of the public drug plans. In Canada, there are other federal plans and many private plans also available.(198) With the exception of Germany, the other countries in this study all have a single public agency responsible for the purchasing medicines or setting medicine prices.(31, 38, 57, 77, 151, 198) This gives these agencies greater bargaining power, especially as they are responsible for larger populations than the Canadian plans.

In this study, all of the six countries used generic medicines where available, which could be expected to reduce medicine prices.(9) However, the list prices in New

Zealand are considerably lower than any of the other countries (see Table 6). The Pharmaceutical Management Agency of New Zealand (PHARMAC) prefers to use cheaper generic medicines where possible and combines this with using reference pricing and tendering processes to contain the cost of medicines. The prices in Table 6 show that PHARMAC appears to combine these strategies to great effect in reducing medicine costs. This is despite the relatively small population of New Zealand; it is the smallest country by population included in the study.

Countries where patients spend the greatest proportion on prescription charges
Given the higher prices Canada pays for medicines, it is not surprising to find that patients in Canada spend more of their income on prescription charges. The mean proportion of income spent on medicines across all of the scenarios in Canada was 0.98% as shown in Table 42. Within Canada, patients in Newfoundland and Labrador face the highest costs, with a mean proportion of 2.84% (see Table 42) across all scenarios. This was particularly due to the prescription charges associated with sunitinib, the most expensive drug in the study. This may be due to the Newfoundland and Labrador Prescription Drug Plan (NLPDP) having a small population that it covers, as well as being a payer of “last resort”.(43)

In Table 42, German patients had the second highest proportion of income spent, however, the mean and median information in the tables are based on incomplete data on patient incomes. Patients in England paid the lowest proportion of incomes on medicines, where all but two of the model patients would be exempt from prescription charges. The New Zealand model patients paid the second lowest proportion of income on medicines, despite only three of the model patients receiving prescriptions free of charge.

Patients at risk of spending the greatest proportion of income on prescription charges

In Tables 6-40, patients aged 20 years were the most at risk of high prescription costs. At this age, many young people are either studying or earning relatively low incomes as they enter the workforce.(199) The median incomes for a 20-year-old may not be entirely reflective of for the non-studying part of the population, as

those earning in the 20-year-old population will have higher incomes than students. There may also be some students with no income. England was the only country to exempt these patients from prescription charges and this was based on level of income. In Australia, these 20-year-old model patients would also have had a lower prescription charge based on their level of income, as they would be eligible for a concession card.

People earning a minimum wage were the next group most likely to spend a higher proportion of income on prescription charges. While some in this group have access to lower prescription prices due to level of income (such as in Australia and England), this was not as consistent as with patients receiving government benefits. Many of the patients on benefits would be entitled to lower prescription charges or free prescriptions.

Model patients with metastatic renal cell carcinoma (RCC) faced the highest prescription costs of all the medical conditions. This was mostly due to the high cost of the medicine being passed on to the patient in systems with a variable co-payment (Newfoundland and Labrador and Québec). In the past, most cancer treatments were given in hospital(200) and in the countries in this study, all medicines given in hospital are given free of charge.(8) As many new cancer medicines are oral medicines, patients are able to take these at home. The potential disadvantage of this will be if they must collect a prescription for their medicine and be faced with a substantial prescription charge. If cancer medicines and other medicines of similar value are not available free of charge or at a lower charge, these expensive medicines could cause major financial hardship for some patients.

The medicines used in the treatment of schizophrenia were also found to be expensive in this study. As people with mental illness often struggle with employment,(201) they may potentially have lower incomes than the model patients used in this study. The price of medicines for the treatment of schizophrenia may therefore be another barrier to treatment for an already vulnerable group.

Most of the model patient scenarios were for a single person. However, many people live with their families. The family patient scenario included was for the prescription charges for an asthmatic child, which are presumed to be paid for by

their parents. If the families had another person with a medical condition, the proportion of income spent on medicines would therefore increase.

Commentary on co-payment systems

The co-payment systems used by the six countries revealed considerable variation in what patients pay for prescription charges. Canada's various systems seem to leave people more vulnerable to high prescription costs. While prescription charges are lower in other countries, patients may still face significant prescription charges proportionate to income, if they are on low incomes. One solution to this is to exempt low-income people from prescription charges or charge a lower fee for those on low incomes. England, British Columbia and Newfoundland and Labrador all charged no prescription fee to patients on benefits. Australia offered a lower rate through access to concession cards.(150) Only England exempted low-income people from prescription charges. Australia again offered a lower rate to those on a low income. Canada, Finland, Germany and New Zealand all charged the same rates to low-income patients as high-income patients,(39, 67, 72, 77) with the consequence that low-income patients will spend a greater proportion of income to treat the same medical conditions. A finding from this study is that the only way to protect patients completely from prescription costs is to make them free of charge. Prescription medicines were provided free of charge by the Canadian Non-Insured Health Benefits Program (NIHBP), and for most of the model patients in England. For the patient, the second-most affordable alternative is a low fixed co-payment, as used in New Zealand and for concession-card holders in Australia.

Deductibles are used as a cost-sharing method by British Columbia and Québec.(44, 47) With the model patients receiving their first prescriptions of the year in the scenarios, this means the first prescription charge is potentially one of the most expensive for the year. Also in these provinces, the first prescription charge will include the deductible. Once the deductible is met, the co-payment will be reduced, so prescriptions may not be charged at the same rate through the year. In 2017, Finland introduced a deductible of €50, which increases patient prescription charges at the beginning of the year. This could potentially pose an additional barrier to patients with the lowest incomes accessing medicines.

Variable co-payments are used for prescription charges in British Columbia, Newfoundland and Labrador, Québec and Finland.(43, 44, 47, 67) As Finland has lower list prices for medicines, as shown in Table 6, the list prices of the medicines did not have as great an impact on the OOP payment. The medicines with the highest costs in Finland (olanzapine, clozapine and sunitinib), were also medicines that are fully reimbursed and only subject to a €3 co-payment.(67, 68) However, in the provinces of Canada, the list prices for medicines are high, therefore the amount patients are required to contribute are also high. The affordability of high-cost medicines under Canadian provincial drug plans currently is low in the model patient scenarios, where no exemption from OOP costs exist.

Strengths and limitations

This study compares the overall cost of the standard treatments of the selected medical conditions, in addition to comparing the cost of the individual medicines. This is most pertinent for the type 2 diabetes mellitus (T2DM) patient, where the standard prescription medicines varied between countries. Where there is variation in what medicines a patient may take for the treatment of a medical condition, it seems fairer to compare the standard treatment in each country, rather than medicines that are unavailable or unlikely to be used.

This is the first study to compare OOP costs for prescription medicines for a range of countries, patients, income type and medical conditions. While other studies have compared medicine prices(121-123) or patients' OOP costs,(136, 137) this study demonstrates more practical situations by comparing the proportion of income spent on medicines across a range of countries and patient incomes. The international collaborators provide in-depth knowledge of the prescription costs in each country. This gives the study accurate representations of the local situations, as compared with only reporting information from regulatory agencies. Examining the proportion of income spent on prescription medicines is useful for policy makers to try to set fair prices for co-payment systems. This supports for some degree of cost-sharing, while not placing an unreasonable financial burden on patients.

While no real patient data was used in this study, using model patients gives unique insights into how co-payment systems work and the application of such systems to real-life situations. It would be difficult to obtain real data for so many different types of patients. The advantage of using real patient data is that the potential impact of prescription costs on health could be evaluated.

There was missing data for some of the model patients. Some of the list prices in Germany were not able to be obtained as there is no single agency responsible for the purchasing or pricing of medicines. The providers of social insurance in Germany do not make their list prices public. The Canadian NIHB keeps all of its prices confidential, as does the British Columbia Cancer Agency, so list prices are also missing for these medicines(194, 195).

The 20-year-old model patient with T2DM is an unlikely scenario clinically, as T2DM usually develops later in adulthood.(90) However, as T2DM incidence is rising in young people the scenario was included in the study, as it may have future implications.

Many patients have more than one medical condition requiring concomitant treatment with medicines. If real patient data could be used, it would more accurately give the proportion of income spent on prescription medicines, rather than just one medical condition at a time. This is particularly true if family or household data could be collected, as the members of a family may have multiple medical conditions.

The model patient incomes given in Table 4 are best estimates for the income types. They originate from a range of years (2010-2015) depending on the source.(149, 160-170) Where census data was used, the last census may have been as long ago as 2010. Newer census data may still be under review by the statistics agency and not yet reported publicly. Census data may also be reliant on participants self-reporting on areas such as income, which may not have been accurate. For example, people may have reported their net (after-tax) income instead of their gross (before-tax) income. Therefore, this may explain why some of the median incomes were less than that of patients receiving benefits or pensions, who were expected to be the minimum income. The drug list prices and co-payments were all for 2015-2016,(34, 78, 188-193) and income from before

2015-2016 may be lower due to inflation rates. This means that the proportion of income spent may be overestimated for some of the model patients.

The model patients received one month's supply of medicines in each of the scenarios. Australia and Canada standardly give one month's supply of medicines per prescription.(34, 202) In England, Finland, Germany and New Zealand, prescriptions are usually given for three month's supply, though a one-month supply is possible.(61, 67, 78, 197) If the proportion of income spent on medicines over one year was to be investigated, it would be expected that patients supplied three months' medicine at a time would have lower costs than those patients only supplied one month at a time.

The NIHB in Canada provides prescription medicines free of charge to indigenous people.(39) In Australia and New Zealand there are some local organisations that aid indigenous people with prescription costs, but no national schemes. Because of the lack of national schemes, indigenous people from Australia and New Zealand were not examined separately in the study. However, indigenous people from Australia and New Zealand were not excluded from the general population data used in the study.

Implications for further research

The estimates of proportion of income spent on prescription medicines given in this study provide a good starting point for further research. To use real patient prescription and income data could create a better picture of what patients spend on prescription medicines. There is very limited information on whether prescription charges have any impact on patient health outcomes. A study with an intervention to reduce prescription costs and then assess health outcomes is recommended.

Conclusions

Patient out-of-pocket prescription medicine costs vary widely between different countries, co-payment systems, patient income levels and medical conditions. As a proportion of patient income, medicine costs can be very high for some patients carrying implications for affordability.

Using a set of model patients across six countries with nine different co-payment systems was a practical way to compare prices of medicines and the proportion of income patients spend on medicines. Of the countries included in the study, the list prices of prescription medicines were highest in Canada and lowest in New Zealand. Patients spent the least amount of income on prescription medicines in England and New Zealand, while patients in Canada spent the most.

Of the different patients included in the study, younger patients with lower income levels were most vulnerable to prescription costs. Some countries offered reduced prescription charges or exemptions to certain groups of patients or for particular medical conditions, which eased the financial burden.

The study was somewhat limited by missing data for some countries, which would have created better estimates of what patients really spend on medicines. Further research using real patient data should be considered and this may reveal the impact of prescription charges on patient health. This is the first study to compare prescription charges as a proportion of patient income across a range of countries, patient income types and medical conditions.

Affordability of prescription medicines, both nationally and on an individual patient level, is an important issue. This study contributes a new perspective and new information to this issue.

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