Implication of Population Ageing on Pharmaceutical Policy

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List of Abbreviations

Abbreviation	Full Description
ACE	Angiotensin-Converting Enzyme (inhibitor)
Askes	Social health insurance for civil servants (Indonesia) (Asuransi Kesehatan)
BPJS	Social Security Administration (Indonesia) (Badan Penyelenggara Jaminan Social)
CHE	Current Health Expenditure
CNS	Central Nervous System
COPD	Chronic Obstructive Pulmonary Diseases
CSMBS	Civil Servant Medical Benefit Scheme (Thailand)
CVD	Cardiovascular disease
DALYs	Disability-Adjusted Life Years
DERP	Drug Expenditure Rationalization Plan (Korea)
DHOs	District Health Offices (Indonesia)
DOEN	National Essential Medicines List (Indonesia)
DRG	Diagnosis Related Group-based prospective payment
DUR	Drug Utilization Review (Korea)
EML	Essential Medicines Lists
FFS	Fee-For-Service payment
FORNAS	National Formulary list (Indonesia)
GDP	Gross Domestic Products
GP	General Practitioners
HIC	High-income countries
HIPDC	Health Insurance Policy Deliberation Committee (Korea)
HIRA	Health Insurance Review and Assessment (Korea)

HITAP	Health Intervention Technology Assessment (Thailand)
HSPI	Health System and Policy Institute (Viet Nam)
HTA	Health Technology Assessment
IHD	Ischaemic Heart Diseases
INN	International Non-proprietary Names
IRP	International Reference Price
Jamkesmas	Government administered health program for the poor (Indonesia) (Jaminan Kesehatan Masyarakat)
Jamsostek	Social health insurance for formal sector workers (Indonesia) (Jaminan social Tenaga Kerja)
JKN-KIS	Jaminan Kesehatan Nasional-Kartu Indonesia Sehat (Indonesia)
LMICs	Low-and Middle-Income Countries
MEA	Managed Entry Agreement
MFDS	Ministry of Food and Drug Safety (Korea)
MoH	Ministry of Health
NCD	Non-Communicable Diseases
NECA	National Evidence-based Healthcare Collaborating Agency (Korea)
NHI	National Health Insurance (Korea)
NHIS	National Health Insurance Service (Korea)
NICE	National Institute for Health and Care Excellence (UK)
NRCMS	New Rural Cooperative Medical Scheme (China)
OECD	Organization for Economic Cooperation and Development
OOP	Out-Of-Pocket Payments
PURE	Prospective Urban Rural Epidemiology
RBRV	Resource-Based Relative Values
SHI	Social Health Insurance

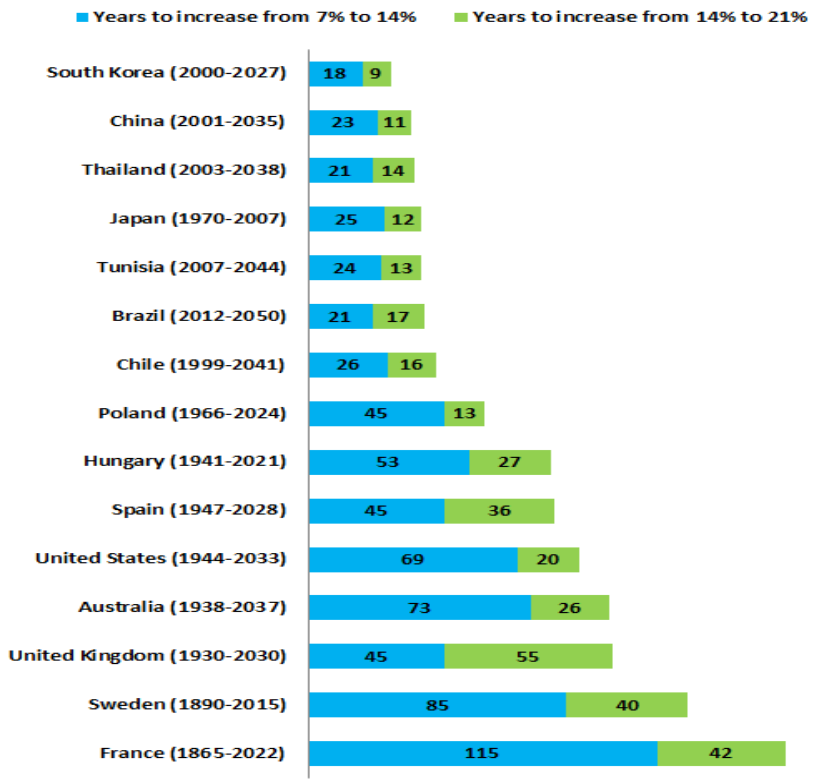
SSS	Social Security Scheme (Thailand)
UC scheme	Universal Coverage of Healthcare Scheme (Thailand)
UEBMI	Urban Employee Basic Medical Insurance (China)
UHC	Universal Health Coverage
URBMI	Urban Resident Basic Medical Insurance (China)
VAT	Value-Added Tax
WHO	World Health Organization

I. Introduction

1. Ageing and non-communicable diseases (NCD)

Increased longevity with decreased mortality and increased life expectancy was one of the remarkable achievements of the late 20th century in history. However, the luxury of ageing is expensive, like any luxury. The rapid and accelerating pace of population ageing (Figure 1.1.1) and its potential of increases in public spending on health and social care have been placing considerable pressures on societies, economies, and government, and are seen as a challenge to economic stability across countries in the 21st century(Beard and Bloom 2015; Bloom, Chatterji et al. 2015; Prince, Wu et al. 2015; He, Goodkind et al. 2016).

Figure 1.1.1 | **Speed of population ageing**



Source: The authors' recreated the Figure based on data from He et al., 2016.

Population ageing is one of the largest drivers of the epidemic of chronic diseases, such as cardiovascular diseases, stroke, diabetes, cancer, and dementia. Regardless of income levels in a country, the major causes of death and disability in older people are non-communicable diseases (NCD)(Beard and Bloom 2015; Bloom, Chatterji et al. 2015; Prince, Wu et al. 2015). Based on the Global Burden of Disease study for 2010, 23% of the global disease burden (574 million of the 2490 million DALYs) came from disorders in people aged 60 years and older. The burden of disease per person in older people is higher in low-and middle-income countries (LMICs), i.e. 827 DALYs per 1000, than in high-income countries (HICs), i.e. 590 DALYs per 1000; the increased burden per head came from cardiovascular diseases (CVDs), cancer, and chronic respiratory diseases. For people aged 60 years and older, the most burdensome diseases are ischaemic heart disease (77.7 million DALYs); stroke (66.4 million); chronic obstructive pulmonary disease (43.3 million); and diabetes (22.6 million)(Prince, Wu et al. 2015).

The risk profiles of the most burdensome diseases in older people are much the same: tobacco use, alcohol abuse, unhealthy diet, physical inactivity, obesity, raised blood pressure, raised blood glucose, and abnormal blood lipids(Robinson and Hort 2012; Prince, Wu et al. 2015). The prevalence of most of the risk factors increases with age. In LMICs as well as HICs, prevalence of hypertension increased gradually with age, with 50% and more of people aged 60 years and older affected. The benefits of modifying risk factor in older age are most evident for control of hypertension and hypercholesterolaemia. In a meta-analysis of 15 trials of diuretics or beta blockers in people aged 60 years and more, event rates per 1000 people over the 5 years were decreased by 18 (95% CI 4-28) for all deaths, by 19 (9-31) for cardiovascular deaths, and by 51 (31-73) for cardiovascular morbidity and mortality combined. In a meta-analysis of 14 trials, the benefits of statins for cholesterol-lowering treatment were clear for patients aged 75 years and older, reducing the risk of major vascular and coronary events(Prince, Wu et al. 2015). Considering the shared risk profiles and high burdens of CVDs and diabetes, this study focuses on CVDs and diabetes.

Cardiovascular disease (ischaemic heart disease, stroke, and hypertension), especially ischaemic heart disease (IHD), is the major cause of death. IHD accounted for 77.7 million DALYs in older people in 2010, with 78% of the burden coming from the burden in LMICs. In LMICs, IHD is likely to occur at younger ages; 21% of deaths from IHD in LMICs and 8% in HICs occurred in people aged 60 years or less. Effective IHD controls need primary prevention, treatment for acute myocardial infarction, and congestive heart failure, of which mainly include drug therapy. In the WHO-CHOICE modelling exercise for the African and southeast Asian countries, tobacco control is the most cost-effective

intervention, with combination drug therapy (statin, diuretic, beta blocker, and aspirin) for those with an absolute risk of having a cardiovascular event in the next 10 years greater than 25% where a high proportion of older people were included(Prince, Wu et al. 2015).

Stroke took up 66.4 million DALYs in older people in 2010, with 86% of the burden from LMICs. Many patients tend to be disabled; in LMICs, stroke was the second leading cause of disability after dementia in older people. Since 2000, stroke incidence in LMICs exceeded that of HICs. Effective stroke treatments include antithrombotic treatment with aspirin or thrombolytic treatment. In the WHO-CHOICE modelling exercise for the African and southeast Asian countries, secondary prevention with drug therapy(aspirin, statin, an ACE inhibitor, and diuretics) would have greater yields(Prince, Wu et al. 2015).

Diabetes mellitus accounted for 22.6 million DALYs in older people in 2010 with 80% of the burden from LMICs. Diabetes treatment includes diet, biguanide, or sulphonylurea drugs or insulin. The WHO-CHOICE modelling exercise, intensive glycaemic control combined with retinopathy screening and photocoagulation was highly cost-effective for the African and southeast Asian countries(Prince, Wu et al. 2015).

NCDs have taken tolls not only on health by millions of deaths and untold suffering, but also on economic growth and development by loss of income and labor productivity(World Health Organization 2005; Bloom 2011; Bloom, Chisholm et al. 2011; World Health Organization 2011; World Health Organization 2011; World Health Organization 2018). A total of 57 million global deaths occurred in 2016; 71% of the deaths (41 million) were due to NCDs that are partly associated with population ageing (CVDs 31%, cancers 16%, chronic respiratory diseases 7%, diabetes 3%, and other NCDs 15%). Most of NCD deaths (78%) and premature deaths from NCDs taking place under the age of 70 (85%) occurred in LMICs(World Health Organization 2018). Furthermore, evidence shows that over the next two decades, NCDs will cost more than USD 30 trillion, indicating 48% of global GDP in 2010, and driving millions of people below the poverty line(Bloom 2011). In addition, NCDs management places huge demand on health systems with increasing health care expenditures(Merkur, Sassi et al. 2013). Since most of the expenditures for treatment in LMICs are from out-of-pocket payments, it can lead to exacerbating poverty(World Bank 2012).

NCDs are costly to treat, because most of them need care and treatment for many years from health professionals with different skills, and diagnosis and treatment can be intensive. Moreover, individuals assume greater responsibility in managing their own care(Robinson and Hort 2012; Atun,

Jaffar et al. 2013; Bloom, Chatterji et al. 2015).

As people age, health systems have to deal with not only patients with single diseases but also patients with multiple chronic diseases. Multi-morbidity affects disproportionately the poor. In LMICs benefiting from improved survival with antiretroviral treatment for HIV/AIDS, health systems now also have to manage individuals with comorbid diseases, i.e. infectious diseases combined with NCDs(Atun, Jaffar et al. 2013).

Multi-morbidity increases with age; around two-thirds of the older aged 65 years and more had one and more diseases. Focusing on treating single diseases might lead to polypharmacy, adverse drug interactions, and unnecessary costs. The older take more medications than the younger, and often take many medications at the same time. In addition, the effects of medicines also change as the body ages. Therefore, the use of medicines in older people and implementation of appropriate prescribing should be paid to attention(World Health Organization 2015).

Although older people most frequently use many drugs, they are generally excluded from clinical trials. As their body ages, their physiological status is altered, meaning that the evidence from younger populations in trials may not be directly applicable to them. The optimum treatments for individuals with multiple diseases should be identified in order to minimize adverse drug interactions(Beard and Bloom 2015).

Dealing with people with NCDs and multi-morbidity will be challenging in most LMICs where their health systems have been weak, fragmented and largely structured around infectious diseases, acute care, and vertical program such as maternal and child health. These health systems are currently not equipped with resources and capacity to manage changing disease patterns with a burden of NCDs and multi-morbidity, and to comprehensively respond to addressing NCDs(Robinson and Hort 2012; Atun, Jaffar et al. 2013).

2. Availability and affordability of NCD medicines

Pharmaceutical expenditure account for 20-60% of total health expenditure in low-and middle-income countries, compared to 18% in the Organization for Economic Cooperation and Development (OECD) countries(Cameron, Ewen et al. 2009). Most of the pharmaceutical expenditure in LMICs came from out-of-pocket payments(Kwon, Kim et al. 2014). As a result, many people in LMICs have difficulties in accessing medicines and paying for them, and procuring and distributing medicines are

a burden on the budgets of governments.

In May 2012, the World Health Assembly announced the global goal of a 25% reduction in preventable NCD deaths by 2025 (the 25 by 25 goal). Access to medicines and vaccines is critical to achieve this goal(Hogerzeil, Liberman et al. 2013). Among the WHO Global Monitoring Framework on NCDs, target 8 indicates that at least 50% of eligible people will receive the key NCD medicines for the prevention of heart attacks and strokes by 2025. Voluntary target 9 indicates that there should be 80% availability of the affordable essential medicines including generics and basic technologies required to manage major NCDs. The major NCD medicines are aspirin, statin, angiotensin converting enzyme inhibitor, thiazide diuretic, long-acting calcium channel blocker, metformin, insulin, bronchodilator, and steroid inhalant(Jakab, Farrington et al. 2018).

Universal access to affordable and good quality medicines and vaccines to prevent and treat NCDs is very important for all countries, particularly low-and middle-income countries(Beaglehole, Bonita et al. 2011; Hogerzeil, Liberman et al. 2013). However, access to medicines for NCDs is unacceptably low. There are large disparities between HICs and LMICs, and within countries, in access to medicines for NCDs and for infectious diseases(Hogerzeil, Liberman et al. 2013). Mean availability of essential medicines in 36 LMICs was about 36% for NCDs vs. 54% for acute diseases in the public sector, while 55% vs. 66% in the private sector(Cameron, Ewen et al. 2009; Hogerzeil, Liberman et al. 2013).

The Prospective Urban Rural Epidemiology (PURE) study analyzed the availability of four NCD medicines (aspirin, beta blockers, ACE inhibitors, and statin) for the secondary prevention of cardiovascular disease in 18 countries. Availability of the four cardiovascular disease medicines widely varied, ranging from 95% in urban to 90% in rural communities in HICs; 80% to 73% in upper middle-income countries; 62% to 37% in lower middle-income countries; and 25% to 3% in low-income countries (excluding India)(Khatib, McKee et al. 2016).

Availability of diabetes medicines shows the similar trends to that of CVDs. For insulin availability, the average availability in the public sector was 56% (17-100%), while it was 39% (0-95%) in the private sector in LMICs(Beran, Ewen et al. 2016).

Medicines often account for a large part of total health expenditure in many LMICs; many in LMICs cannot afford to pay for essential medicines. Many medicines in the public sector were not consistently available; when patients are provided medicines free of charge in the public sector, they might still need to buy medicines in the private sector where prices are generally high.

The PURE study showed that the occurrences of catastrophic expenditure on four cardiovascular disease medicines at 20% of household capacity to pay was 0.14% in high-income countries, 25% in upper-middle income countries, 33% in lower-middle income countries, and 60% in low-income countries(Khatib, McKee et al. 2016). Niens and Brouwer (2013) calculated the affordability of lowest-priced generics Glibenclamide (diabetes) and Atenolol (hypertension) in Indonesia. Occurrence of catastrophic expenditure at 5% and 10% of daily wage by the lowest paid government worker was 65.9% and 17.2% of the population for diabetes and 98.6% and 92.5% for hypertension.

There are many factors affecting low availability and affordability of NCD medicines in LMICs, such as inadequate funding in the health sector, lack of incentives for managing stock-outs, inability to forecast accurately, inefficient procurement process and distribution systems, low benefit coverage for essential medicines, ineffective generic policies, and so on.

In this study, we examine lessons learned from OECD countries for pharmaceutical polices in responses to population ageing and NCDs. Then, we present challenges for low-and middle-income countries in pharmaceutical policies to deal with NCDs, and share case studies from five countries (Viet Nam, China, Indonesia, Thailand, and Korea). And then, we conclude.

II. Lessons learned from OECD countries for pharmaceutical policies

1. Pharmaceutical expenditure trends

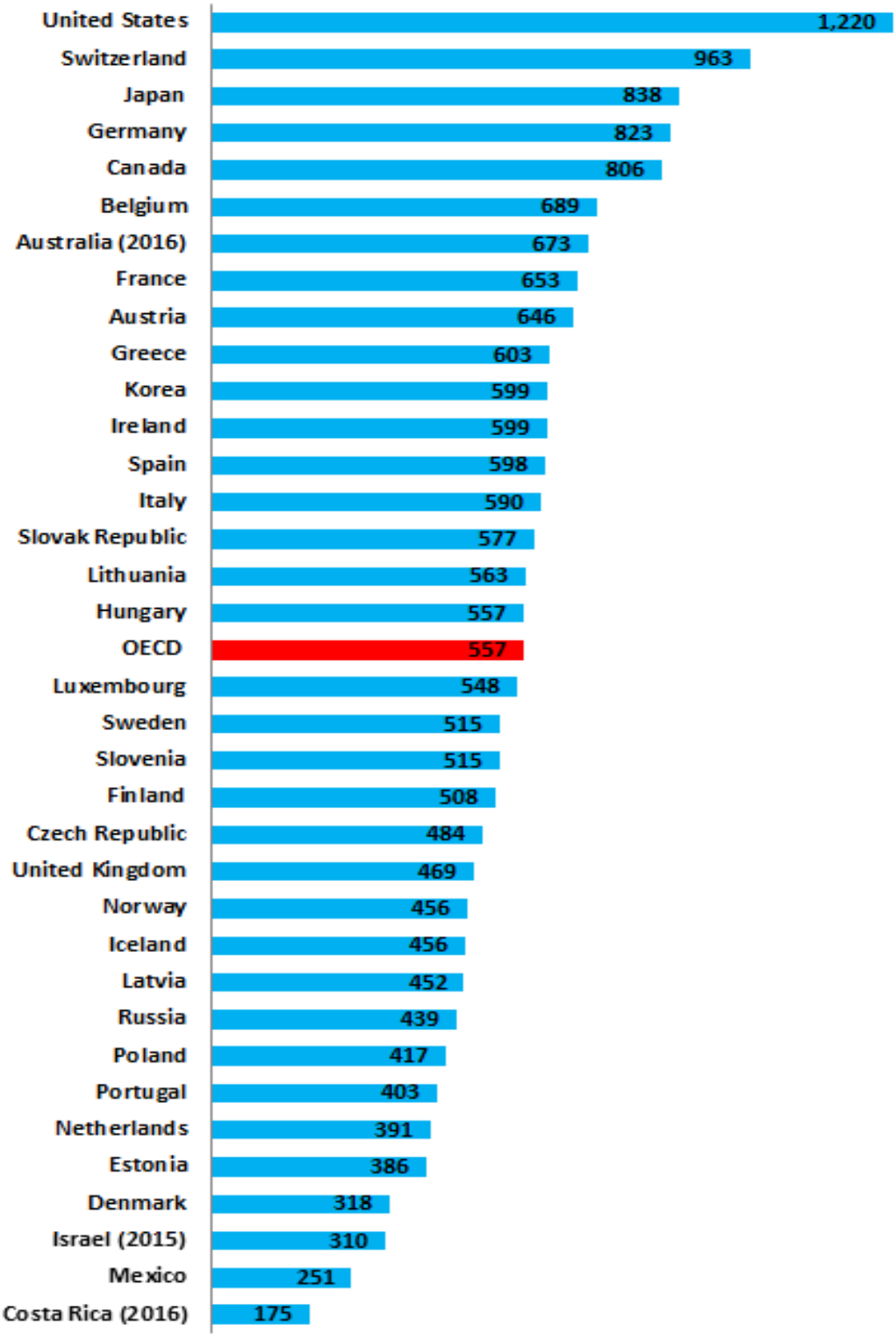
Pharmaceutical expenditure is a key component of total health expenditure. The average total pharmaceutical spending among the OECD countries was 557 USD per capita in 2017. The average retail pharmaceutical spending (excluding hospital use) was 491 USD per capita in 2017 (Figure 2.1.1). The five highest spending countries (United States, Switzerland, Japan, Germany, and Canada) spent more than 800 USD per capita in 2017. For spending on retail pharmaceuticals, most of the expenditure came from prescribed medicines except Russia, with around 400 USD on average (about 4 times that of OTC medicines) (OECD 2018).

Total pharmaceutical spending accounted for 16.7% of current health expenditure in 2017, with 8.5% from public funding and 8.1% from private funding (private health insurance and OOP) (Figure 2.1.2). In terms of proportion of gross domestic products (GDP), 1.4% of GDP went to pharmaceuticals (Figure 2.1.3). 57% of the pharmaceutical spending was covered by public funding. Germany (84%), France (80%), Ireland (78%), United States (73%), and Japan (72%) covered pharmaceuticals by public sources at more than 72% or more. Compared to about 75% for total health expenditure covered by public sources, even people in the OECD countries have to pay significant amount of OOP for medicines.

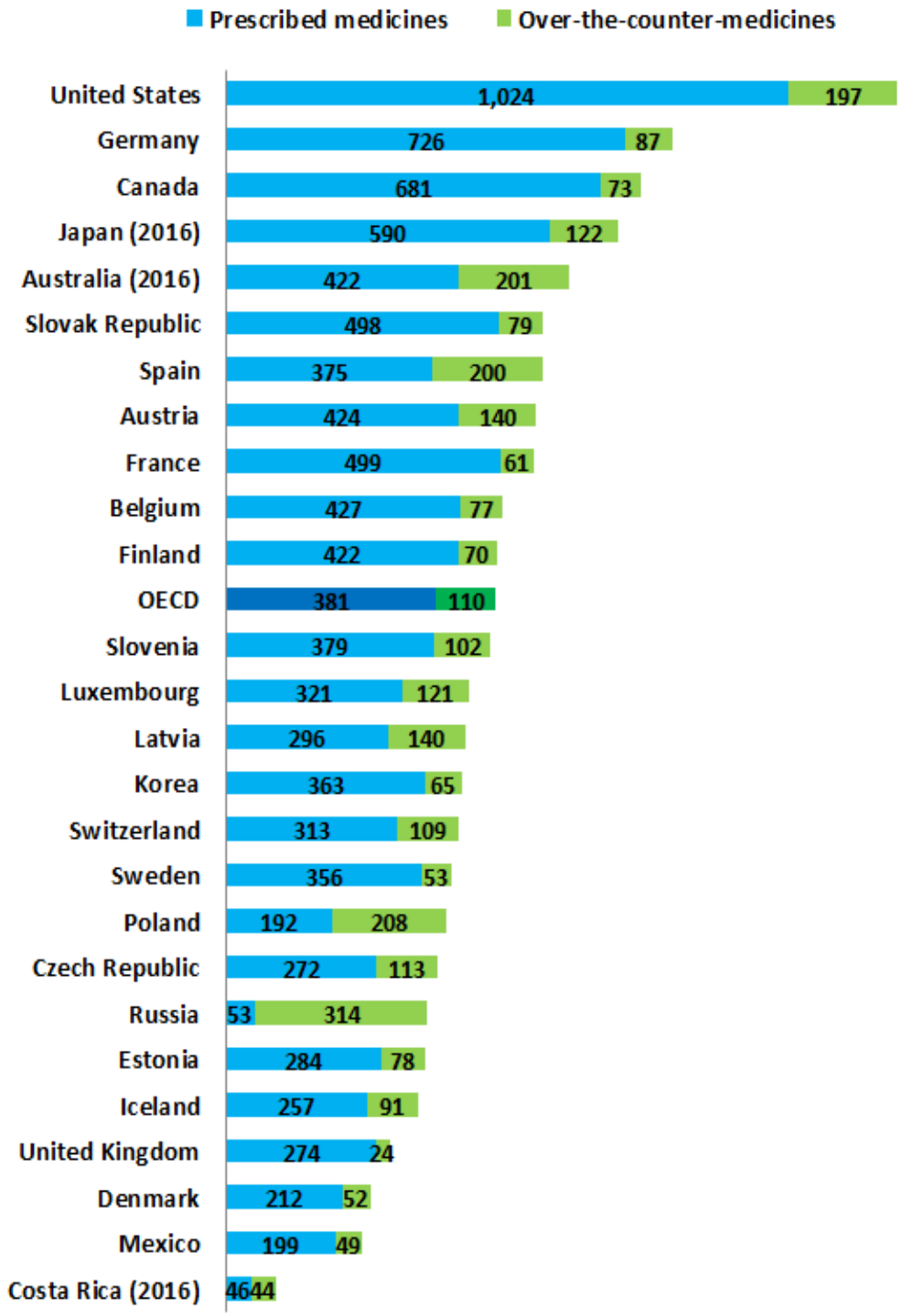
Pharmaceutical expenditure has been on the increase at a slower pace since the mid-2000s through the global economic crisis. From 2005-2013, annual growth in pharmaceutical spending on average was 0.7% compared to 2.4% for health care expenditure growth. In most OECD countries, private spending growth on pharmaceuticals has been higher than public spending over the period from 2005 to 2013(Belloni, Morgan et al. 2016).

Figure 2.1.1 | **Per capita spending on total pharmaceuticals and retail pharmaceuticals (USD PPP), 2017 or the latest year**

1) Per capita total pharmaceutical spending

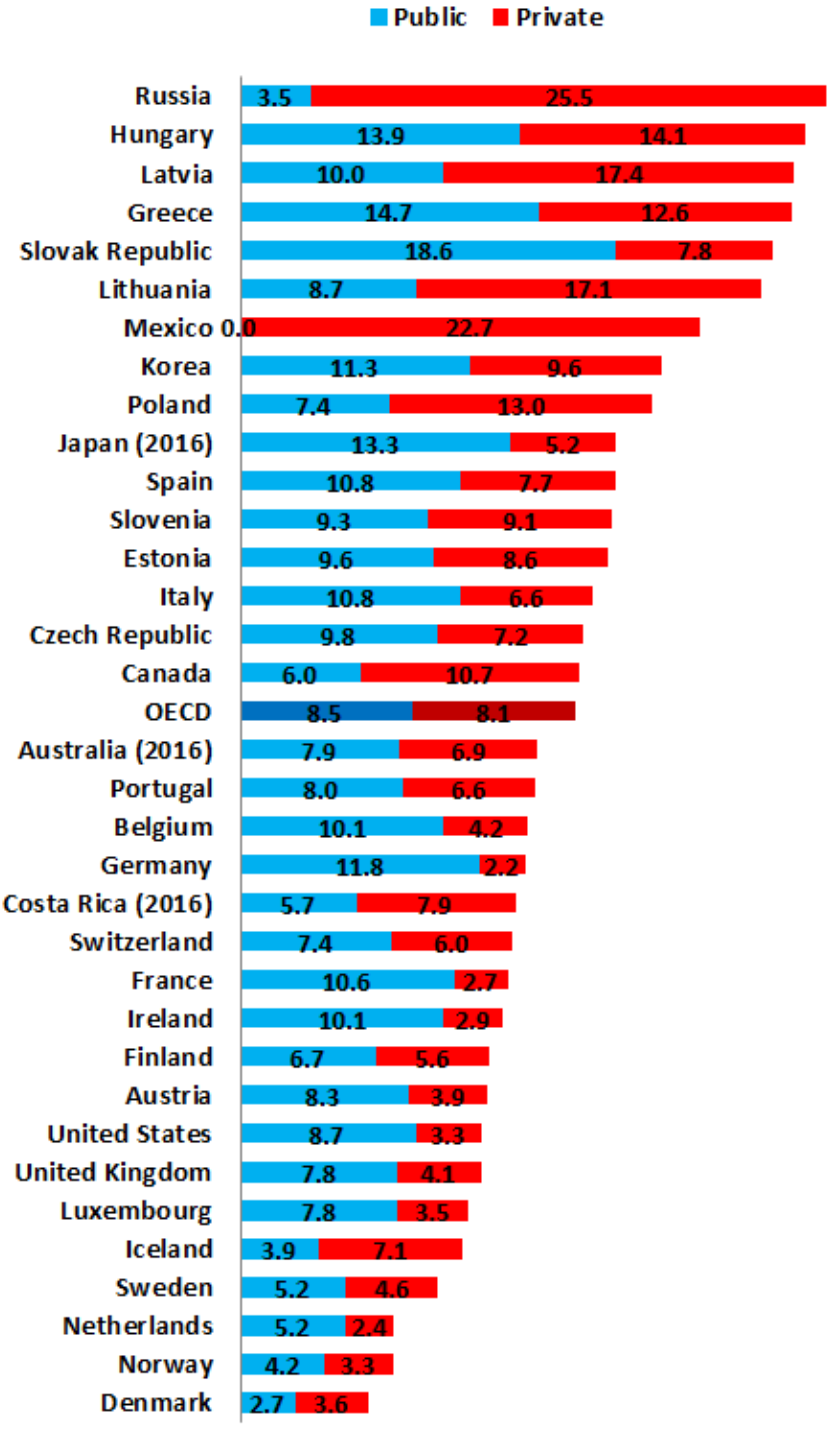


2) Per capita spending on retail pharmaceuticals



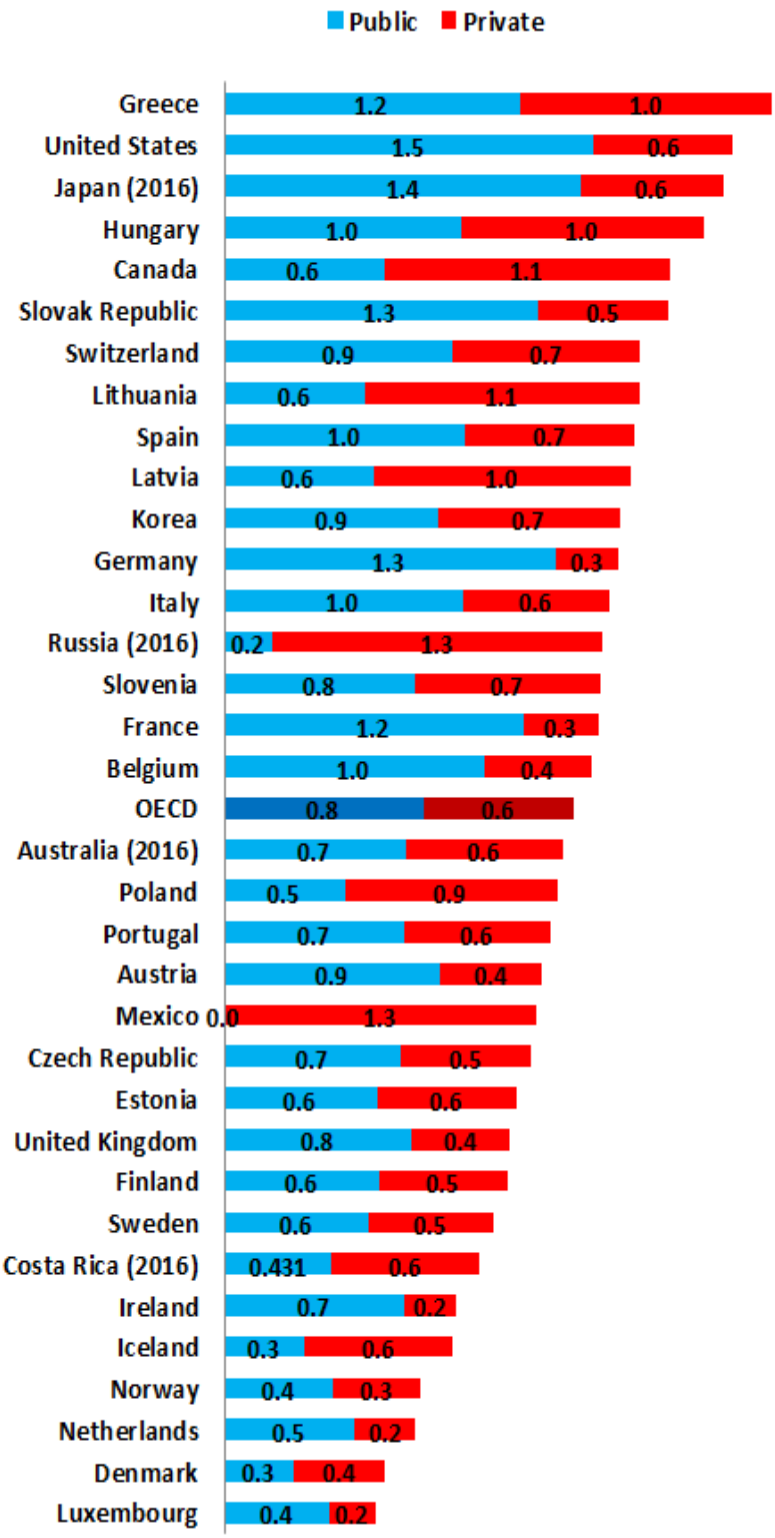
Source: OECD Health Statistics, 2018.

Figure 2.1.2 | **Spending on pharmaceuticals as a percentage of current health expenditure, 2017 or the latest year (%)**



Source: OECD Health Statistics, 2018.

Figure 2.1.3 | **Spending on pharmaceuticals as a percentage of GDP, 2017 or the latest year (%)**



Source: OECD Health Statistics, 2018.

Pharmaceutical expenditure growth can be affected by changes in prices of existing drugs, changes in quantity, and changes in therapeutic mix (types of drugs used for a given condition). Demand for pharmaceuticals (health needs and clinical practices), pharmaceutical market dynamics (new drugs, patent expiries, and introduction of generics), and pharmaceutical policies (coverage expansion, price cuts, mark-ups, VAT, reference price policies, etc.) can have impacts on the components of changes in prices, quantity and therapeutic mix(Belloni, Morgan et al. 2016; Leo Ewbank, David Omojomolo et al. 2018). Australia, Canada, Italy, and Germany have a monitoring system to monitor the factors of pharmaceutical spending growth(Belloni, Morgan et al. 2016).

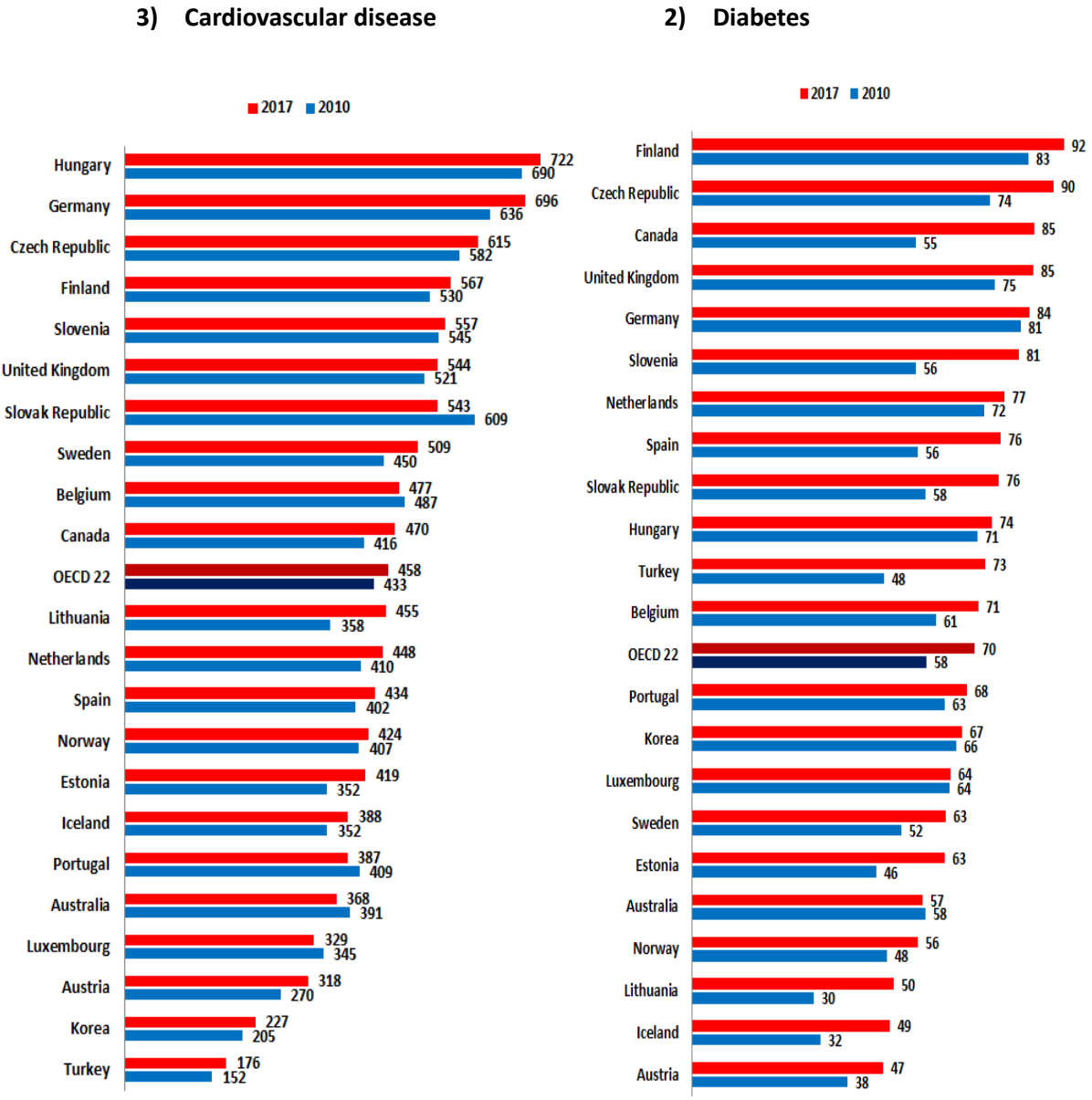
The prices of drugs generally remain stable or decrease after entering the market. The quantity of drugs used is likely to increase over time in most of therapeutic classes. Between 2000 and 2013, the use of antihypertensive and antidiabetic medications has doubled, with the use of cholesterol-lowering drugs tripled(Belloni, Morgan et al. 2016). More recently, as seen in Figure 2.1.4, the use of cardiovascular disease medicines and diabetes medicines has increased between 2010 and 2017. The use of antidiabetic has increased significantly compared to the use of CVD drugs. The factors affecting the increase in medicines use would be population ageing, increased prevalence of chronic diseases, the availability of new drug treatment options, changes in clinical guidelines and the physicians' practices, and so on(Belloni, Morgan et al. 2016; Leo Ewbank, David Omojomolo et al. 2018).

The effects of changes in the therapeutics mix on spending growth can be affected by the two factors: the introduction of new and expensive drugs and the introduction of generics. Although the use of diabetes medicines has been increasing, the spending on diabetes medicines has remained relatively stable because of the use of generics. However, recently, the introduction of new and expensive treatment has increased the treatment costs, with 6% of the total sales accounting for diabetics medicines (Figure 2.1.5)(Belloni, Morgan et al. 2016). In the United Kingdom, three new treatments accounting for 8% of the total volume of prescriptions for diabetes (linagliptin, liraglutide, and sitagliptin) made up 18.2% of the total spending on diabetics medicines in 2016(Leo Ewbank, David Omojomolo et al. 2018).

Although the use of CVD medicines have been one of the leading therapeutic classes, the share of the total sales has been declining with 11.7% of total sales on average in the OECD countries in 2017 (Figure 2.1.5). The use of hypertension drugs has grown significantly, and the average use of the most recent and expensive anti-hypertensives doubled between 2005 and 2013; but the total value

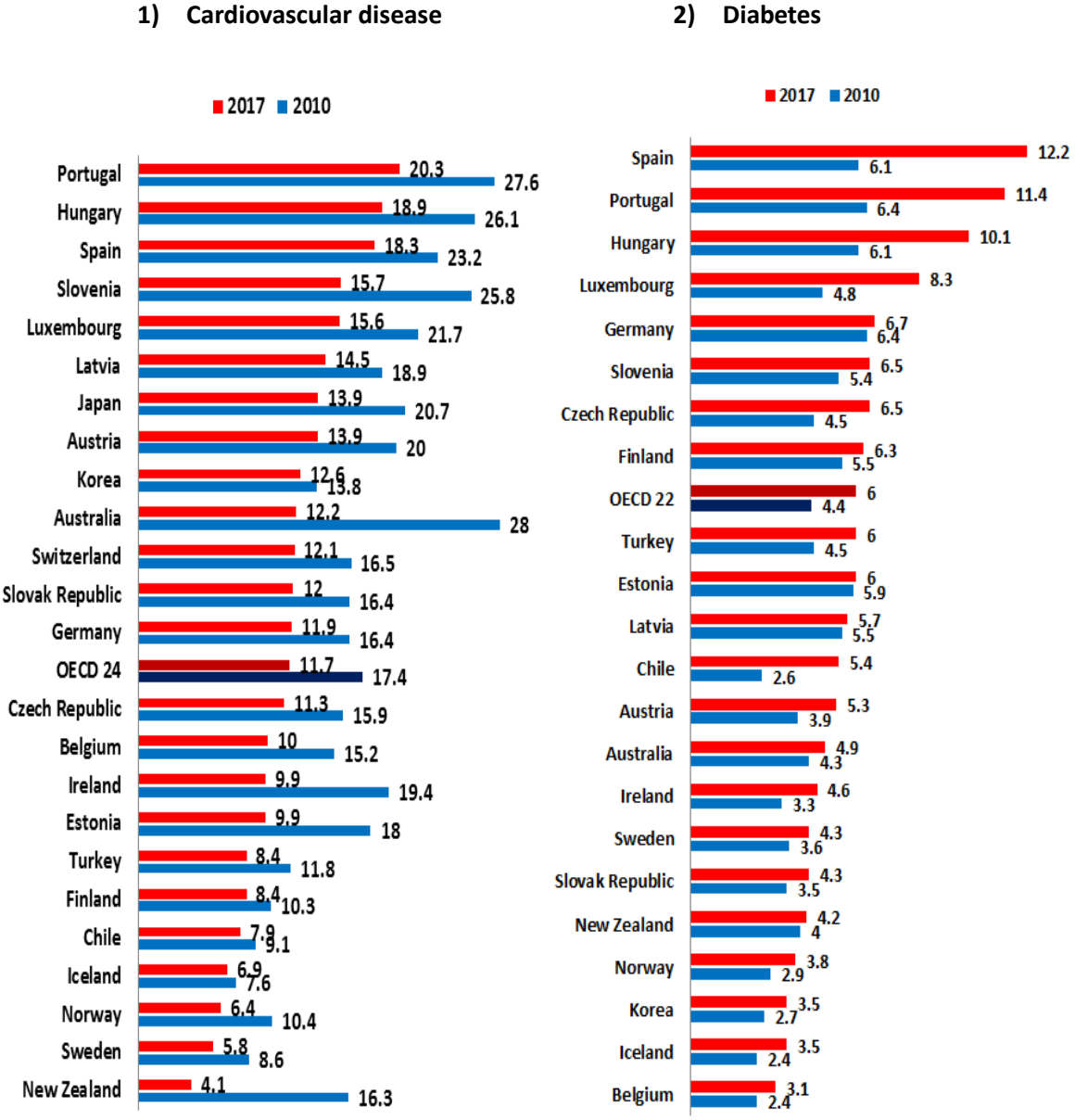
of sales of hypertension drugs dropped by more than 20% between 2005 and 2013 because of the end of patents and availability of generics. In the class of lipid-lowering medications, the expiry of the patient for some top selling statins (Lipitor-Atorvastatin, Zocor-Simvastin) in the mid-2000s with availability of generics had been affecting the decreased pattern of treatment costs in many countries recently(Belloni, Morgan et al. 2016).

Figure 2.1.4 | Trends in pharmaceutical consumption on cardiovascular disease and diabetes in 2010 and 2017 (Defined daily dose per 1000 people per day)



Source: OECD Health Statistics, 2018.

Figure 2.1.5 | **Trends in pharmaceutical sales on cardiovascular disease and diabetes as a share of total pharmaceutical sales in 2010 and 2017 (%)**



Source: OECD Health Statistics, 2018.

In the United Kingdom, after the patent of Atorvastatin (Lipitor) expired in 2012, spending on Atorvastatin (Lipitor) in primary care by the National Health Service (NHS) fell from around 310.5 million GBP in 2011 to 3.3 million GBP in 2014. While the use of generic atorvastatin prescribed increased significantly, up to over 32 million items in 2016, the low cost of generics led to moderated growth in total cost(Leo Ewbank, David Omojomolo et al. 2018).

2. Benefit coverage policies for cost containment

Benefit coverage policies, i.e. reimbursement policies, and co-payment policies are critical for ensuring sustainable access to affordable medicines. Benefit coverage policies and pharmaceutical policies for NCDs are not separate from the organizational setting of a country's existing health system.

Eligibility for benefit coverage on medicines may be linked to product-specific, disease–specific, consumption-based, and population groups-specific approaches. Product-specific eligibility depends on the medicines, i.e. whether a medicine is reimbursable and covered by a public payer. The status of reimbursement of a medicine is generally based on various criteria, including therapeutic benefit, added value compared to alternative products, cost-effectiveness, and budget impact. Most OECD countries use this as the major reimbursement approach for outpatient medicines(World Health Organization 2018).

For disease-specific eligibility, the status and rate of reimbursement are linked to the disease that a medicine aims to treat; the rate of the medicine may be reimbursed differently based on the patient's disease. Estonia, Latvia, and Lithuania employ this as the main scheme, while Bulgaria, France, Ireland, and Portugal use this as supplementary scheme(World Health Organization 2018).

Denmark and Sweden employ consumption-based eligibility; if a patient reaches a certain threshold of OOP, the public payer full or partially covers additional pharmaceutical spending by the patient within a specified time period (a year) (World Health Organization 2018).

As with population groups-specific eligibility, medicines are reimbursed for defined population groups at a higher rate than the standard rate or at 100% reimbursement rate, including those with certain conditions (chronic or infectious diseases, disability, and pregnancy), age (children, the elderly), status (pensioner, veteran), or income levels (the low-income group, the unemployed). This scheme is used as the key scheme for outpatient care in Ireland and Turkey. In Turkey, medicines for the retired and their dependants can be reimbursed at 90%, for active workers and their dependants at 80%, and for those with chronic diseases at 100%. Many countries employ some of the population groups-specific approach to supplement their major scheme for specific population groups(World Health Organization 2018).

The key instrument for benefit coverage on medicines is a reimbursement list (positive list or

formulary) where medicines are added if they meet predefined criteria(Jakab, Farrington et al. 2018; World Health Organization 2018). Most OECD countries apply a positive list where all medicines in the list may be prescribed and reimbursed by a public payer. Germany applies a negative list where all medicines are covered unless they are on a negative list. Spain and the United Kingdom apply both(World Health Organization 2018). Positive lists are critical methods to prioritize medicines for reimbursement; most countries regularly review and update the lists.

Facing the increased financial burden of pharmaceutical costs after the global economic crisis in 2008, most OECD countries have used several approaches to cost containment for pharmaceuticals, such as delisting products, using health technology assessments, using managed entry agreements, changing in the reference price systems, and increasing cost sharing.

Some countries delisted products after review of the reimbursement list. In Greece, 49 medicines were delisted after a price review in 2011. Czech Republic, Ireland, Portugal, and Spain also delisted products(Belloni, Morgan et al. 2016). In Spain, in 2012, the Government delisted over 400 medicines in most specific therapeutic categories for minor symptoms in outpatient care(World Health Organization 2018). In the United Kingdom, since the 1980s, the NHS has gradually stopped providing older low-value products, and some products are blacklisted for prescribing in primary care. In 2017, the NHS has issued guidance on 18 products with low value, not cost-effective, or low priority(Leo Ewbank, David Omojomolo et al. 2018).

Most OECD countries adopt a set of decision-making criteria for benefit coverage on pharmaceuticals such as therapeutic benefit of a medicine or relative therapeutic benefit, medical necessity/priority, safety, cost-effectiveness, and budget impact. Many countries adopted health technology assessment (HTA) system to inform decision-making for benefit coverage on medicines, although the level of the use of HTA for coverage decisions may be diverse. HTA is a multidisciplinary process assessing information on the clinical benefits as well as the social, ethical, and economic dimensions linked to use of health technologies and interventions(World Health Organization 2018).

Some countries give a greater role to HTA in reimbursement and pricing on pharmaceuticals. In the United Kingdom, HTA has been adopted to decide on whether medicines should be covered by the NHS since the introduction of the National Institute for Health and Care Excellence (NICE) in 1999. NICE's key approach is to assess the cost-effectiveness of new products, and their decision also influences medicines prices. In April 2017, NICE introduced the budget impact analysis of new medicines where if the cost of the medicine is expected to exceed 20 million GBP in the first three

years of the entry, a commercial negotiation will be triggered for the cost down(Leo Ewbank, David Omojomolo et al. 2018). In Germany, the AMNOG low in January 2011 adopted a systematic and formal assessment of the added therapeutic benefit of new medicines after market entry for negotiation of a reimbursement price of the medicines(Belloni, Morgan et al. 2016).

Many OECD countries introduced the use of managed entry agreement (MEA) between the manufacturer and the public payer, allowing coverage of medicines subject to certain conditions. It has a wide range of forms, including price-volume agreements, coverage with evidence development, performance-based outcome guarantees, patient access schemes, and so on, in order to address the cost of uncertainty about a drugs' performance or adoption to increase its effective use, or deal with the risk of related budget impact(World Health Organization 2018). The United Kingdom, Italy, Germany, and Poland are the leading countries in using the agreements(Belloni, Morgan et al. 2016). In the United Kingdom, the NHS increased use of case-by-case negotiation with manufacturers of new medicines. In this patient access schemes, if medicines cannot meet cost-effectiveness requirements, companies may offer a discount or some form of agreement to provide medicines to NHS patients(Leo Ewbank, David Omojomolo et al. 2018).

A Reference price system is reimbursement policy where interchangeable medicines are grouped into a reference group generally by the same active substance or chemically related subgroup. A price (reference price) to be reimbursed for all drugs in the group is determined by the public payer. If the pharmacy retail price of the drug is over its reference price, then the patient have to pay the difference. A reference price system may be used to promote the use of generics and increase competition in the market, leading to the increased savings for the public payer. As of 2017, most of the OECD countries have this system in place. Most countries including Iceland, Latvia, Russia, Slovakia, and Spain determine the reference price at the lowest-priced medicine within the reference group. Revision of the reference price system is frequently conducted in most countries, because of patents expiries and introduction of generics. The frequency of revision of groups and prices may vary: every two weeks (Denmark), monthly (Italy), quarterly (Finland, Estonia, Germany, Hungary, Portugal, Slovakia), every six months (Slovenia), twice a year (Greece), and every five years (France)(World Health Organization 2018).

Table 2.2.1 shows reimbursement rates of outpatient reimbursement medicines in selected OECD countries. Several OECD countries, including Australia, Austria, Germany, Ireland, Italy, the Netherlands, and the United Kingdom, offer 100% of reimbursement rate for publicly subsidized medicines. Other countries have a wide range of reimbursement rates(Ikegami, Yoo et al. 2011; Kwon

2015; World Health Organization 2018; Department of Health of the Australian Government 2019).

Many OECD countries increased or introduced co-payments for medicines for outpatient care, such as Czech Republic, Estonia, France, Greece, Italy, Ireland, Portugal, Slovakia, Slovenia, Spain, and Sweden(Belloni, Morgan et al. 2016). In Spain, a 10% of co-payment on medicines was introduced for pensioners, and standard 40% of co-payment rate is increased to 50-60% for medicines based on non-pensioners' income levels(World Health Organization 2018).

Table 2.2.1 | Reimbursement rates of outpatient reimbursement medicines in selected OECD countries

Country	No percentage reimbursement rate for publicly subsidized medicines	Reimbursement rates
Australia	✓	(100% reimbursement for a specific population group with certain chronic conditions; all others have 100% only after a deductible is paid in advance.)
Austria	✓	
Belgium		100%, 75%, 50%, 40%
Czech Republic		100% and no fixed reimbursement rates for partially reimbursed medicines
Denmark		100%, 85%, 75%, 50%
Estonia		100%, 75% (or 90% for vulnerable groups), 50%
Finland		100%, 65%, 40%
France		100%, 65%, 30%, 15%
Germany	✓	
Greece		100%, 90%, 75%
Hungary		100%, 90%, 80%, 70%, 55%, 50%, 25%
Iceland		100%, 92.5%, 85%, 0%; 65-70% on average for medicines with general reimbursement status
Ireland	✓	(Additional co-payments are possible due to a reference price system; 100% reimbursement for a specific population group with certain chronic conditions; all others have 100% only after a deductible is paid in advance.)
Israel		85-90%
Italy	✓	(Additional co-payments are possible due to a reference price system.)
Japan		70%
Korea		70%, 50%
Latvia		100%, 75%, 50%
Lithuania		100%, 90%, 80%, 50%
Luxembourg		100%, 80%, 40%
Netherlands	✓	
Norway		100%, 61%
Poland		100%, 70%, 50%
Portugal		100%, 90%, 69%, 37%, 15%

Country	No percentage reimbursement rate for publicly subsidized medicines	Reimbursement rates
Slovak Republic		100% and no fixed reimbursement rates for partially reimbursed medicines
Slovenia		100%, 70%, 10%
Spain		100%, 90%, 40-60% (standard rate linked to income)
Sweden		100%, 90%, 75%, 50%
Switzerland		90% and 80% (upon reaching deductible)
Turkey		100%, 90%, 80%
United Kingdom	✓	

Source: Ikegami et al., 2011; Kwon et al., 2015; WHO, 2018; Department of Health of the Australian Government, 2019.

As seen in the previous section, even in the OECD countries, about half of pharmaceutical spending came from OOP. High OOP for buying medicines may prevent patients from consuming needed medicines. Many OECD countries apply co-payment exemption systems for vulnerable population groups, such as those with certain diseases, those with low income, certain age groups including children and the elderly, pensioners and so on.

With regard to NCD specific exemptions for co-payment, in Greece, co-payment for medicines is exempted for certain diseases including type 1 diabetes and cancer, and 25% standard co-payment rate is reduced to 10% for certain diseases including type 2 diabetes. In Finland, 60% of basic co-payment rate for pharmacy retail prices is reduced to 35% for certain diseases including cardiac insufficiency, hypertension, and coronary heart disease; exemptions of co-payment are applied to a list of severe diseases, such as cancer, type 1 diabetes, multiple sclerosis, etc., although patients eligible for exemptions pay a fixed co-payment of 4.5 Euro dollar each time a medicine is dispensed(World Health Organization 2018). In the United Kingdom, co-payment for pharmaceuticals is exempted for those with one of 10 medical conditions such as cancer and diabetes(Leo Ewbank, David Omojomolo et al. 2018; World Health Organization 2018). In Korea, reduction of co-insurance rates from 10% to 5% for cancer patients as of 2009 and for cardio-vascular disease patients as of January 2010 was introduced(Korea Ministry of Health and Welfare 2012).

Although many OECD countries tried to reduce pharmaceutical spending growth, at the same time, governments have strived to make progress to achieve affordable and sustainable access to medicines to meet the increased demands from population ageing and NCDs epidemics by expanding the benefit coverage of pharmaceuticals. In Turkey, the social insurance covers the total

costs of essential medicines for NCD for outpatient and inpatients(Jakab, Farrington et al. 2018). The United States introduced Medicare Part D in 2011; it is a voluntary drug benefit package covering outpatient prescription drug for people aged 65 years old and more and to people under age 65 with some disabilities. The share of prescription drug costs funded by the Medicare Part D increased significantly (1.9% in 2005 to 27.5% in 2013)(Kwon, Kim et al. 2014; Belloni, Morgan et al. 2016).

3. Pharmaceutical policies for cost containment

Many OECD countries have used pricing policies for cost containment on pharmaceuticals, including price cuts on ex-factory prices of medicines, decreased mark-ups for distributors, decreased/increased value-added tax (VAT) rates, the use of external price referencing or changes in the method or basket of reference countries, and so on.

According to the OECD report by Belloni et al. (2016), about one third of OECD countries adopted pricing policies to decrease prices of medicines since 2008. Most of them implemented price cuts on ex-factory prices. In the United Kingdom, the statutory scheme that regulates the prices of originators brands manufactured by companies that are not signatories to the Pharmaceutical Price Regulation Scheme (the main scheme for controlling costs on branded products), accounting for 6% of total volume in 2014; the statutory scheme implemented a 15% cut on the list price of medicines launched before December 2013(Leo Ewbank, David Omojomolo et al. 2018). In Ireland, the Government implemented a 40% price reduction on 300 prescribed off-patent medicines in 2010(Belloni, Morgan et al. 2016).

The design of the distribution margins (fixed mark-ups or regressive schemes) may have an effect on pharmacy retail prices. Several European countries chose to implement regressive wholesale and pharmacy margin schemes where the mark-ups for high-cost medicines are decreased and the mark-ups for low-price medicines are increased(Kanavos, Schurer et al. 2011). Some countries decreased mark-ups for some medicines including Greece, Ireland, and Portugal; in Greece, wholesale mark-ups were decreased and supply chain discounts were abolished in 2011(Belloni, Morgan et al. 2016).

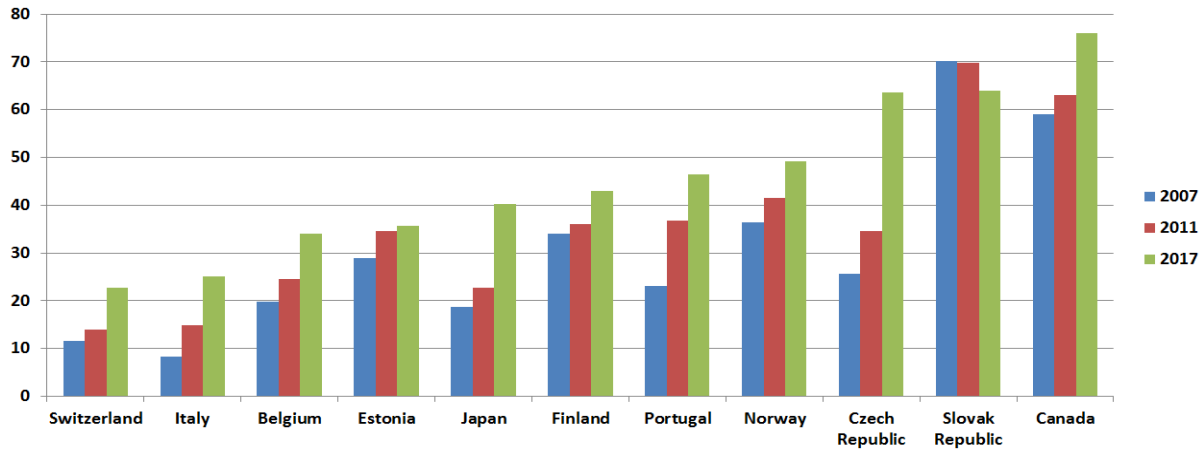
Duties and taxes may increase the price of medicines. Most European countries impose VAT rates on medicines lower than the standard rate(Kanavos, Schurer et al. 2011). Austria, Czech Republic, and Greece decreased VAT rates from 20% to 10% in 2009, from 15% to 10% in 2015, and from 11% to 6.5% in 2011, respectively. Estonia and Portugal increased VAT rates from 5% to 9% in 2009 and from 5% to 6% in 2010, respectively in order to increase public funding(Belloni, Morgan et al. 2016).

Most OECD countries have external price reference systems in place(Kwon, Kim et al. 2014). External price referencing systems are used to decide on the price of new medicines, using the price of a medicine in selected countries as a benchmark or reference price to set or negotiate the price of the product in a given country(Vogler, Zimmermann et al. 2013). Greece, Portugal, Slovakia, Spain, and Switzerland reformed the external price referencing system. In Greece, they changed in price setting methods in 2009 and 2011; in Portugal, changes in the price setting methods in 2010 and changes in the basket of countries were made; in Slovakia, they changed the basket of reference countries in 2009 and 2010, and changed price setting methods in 2011; in Spain, calculation methods were changed in 2010; in Switzerland, they expanded the basket of countries and changed calculation methods in 2015(Belloni, Morgan et al. 2016).

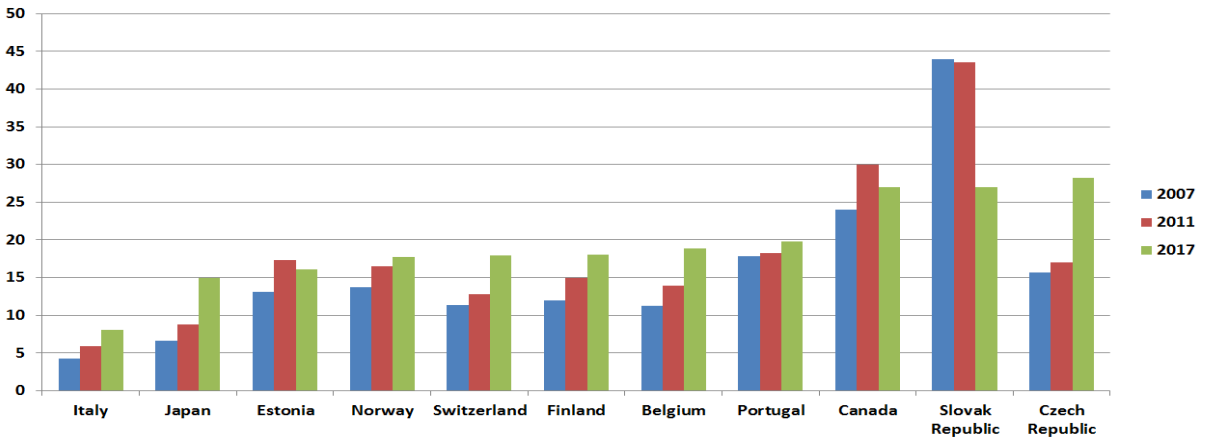
Policies for increasing generics uptake play a great role in improving access to affordable medicines, as voluntary target 9 of the Global NCD monitoring framework suggested(Vogler, Zimmermann et al. 2013; Jakab, Farrington et al. 2018). However, as seen in Figure 2.3.1, there is much room for maximizing the use of generics in many OECD countries. Over the decade, the use of generics as a share of total volume of the pharmaceutical market has been increased in most countries with wide variation in the level of shares. In 2017, the share of generics in volume accounted for less than 30% in Switzerland and Italy, while it accounted for 76% of the market in Canada. In 2016, 84% of prescriptions in primary care used the generic name and 77.7% were dispensed as generic(Leo Ewbank, David Omojomolo et al. 2018).

Figure 2.3.1 | Trends in generic market shares in volume and in value in OECD countries, 2007-2017 (%)

1) Volume



2) Value



Source: OECD Health Statistics, 2018.

Three key approaches to promote generics uptake are International Non-proprietary Names (INN) prescribing for prescribers, generic substitution for pharmacists, and campaign to raise awareness about benefits of generics for patients(Vogler, Zimmermann et al. 2013; Kwon, Kim et al. 2014; Belloni, Morgan et al. 2016; Jakab, Farrington et al. 2018; Leo Ewbank, David Omojomolo et al. 2018). The aim of INN prescribing is to promote the use of lowest-priced medicines with the same active ingredient(Kwon, Kim et al. 2014). Most European countries have allowed INN prescribing except Austria, Denmark, Serbia, and Sweden. INN prescribing is allowed in 22 of 45 European countries, and is obligatory in 19 countries(World Health Organization 2018). With two-third of OECD countries allowed INN prescribing, Italy in 2012, Slovakia and Spain in 2011 allowed INN prescribing. Estonia in 2010, Portugal and Spain in 2011, and France in 2015 made INN prescribing obligatory(Belloni, Morgan et al. 2016).

Physician prescription patterns are monitored in most OECD countries(Vogler, Zimmermann et al. 2013; Kwon, Kim et al. 2014). In the Netherlands, the electronic monitoring system allows the authorities to analyse pharmaceutical consumption at the level of the prescribing doctors, at aggregated local and central levels; physicians can access the system and compared their prescription patterns with the average of other physicians in the region(Vogler, Zimmermann et al. 2013). Some countries have some incentives in place. In France, they introduced financial incentives for prescribing a specific target within a therapeutic class and less expensive medicines in 2009 and 2012(Godman, Paterson et al. 2012; Vogler, Zimmermann et al. 2013). In Japan, they increased the targets to be achieved in the share of generics prescribing to gain the additional bonus in

2012(Belloni, Morgan et al. 2016). In the United Kingdom, General Practitioners (GP) in training are trained to prescribe using the generic name; moreover, there are financial incentives for GP fundholding and community pharmacists to dispense cheaper products; GP receive feedback over their prescribing; digital decision-support systems promoting prescribers to use low-cost products are introduced(Leo Ewbank, David Omojomolo et al. 2018).

Generic substitution is to substitute a medicine with a less expensive medicine containing the same active ingredients at the community pharmacy level. Generic substitution is in place in many European countries (29 of the 45 countries), and obligatory in 12 of the 45 European countries (including Denmark, Estonia, Finland, Germany, Greece, Italy, Iceland, Slovakia, Spain, and Sweden). Austria, Bulgaria, Luxembourg, and United Kingdom do not allow generic substitution(World Health Organization 2018). Italy recently made generic substitution obligatory in 2012(Belloni, Morgan et al. 2016). In France, pharmacists can have financial incentives for generic substitution through an equivalent mark-up; in Switzerland, pharmacists are rewarded a fee for generic substitution(World Health Organization 2018).

Campaigns for patients to increase awareness for generics are important to improve generics uptake. Difference in co-payments between generics and branded products plays a role in incentivizing patients to choose cheaper medicines(Vogler, Zimmermann et al. 2013; Kwon, Kim et al. 2014; World Health Organization 2018). France introduced a policy where patients must to pay in advance for the drugs and be reimbursed later if they decline generic substitution(Belloni, Morgan et al. 2016).

4. Policies for rational use of NCD medicines

Patients with NCD may have co-morbidities and may have to take multiple medicines (polypharmacy), which can interact sometimes with fatal effect(World Health Organization 2015; Jakab, Farrington et al. 2018). More than 30% of patients aged 65 years old or older are prescribed 5 or more medicines(Scott, Hilmer et al. 2015; Qato, Wilder et al. 2016; Taeik Chang, Haeyong Park et al. 2019). In Korea, 46.6% of patients aged 65 years old or older were prescribed 5 or more than drugs in 2012; among older patients with 5 or more drugs, 47% had one and more inappropriate prescribed medicines(Taeik Chang, Haeyong Park et al. 2019). Diseases commonly associated with polypharmacy were NCDs including coronary vascular diseases or stroke, heart failure, diabetes, and chronic obstructive pulmonary diseases(Corsonello, Pedone et al. 2007; Jyrkkä, Enlund et al. 2009; Sergi, De Rui et al. 2011).

Particularly, older patients with NCD may face a wide range of drug-related issues. The effects of medications among the elderly may be varied and less predictable, differing from the younger due to physiologic changes related to ageing including decreased renal function, decreased hepatic function, decreased total body water and lean body mass, and so on(Fulton and Riley Allen 2005; Bushardt, Massey et al. 2008; Oxley 2009). About 20% of medicines commonly used in older people may be inappropriate(Scott, Hilmer et al. 2015; Taeik Chang, Haeyong Park et al. 2019). Incidence of adverse drug reactions increases with polypharmacy. Evidence shows that at least 15% of older patients had adverse drug reactions(Fulton and Riley Allen 2005; Scott, Hilmer et al. 2015). Evidence shows that there was a linear relationship between the occurrence of adverse drug reactions and the number of drugs taken; 8.6% increase in the risk of adverse drug reactions for each additional drug was found(Viktil, Blix et al. 2007). The risk for adverse drug reactions is 13% with the use of two drugs, but the risk increases to 58% for 5 drugs and to 82% for 7 or more drugs(Prybys and Gee 2002). The risk of adverse drug reactions was 2.65-fold higher in patients with more than 4 drugs taken; the risk was higher if diuretics, digoxin, ACE inhibitors or antihyperglycaemic agents in the regimen(Corsonello, Pedone et al. 2005).

Medication errors and adverse drug reactions are mostly likely to have impacts on patients who take multiple medicines, contributing to ill health, hospitalization, and in certain cases death. The percentage of hospital admissions related to medication errors varied from 4% in young people to 16% and more among older people, ranking between the 4^{th} and 6^{th} cause of death in hospitalized patients(Swedish National institute of Public Health 2007). About 10% of emergency visits are caused by adverse drug reactions among patients aged 65 years old or older who visited an emergency room(Hohl, Dankoff et al. 2001). In Korea, polypharmacy with 5 or more drugs increased the risk of hospitalization by 18% and the risk of death by 25%(Taeik Chang, Haeyong Park et al. 2019). In the United Kingdom, hospital admissions due to drug-related errors and adverse drug reactions could cost the NHS 530 million GBP a year, and contributed to 700 deaths a year(Leo Ewbank, David Omojomolo et al. 2018).

Polypharmacy also contributes to falls and hip fractures, associated with high morbidity and mortality rates in older people. Moreover, it may lead to medication non-adherence with impairing the efficacy of a drug(Sergi, De Rui et al. 2011; Maher, Hanlon et al. 2014). Non-adherence rates in community-dwelling elderly people have been estimated to be between 43-100%(Vik, Maxwell et al. 2004). Poor compliance is associated with potential disease progression, treatment failure, hospitalization, and adverse drug reactions, leading to increased costs(Sergi, De Rui et al. 2011;

Maher, Hanlon et al. 2014).

Polypharmacy had an influence on increased healthcare costs to both the patient and the health system(Maher, Hanlon et al. 2014). In Japan, polypharmacy was related to an increased risk of taking an inappropriate medication and an increased risk of outpatient visits and hospitalization, with an about 30% increases in health costs(Akazawa, Imai et al. 2010). In Sweden, those taking 5 or more drugs had a 6.2% increase in pharmaceutical drug expenditure and those taking 10 or more drugs had a 7.3% increase(Hovstadius and Petersson 2013).

In Australia, a Home Medicine Review Service was introduced in 2001 for older patients at risk for medication errors, which uses pharmacists to manage issues. In the Service, GPs identify older people at risk using defined criteria (e.g., those taking five or more medications), and these patients are referred to their community pharmacy. A pharmacist meets the older patient, generally at home, to examine a comprehensive medication list. Then, the pharmacist prepares a written document on the findings and recommendations, which sent to the person's GP. And the GP and the patient agree on medication plan based on the report. This Service is regarded as a key component of Australia's national Medicines Policy, ensuing that medicines are applied safely and effectively. Evidence showed that the reviews were effective for optimizing prescribing and preventing unnecessary adverse reactions(World Health Organization 2015).

In Korea, there have been several approaches to a rational use of NCD drugs. In 2010, a Drug utilization review (DUR) was established by the Health Insurance Review and Assessment (HIRA); almost all health facilities use DUR. DUR provides information on the drugs taken by a patient and their contraindications to doctors and pharmacists. DUR aims to protect the health of patients and reduce pharmaceutical expenditure through reducing unnecessary drug utilization. HIRA provides information on the number of medicines per prescription, the antibiotics prescription rates, and so on to the public through the website(Kwon, Lee et al. 2015). In July 2018, the National Health Insurance Service of Korea (NHIS) introduced a pilot of the use of appropriate medication in collaboration with the Association of the Korean Pharmacists. In the pilot, among patients with hypertension, diabetes, cardiovascular diseases, and chronic renal failure in 8 designated regions, those with multiple medications and taking medications having contraindications were selected. A pharmacist and staff from the NHIS visit the patient on a regular basis to monitor medication plans(National Health Insurance Service of Korea 2018).

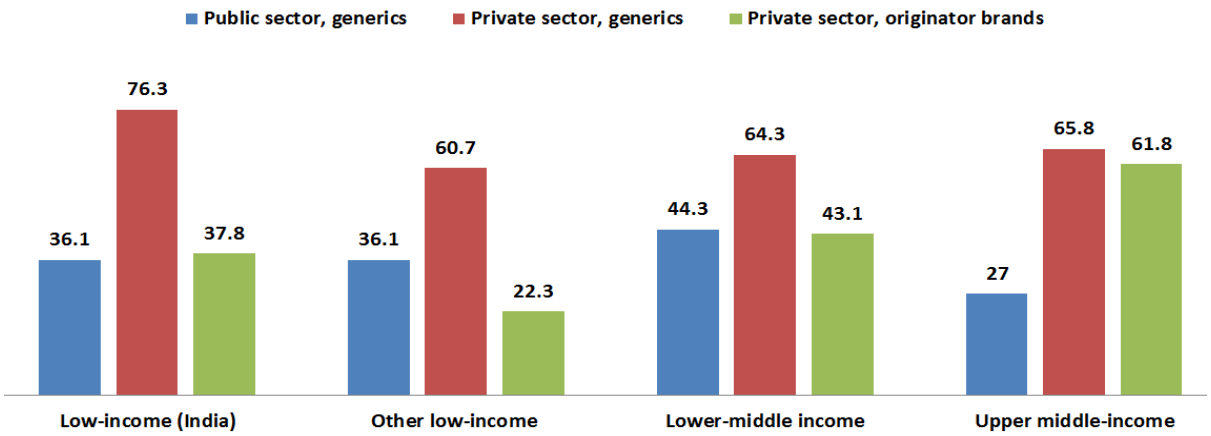
III. Challenges for low-and middle-income countries in the Asia-Pacific region

1. Availability and affordability of NCD medicines

Universal access to affordable and good quality medicines and vaccines to prevent and treat NCDs is critical for all countries, especially low-and middle-income countries(Beaglehole, Bonita et al. 2011; Hogerzeil, Liberman et al. 2013). However, access to medicines for NCDs is unacceptably very low with wide disparities between countries and within countries.

Figure 3.1.1 shows the average of country-level mean percentage availability of medicines in the public and private sector in 36 LMICs by World Bank income group studied by Cameron et al. (2009). Public sector availability of generic medicines shows the similar range across income groups, ranging from 27% in upper middle-income countries to 44.3% in lower middle-income countries. Private sector availability of generic medicines was 60.7% in low-income countries, 64.3% in lower middle-income countries, and 65.8% in upper middle-income countries. Private sector availability of originator brands ranged from 22.3% in low-income countries to 61.8% in upper middle-income countries; originator brands were less available than generics in low-income countries.

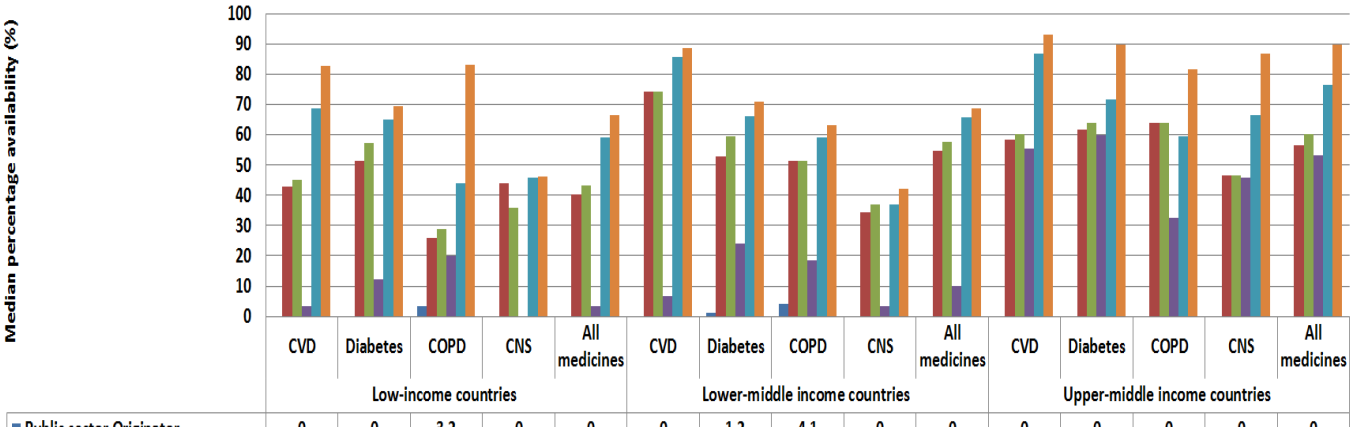
Figure 3.1.1 | **Average of country-level mean percentage availability of medicines in the public and private sector by World Bank income group (%)**



Note: Medicines included Salbutamol (antiasthmatic), Captopril (antihypertenstive), Ciprofloxacin (antibacterial), Amitriptyline (antidepressant), Omeprazole (antacid), Ranitidine (antacid), Aciclovir (antiviral), Glibenclamide (antidiabetic), Amoxicillin (antibacterial), Ceftriaxone (antibacterial), co-trimoxazole (antibacterial), Fluoxetine (antidepressant), Hydrochlorothiazide (antihypertensive), Atenolol (antihypertensive), and Beclometazone (antiasthmatic).
Source: Cameron et al., 2009.

Figure 3.1.2 presents median percentage availability in the public and private sectors in selected countries by therapeutic group and World Bank income group studied by Ewen et al. (2017). The median availability of generics in the public sector did not exceed 80% for any therapeutic group; only for CVD medicines in the private sector in lower-middle income countries (85.8%) and upper-middle income countries (86.7%). Overall generic availability was the lowest in low-income countries (40.2% in the public sector and 59.1% in the private sector) with increased availability as income rises. For any product type, median availability was less than 80% for all four therapeutic groups in the public sector; the median availability in the private sector was 80% or more for CVD (82.9%) and COPD (83.3%) in low-income countries, CVD (88.6%) in lower-middle income countries, and all four groups in upper-middle income countries. Availability of CVD and diabetes medicines for any products was relatively higher than other groups in lower-middle and upper-middle income countries(Ewen, Zweekhorst et al. 2017).

Figure 3.1.2 | **Median percentage availability in the public and private sectors in selected countries by therapeutic group and World Bank income group (%)**

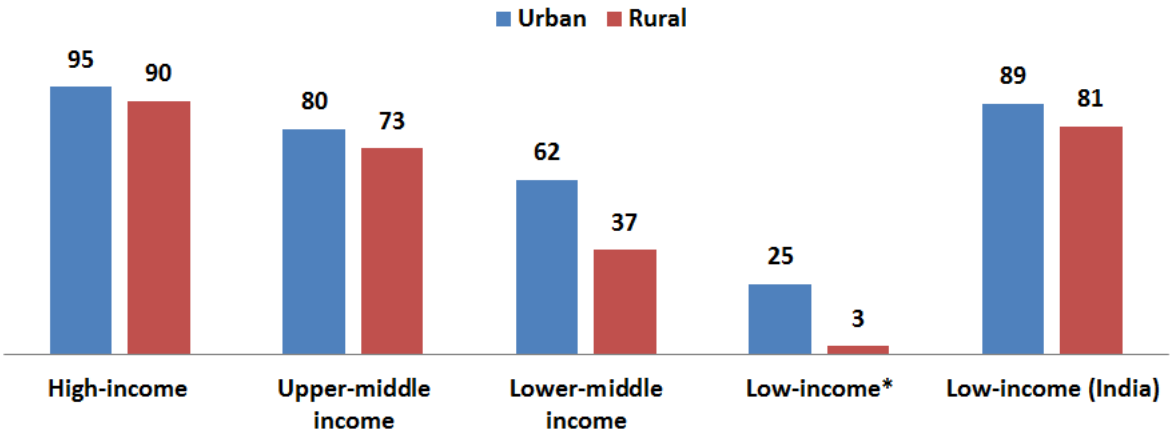


	Low-income countries					Lower-middle income countries					Upper-middle income countries				
	CVD	Diabetes	COPD	CNS	All medicines	CVD	Diabetes	COPD	CNS	All medicines	CVD	Diabetes	COPD	CNS	All medicines
Public sector Originator	0	0	3.2	0	0	0	1.2	4.1	0	0	0	0	0	0	0
Public sector Lowest priced generic	42.9	51.3	25.8	44.1	40.2	74.2	52.9	51.4	34.3	54.6	58.4	61.7	64.1	46.7	56.7
Public sector Any product	45	57.4	29	35.7	43.3	74.2	59.5	51.4	37.1	57.6	60.3	64.1	64.1	46.7	60.2
Private sector Originator	3.3	12.1	20	0	3.2	6.7	24	18.6	3.3	10	55.6	60	32.6	45.8	53.3
Private sector Lowest priced generic	68.6	65.2	44	45.7	59.1	85.8	66.2	59.2	37.1	65.7	86.7	71.7	59.7	66.7	76.7
Private sector Any product	82.9	69.5	83.3	46.4	66.7	88.6	71	63.3	42.1	68.6	93.3	89.9	81.7	86.7	90

Source: Ewen et al., 2017.

The Prospective Urban Rural Epidemiology (PURE) study examined the availability of four NCD medicines (aspirin, beta blockers, ACE inhibitors, and statin) for the secondary prevention of cardiovascular disease in 18 countries. Availability was estimated by presence in pharmacy at the time of survey. As seen in Figure 3.1.3, availability of the four cardiovascular disease medicines ranged from 95% in urban to 90% in rural communities in HICs; 80% to 73% in upper middle-income countries; 62% to 37% in lower middle-income countries; and 25% to 3% in low-income countries (excluding India). Availability in India ranged from 89% to 81%, because the country has the large generic pharmaceutical industry(Khatib, McKee et al. 2016).

Figure 3.1.3 | Percentage availability of the four cardiovascular disease medicines in the 596 PURE communities surveyed (%)

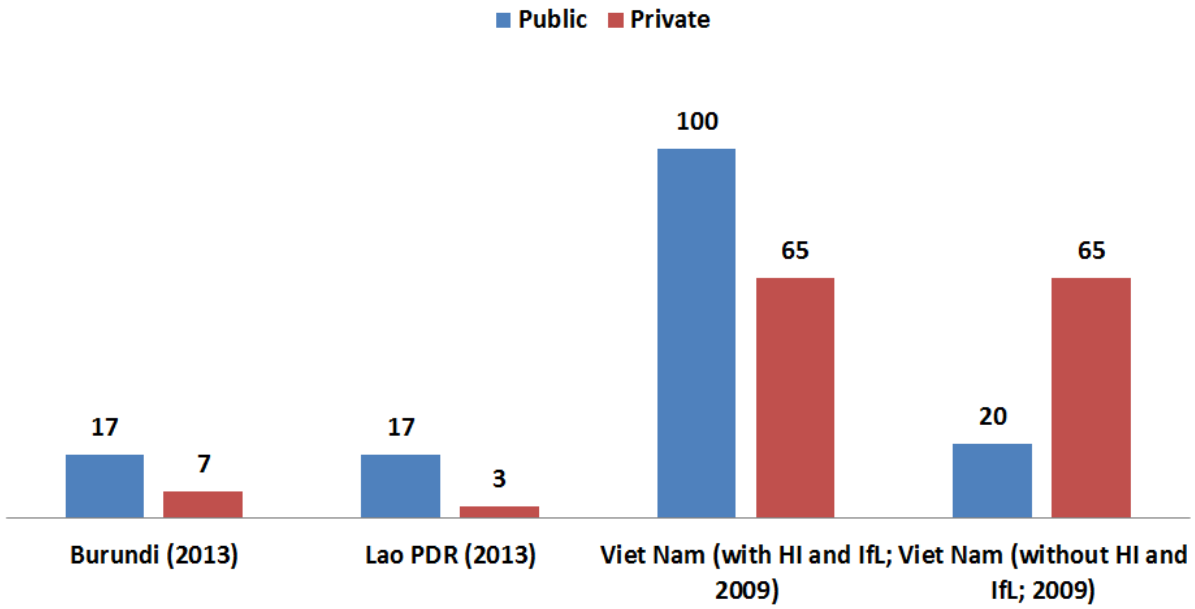


Note: Cardiovascular medicines included aspirin, beta blockers, angiotensin-converting enzyme inhibitors, and statins.
*Excluding India.
Source: Khatib et al., 2016.

Diabetes medicines show the similar pattern to that of CVDs. The average availability of Glibenclamide (antidiabetic) was 56.5% in the public sector and 71.3% in the private sector in LMICs(Cameron, Ewen et al. 2009). Insulin is essential for treatment of people with type 1 diabetes. Insulin has three types, i.e. human insulin, analogue insulin, and animal insulin; animal insulin disappeared from the market over the period 1999-2009; human insulin was the only formulation used in HICs and middle-income countries but now represented a third of insulin used in HICs and two-thirds in middle-income countries by 2009; in low-income countries, human insulin comprises more than 94% of all insulin sued in 2009, followed by analogue insulin(Beran, Ewen et al. 2016); only human insulin is included on the WHO's essential medicines lists (EML)(Beran, Ewen et al. 2017). Figure 3.1.4 shows availability of insulin in the public and private sectors in the selected countries.

The average availability in the public sector in Viet Nam was 100% with health insurance, and 20% without health insurance, while it was 65% in the private sector. According to the study conducted by Beran et al. (2016), only four of 15 countries showed 100% availability of insulin in the public sector and six countries showed more than 80% availability; availability in the private sector was less than 80% in all except two countries(Beran, Ewen et al. 2016).

Figure 3.1.4 | Availability of insulin in the public and private sectors in selected countries (%)



Note: HI=health insurance; IfL=donated human insulin from the charity Insulin for Life.
Source: Beran et al., 2016.

As mentioned earlier, much of out-of-pocket payments (OOP) in LMICs go to medicines. In LMICs, the availability of free drugs in the public sector is often low; this causes patients to buy their medications in the private sector where the prices of medicines are generally high(Cameron, Ewen et al. 2009; Niëns and Brouwer 2013). Moreover, people often prefer originator brands than generics, thus increasing OOP(Jakab, Farrington et al. 2018).

Cameron et al. (2009) showed that for 15 medicines studied, the average median price ratio to the International reference price in the 39 surveys with public procurement data was 1.11; as seen in Table 3.1.1, the median price ratio for lowest-priced generics in public procurement varied by income group; the median price ratios of lowest-priced generics ranged from 0.09 to 5.37 in low-income countries, while ranging from 0.33 to 2.94 in lower-middle income countries. This showed that even lowest-priced generics in the public sector can cost many times the international reference price. However, public sector medicines prices were still lower than medicines in the private sector.

Table 3.1.1 | **Ratios of the median price for lowest-priced generics in public procurement to the Management Sciences for Health (MSH) international reference price by World Bank income group**

	Median price ratios		95% CI
	Estimates	Max/Min	
Upper-middle income	1.39	0.90-1.76	0.15
Lower-middle income	1.33	0.33-2.94	0.51
Other Low-income	1.17	0.09-5.37	0.59
Low-income (India)	0.47	0.27-0.78	0.15

Note: Medicines included Salbutamol (antiasthmatic), Captopril (antihypertenstive), Ciprofloxacin (antibacterial), Amitriptyline (antidepressant), Omeprazole (antacid), Ranitidine (antacid), Aciclovir (antiviral), Glibenclamide (antidiabetic), Amoxicillin (antibacterial), Ceftriaxone (antibacterial), co-trimoxazole (antibacterial), Fluoxetine (antidepressant), Hydrochlorothiazide (antihypertensive), Atenolol (antihypertensive), and Beclometazone (antiasthmatic).
Source: Cameron et al., 2009.

Cameron et al. (2009) presented that the median price difference between originator brands and lowest-priced generics for matched pairs of medicines in the private sector exceeded 300% in lower-middle income countries and low-income countries; it was decreased in upper-middle income countries (152%) and in India (6%) (Table 3.1.2).

Table 3.1.2 | **Median price difference between originator brands and lowest-priced generics for matched pairs of medicines in the private sector by World Bank income group (%)**

	Median price difference (%)	
	Estimates	Max/Min
All low-and middle-income countries	260.2	0-1464.7
Upper-middle income	151.7	140.3-167.7
Lower-middle income	345.3	55.9-1464.7
Other Low-income	337.7	100-1000.3
Low-income (India)	6	0-26

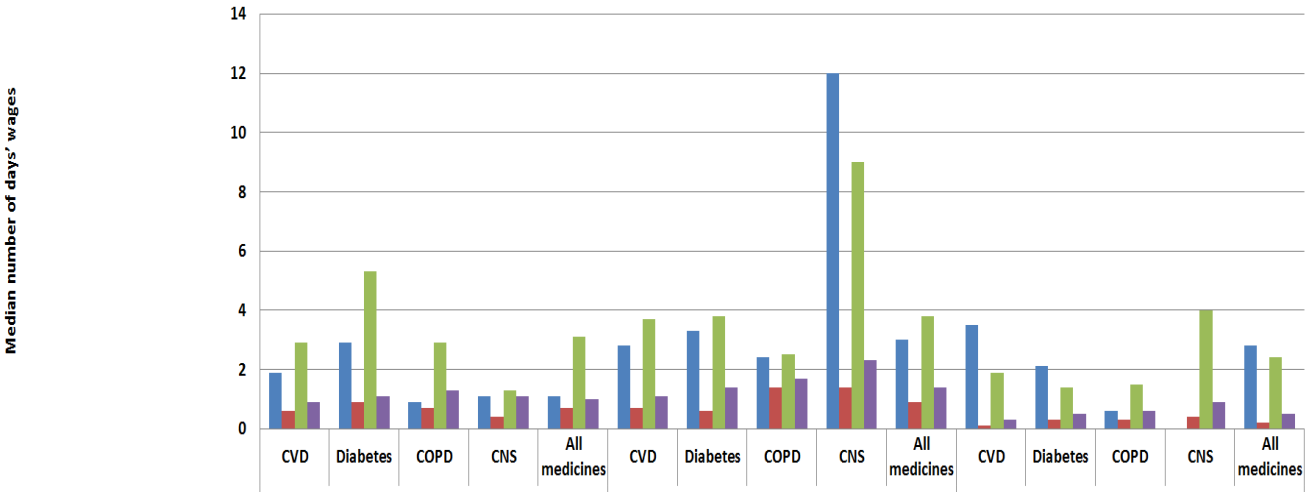
Note: Medicines included Salbutamol (antiasthmatic), Captopril (antihypertenstive), Ciprofloxacin (antibacterial), Amitriptyline (antidepressant), Omeprazole (antacid), Ranitidine (antacid), Aciclovir (antiviral), Glibenclamide (antidiabetic), Amoxicillin (antibacterial), Ceftriaxone (antibacterial), co-trimoxazole (antibacterial), Fluoxetine (antidepressant), Hydrochlorothiazide (antihypertensive), Atenolol (antihypertensive), and Beclometazone (antiasthmatic).
Source: Cameron et al., 2009.

There is no consensus on methods for measuring affordability of medicines(Niëns and Brouwer 2013). Some used the number of days' wages of the lowest paid government worker needed to buy

treatments(Ewen, Zweekhorst et al. 2017); some used assessment of catastrophic health expenditure (if OOP on medicines exceeds 5% of daily income of the lowest paid government worker) and household impoverishment (if the remaining income after buying medicines was less than USD 1.25 or USD 2 per day)(Niëns and Brouwer 2013). Some employed the measurement of catastrophic expenditure defined as combined costs less than 20% of household capacity to pay(Khatib, McKee et al. 2016).

Ewen et al. (2017) conducted a secondary analysis of data from 30 surveys in LMICs that were undertaken from 2008-2015 using the WHO/Health Action International medicine availability and price survey methodology; based on the median number of days' wages required to buy treatments, purchasing lowest-priced generics in the public sector needs less than 1 days' wage in all four therapeutic groups, except COPD and CNS medicines in lower-middle income countries where 1.4 days' wages were needed. Less than 1 days' wage was required in upper-middle income countries for all four therapeutic groups, and CVD drugs in low-income countries (Figure 3.1.5). Across countries, originator brands were less affordable than lowest-priced generics in the public and private sectors.

Figure 3.1.5 | Median number of days' wages needed to purchase standard treatments by World Bank income group



	Low-income countries					Lower-middle income countries					Upper-middle income countries				
	CVD	Diabetes	COPD	CNS	All medicines	CVD	Diabetes	COPD	CNS	All medicines	CVD	Diabetes	COPD	CNS	All medicines
Public sector Originator	1.9	2.9	0.9	1.1	1.1	2.8	3.3	2.4	12	3	3.5	2.1	0.6		2.8
Public sector Lowest priced generic	0.6	0.9	0.7	0.4	0.7	0.7	0.6	1.4	1.4	0.9	0.1	0.3	0.3	0.4	0.2
Private sector Originator	2.9	5.3	2.9	1.3	3.1	3.7	3.8	2.5	9	3.8	1.9	1.4	1.5	4	2.4
Private sector Lowest priced generic	0.9	1.1	1.3	1.1	1	1.1	1.4	1.7	2.3	1.4	0.3	0.5	0.6	0.9	0.5

Note: Estimates were based on median treatment prices and the daily wage of the lowest paid unskilled government worker. Medicines supplied free of charge in the public sector were excluded. CVD=cardiovascular diseases; COPD=chronic obstructive pulmonary diseases; CNS=central nervous system.
Source: Ewen et al., 2017.

Niens and Brouwer (2013) calculated the affordability of lowest-priced generics Glibenclamide (diabetes), Amoxicillin (acute respiratory infection), and Atenolol (hypertension) using the 2005 wave of the Indonesian National Socioeconomic Survey (n=7302 households). Occurrence of catastrophic expenditure at 5% and 10% of daily wage by the lowest paid government worker was 65.9% and 17.2% of the population for diabetes and 98.6% and 92.5% for hypertension. The number of days' wages needed to pay for medicines was 0.6 days for diabetes and 2.4 days for hypertension. For impoverishment, 5.8% and 3.7% of the population would be impoverished due to diabetes medicines costs at the poverty line of less than USD 1.25 per day and USD 2 per day, while 21.6% and 11.6% of the population would become poor due to hypertension medicines costs, respectively (Table 3.1.3).

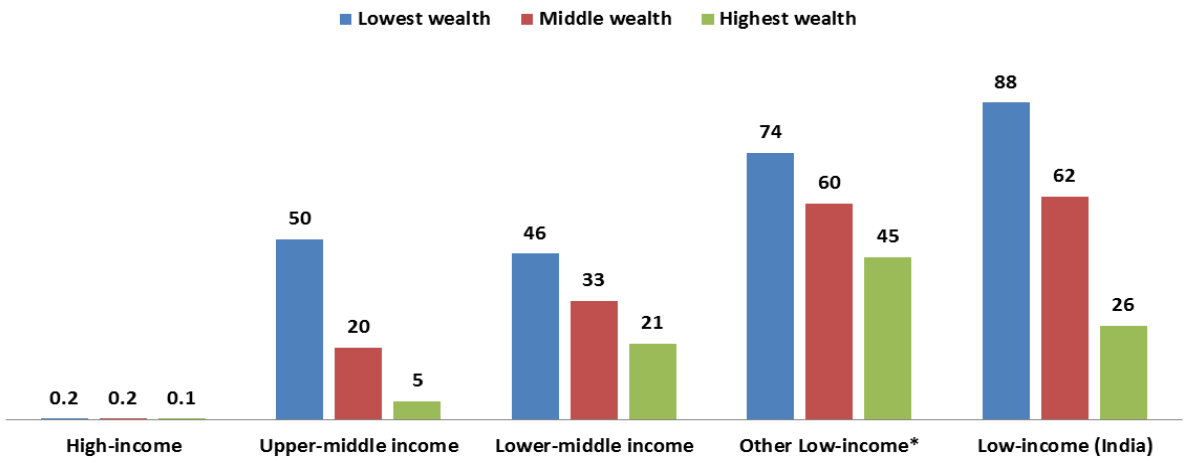
Table 3.1.3 | Affordability estimates of selected medicines in Indonesia in 2005

Methods	Medicine (condition)		
	Glibenclamide (diabetes)	Amoxicillion (acute respiratory infection)	Atenolol (hypertension)
Catastrophic payment			
Catastrophic expenditure at 5% of daily wage by the lowest paid government worker	65.9%	95.8%	98.6%
Catastrophic expenditure at 10% of daily wage by the lowest paid government worker	17.2%	78.0%	92.5%
No. of daily wages needed by the lowest paid government worker	0.6 days	0.4 days	2.4 days
Impoverishment			
Less than USD 1.25 per day	5.8%	14.2%	21.6%
Less than USD 2 per day	3.7%	8.2%	11.6%

Source: Niens and Brouwer, 2017.

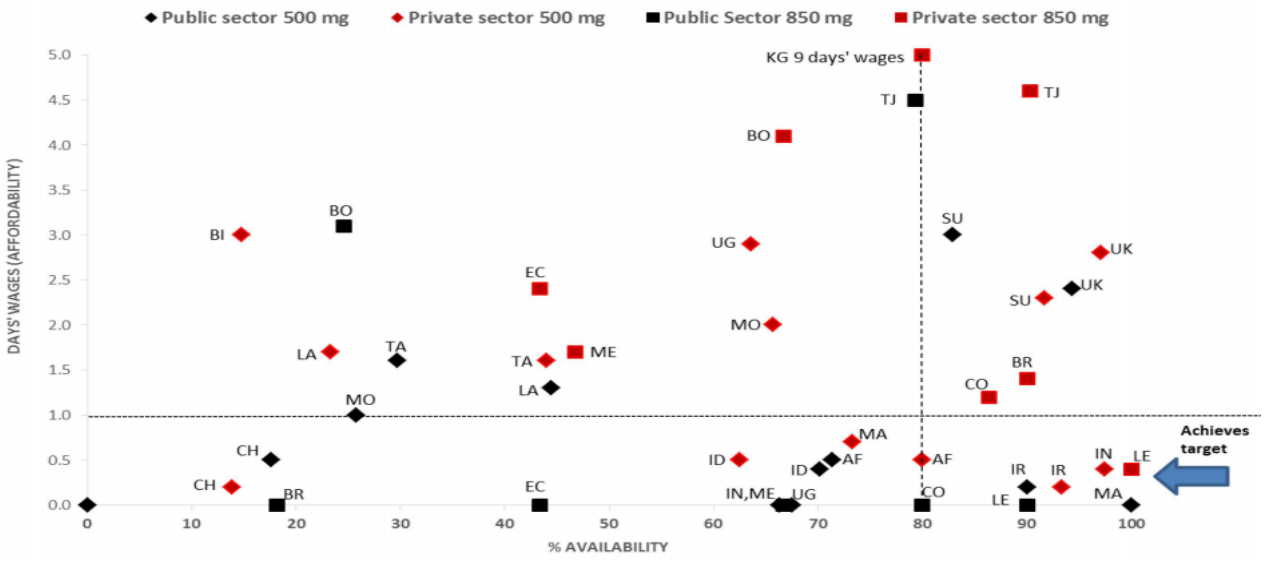
In the PURE study for four NCD medicines (aspirin, beta blockers, ACE inhibitors, and statin) for the secondary prevention of cardiovascular disease in 18 countries, occurrence of catastrophic expenditure on medicines at the threshold of 20% of household capacity to pay (the household income remaining after food subsistence costs) was 25% and 33% of the households in upper-middle income countries and lower-middle income countries; 60% of the households in low-income countries (excluding India) and 59% in India experienced catastrophic expenditure due to medicines. In high-income countries, 0.14% of households had catastrophic expenditure due to medicines. As seen in Figure 3.1.6, the poor disproportionately experienced catastrophic health expenditure due to medicines(Khatib, McKee et al. 2016).

Figure 3.1.6 | Proportion of households that might not be able to afford all four cardiovascular disease medicines at the thresholds of 20% by tertiles of wealth index by World Bank income group (%)



Note: *excluding India.
Source: Khatib et al., 2017.

Figure 3.1.7 | Availability and affordability of metformin 500mg and 850mg tabs of lowest-priced generics by sector and by country



AF Afghanistan; BI Burundi; BO Bolivia; BR Brazil Rio Grande de Sol; CH China Shaanxi Province; CO Colombia; EC Ecuador; ID Indonesia; IN India Delhi; IR Iran; KG Kyrgyzstan; LA Lao PDR; LE Lebanon; MA Mauritius; ME Mexico City; MO Mongolia; SU Sudan; TA Tanzania; TJ Tajikistan; UG Uganda; UK Ukraine.
Note: Medicines in the public sector in BR, EC, ME, IN, UG, CO, LE and MA were dispensed free of charge to all patients in the outlets sampled so days' wages are indicated as zero.
Source: Ewen et al., 2017.

Ewen et al. (2017) showed availability and affordability of metformin (antidiabetic) 500mg and 850mg tabs of lowest generics by sector and by country. The right hand lower quadrant indicates 80% or more availability and one days' wages or less to pay for metformin to treat diabetes. In the public sector, only four out of the 20 countries (Mauritius, Lebanon, Iran, and Colombia) showed that metformin was available and affordable. In the private sector, four countries (Lebanon, India, Iran, and Afghanistan) of the 21 countries also achieved this target (Figure 3.1.7).

2. Procurement and benefit coverage policies for NCD medicines

Weak, ineffective, and inefficient procurement systems and supply management systems can result in shortages or undersupply as well as high costs of NCD medicines, which may affect availability of NCD medicines(World Health Organization 2011; OECD 2012; Robinson and Hort 2012; Wirtz, Hogerzeil et al. 2017). Interrupting supply and procurement processes of medicines can be detrimental to patients, particularly for NCD patients where many NCD patients need treatment for many years to control their conditions (e.g., hypertension and diabetes).

Evidence shows that for the basket of 15 medicines, some countries (including southeast Asia) achieved generic medicine prices close to or lower than international reference prices in public sector procurements, while countries in the western pacific countries payed generic medicines prices 34-44% more than international reference prices; For diabetes medicines (Glibenclamide), both countries in the south-eastern Asia and western pacific region procurements averaged 52% and 68% more than international reference prices(Cameron, Ewen et al. 2009). For insulin, human insulins tended to be more often procured at lower prices (median 5.99 USD) than analogues (34.4 USD). Government procurement prices ranged from 2.24 USD in Pakistan to 32 USD in Kyrgyzstan for regular/isophane (premixed 30/70 insulin(Beran, Ewen et al. 2017).

Procurement agencies for essential medicines including NCD medicines in many LMICs are centralized, providing a good starting point to applying good procurement practice(Cheryl Cashin 2017). Many government procurement agencies have been applying similar policies and focusing on products that achieve quality standards(Wirtz, Hogerzeil et al. 2017). However, there is still room for improvement; procurement regulations in many LMICs are often cumbersome and outdated, reducing the flexibility to have medicines at the right time and in the right quantity based on service

delivery needs. Procurement systems can use more centralized negotiation of multi-year purchase agreements and more decentralized purchasing at local levels to meet supply and need(Cheryl Cashin 2017). Pooled procurement can be beneficial to exerting monopsony power through competitive bidding and price negotiation if multiple payers within a country or across countries negotiate prices together(Beran, Ewen et al. 2016; Wirtz, Hogerzeil et al. 2017).

Supply management systems need to be strengthened to decrease interruptions to medicines supplies(Atun, Jaffar et al. 2013). Monitoring systems for stock levels and use of NCD medicines are critical. Harnessing communication technology such as short message services can be a good tool for increasing procurement efficiency and monitoring(Hogerzeil, Liberman et al. 2013).

Availability and affordability of NCD medicines can be significantly improved within existing budgets for medicines through optimizing the selection of medicines in benefit coverage. Patients may face challenges of high OOP at the point of service under limited benefit coverage for NCD medicines, although governments may often be able to procure essential medicines at competitive international prices. This would discourage patients to appropriate use of NCD medicines and reduce adherence to long-term treatment for NCD medicines(World Health Organization 2015).

Many NCDs can be managed and treated with a small list of off-patent medicines, including antihypertensives, CVD drugs, statins, and so on(Hogerzeil, Liberman et al. 2013). Public sectors in low-resourced settings might need to have some strategies targeting a reduced number of essential generic medicines, rather than trying to cover a large number of originator and generic medicines together(Cameron, Ewen et al. 2009).

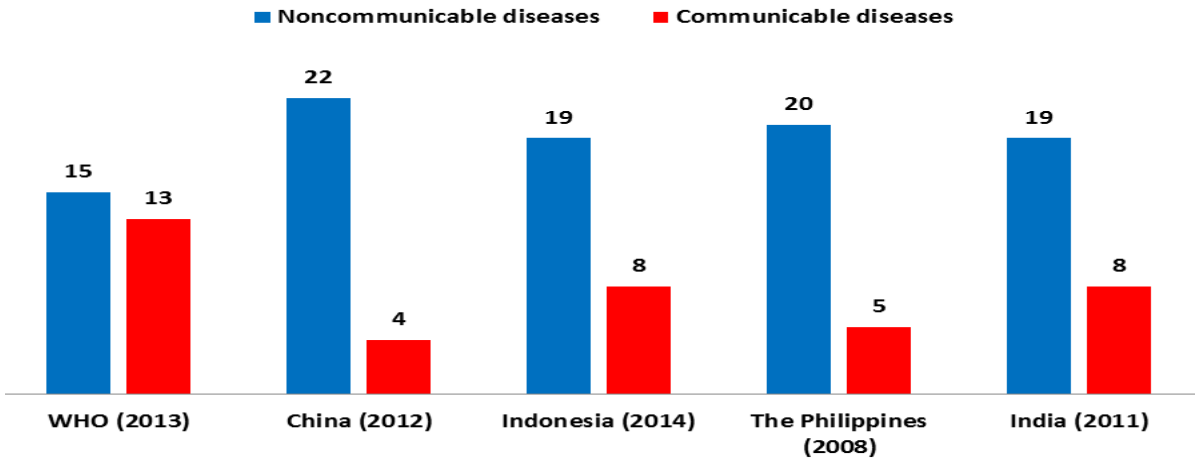
WHO's essential medicines lists (EML) are based on evidence-based clinical guidelines for the prevention and treatment of NCDs, which are regularly updated. The WHO EML has been well received among countries with 4 out of 5 countries adopted a national medicines list based on the WHO EML(IMS Institute for Healthcare informatics 2015). This list has been used to guide national committees responsible for identifying the most cost-effective medicines at country level for procurement, reimbursement, and treatment decisions(Hogerzeil, Liberman et al. 2013).

With the increasing burden of NCD, the number of NCD medicines in the WHO EML has been increased. However, the ratio of NCD medicines to total number of medicines in the WHO EML remains stagnant on average at 15% from 1977 to 2013(IMS Institute for Healthcare informatics 2015), as seen in Figure 3.2.1. China, Indonesia, the Philippines, and India included a higher share of

NCD medicines in the WHO EML compared to the average of WHO.

Table 3.2.1 shows comparison of oral anti-diabetic drugs in 2013. 12 molecules are used in one or more EMLs, while the WHO EML covers only three. All countries have metformin in their EML. Although prevalence of diabetes among adults aged between 20-79 in 2010 was similar between China and Indonesia, the number of diabetes medicines in the EMLs was different with 9 in Indonesia and 6 in China. Metformin and Glibenclamide are first line anti-diabetic medicines and included in the EML for most countries. Insulin is included in the WHO EML and other country EMLs(IMS Institute for Healthcare informatics 2015).

Figure 3.2.1 | **Contribution of selected NCD and CD medicines in the WHO essential medicines list (%)**



Note: NCD include cardiovascular disease, diabetes, cancer, and respiratory diseases; CD include malaria, HIV, TB, and vaccines.
Source: IMS, 2015.

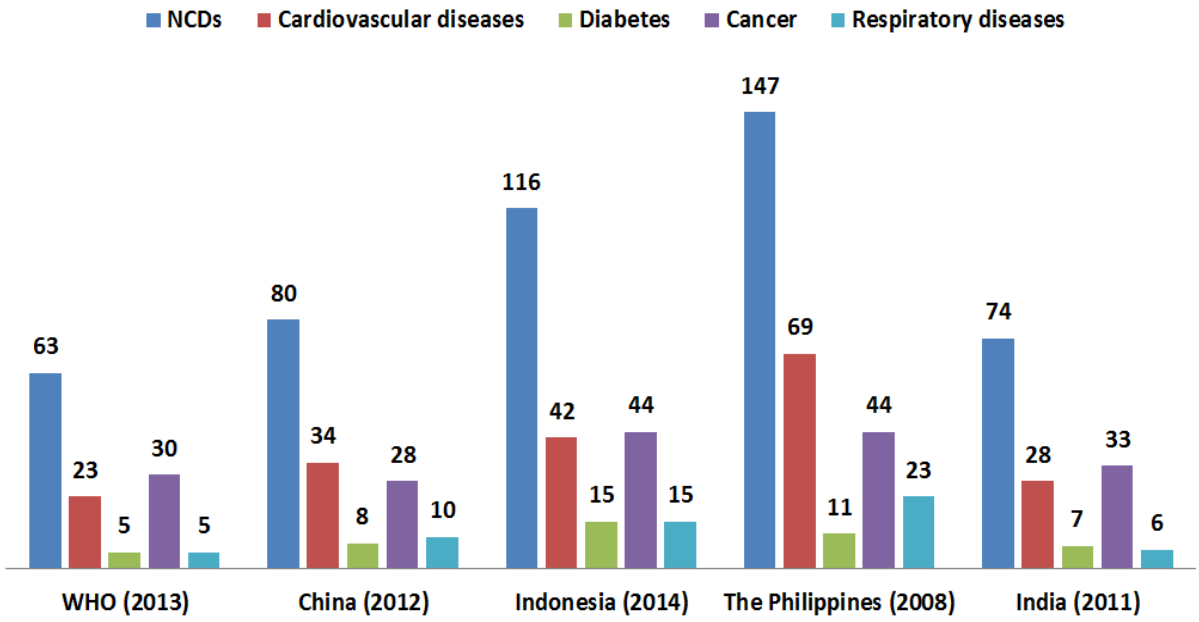
Table 3.2.1 | **Comparison of oral anti-diabetic drugs in selected countries**

	WHO (2013)	China (2012)	Indonesia (2014)	The Philippines (2008)	India (2011)
Acarbose		✓	✓	✓	
Chlorpropamide			✓	✓	
Glibenclamide		✓	✓	✓	
Gliclazide	✓		✓	✓	✓
Glimepiride		✓	✓		
Glipizide		✓	✓	✓	
Gliquidone			✓		

	WHO (2013)	China (2012)	Indonesia (2014)	The Philippines (2008)	India (2011)
Glucagon	✓			✓	✓
Glyburide		✓			
Metformin	✓	✓	✓	✓	✓
Pioglitazone			✓		
Rosiglitazone				✓	

Source: IMS, 2015.

Figure 3.2.2 | Comparison of the number of NCD medicines in the essential medicines list



Source: IMS, 2015.

Figure 3.2.2 shows comparison of the number of NCD medicines in country EML in selected countries. The number of CVD and cancer medicines was the highest in the EML across countries. The four selected countries included higher numbers of CVD medicines and diabetes compared to the WHO EML.

Along with the WHO EML, attention on the potential of the use of HTA for optimizing cost-effectiveness in the medicines list has been paid. HTA has been introduced and used in many high-income countries. Several middle income countries, including Malaysia, Colombia, and Thailand have also established HTA systems. HTA can be useful for providing evidence base for selection and

reimbursement decisions on medicines(Li, Hernandez-Villafuerte et al. 2016). In Thailand, HTA has been introduced in 2007 and used as a tool for implementing policies for selection and reimbursement decisions on essential medicines and technologies. The HTA has contributed to providing evidence to support decision-making on the inclusion of medicines in the national EML and on the reimbursement list, using price quotations from manufacturers and marketers of medicines as an input for HTA and a trigger for pricing interventions to ensure the affordability of essential medicines, and serving as an input for budgetary impact consideration(Wirtz, Hogerzeil et al. 2017).

In many LMICs, ensuring comprehensive benefit coverage to all people without suffering financial hardship due to high OOP for NCD medicines has not yet been achieved(Bloom, Chatterji et al. 2015; Beran, Ewen et al. 2016). Expanding benefit coverage for NCD medicines should be a priority to improve availability and affordability of NCD medicines.

In Brazil, with increasing focuses on approaches to improving management of NCD, particularly diabetes and hypertension, the Farmacia Popular program was launched in 2004, aiming for improving quality use of medicines through dealing with shortages of medicines in the public sector and high medicines prices in the private sector. In 2011, this program covered diabetes and hypertension medicines to provide prescribed medicines to patients free of charge in both the public and private sectors. The number of private pharmacies participating in the program increased from 2,955 in 2006 to 25,200 in 2013, while the number of public sector pharmacies increased from 259 to 558 over the period; including the private retail pharmacies in the program led to improvement of access to affordable medicines(Wirtz, Hogerzeil et al. 2017).

In Thailand, expanding benefit coverage and population coverage through the insurance scheme contributed to improving availability and affordability of NCD medicines. Since the achievement of UHC in 2011 through 30-baht schemes funded by taxes, the drug benefit packages were based on the national EML and can be reimbursed without co-payment for basic essential medicines including NCD medicines(Yoongthong, Hu et al. 2012).

Exemption or reduction of co-payments for NCD should be properly in place in the co-payment systems to improve access to affordable NCD medicines. Ceiling on OOP can contribute to financial protection due to services for NCD treatment. However, there is much room for improvement in establishing and implementing the exemption/reduction of co-payment systems in LMICs.

3. Pharmaceutical policies for cost containment

Pricing policies on ex-factory prices, duties, taxes, mark-ups, and so on affect the affordability of NCD medicines significantly. WHO recommends a wide range of medicines pricing policy to deal with financial burdens of NCD medicines including reimbursement limits and co-payments, internal and external reference pricing, decreasing sales taxes and tariffs on medicines, improved regulation on ex-factory prices, regulating distribution price controls, etc(Beran, Ewen et al. 2016; Wirtz, Hogerzeil et al. 2017).

Table 3.3.1 shows indications of internal and external reference pricing in selected countries in Asia and the Pacific. Indonesia, Korea, and Mongolia do not apply internal reference pricing; Indonesia and Mongolia do not employ external reference pricing for medicines(World Health Organization 2018). Indonesia uses cost plus pricing to set a price ceiling on the retail price at 40% of the wholesale price(Verghese, Barrenetxea et al. 2019). In Mongolia, medicines procured and sold at private pharmacies are supplied by wholesale companies with free pricing; there is no pricing control mechanism by the Government(Dorj, Sunderland et al. 2017).

Table 3.3.1 | Internal and external reference pricing in selected countries

	Internal reference pricing	External reference pricing
Cambodia	✓	✓
China	✓	✓
Indonesia		
Korea		✓
Lao PDR	✓	✓
Malaysia	✓	✓
Mongolia		
Philippine	✓	✓
Thailand	✓	✓
Viet Nam	✓	✓

Source: WHO Regional office for the Western Pacific, 2018.

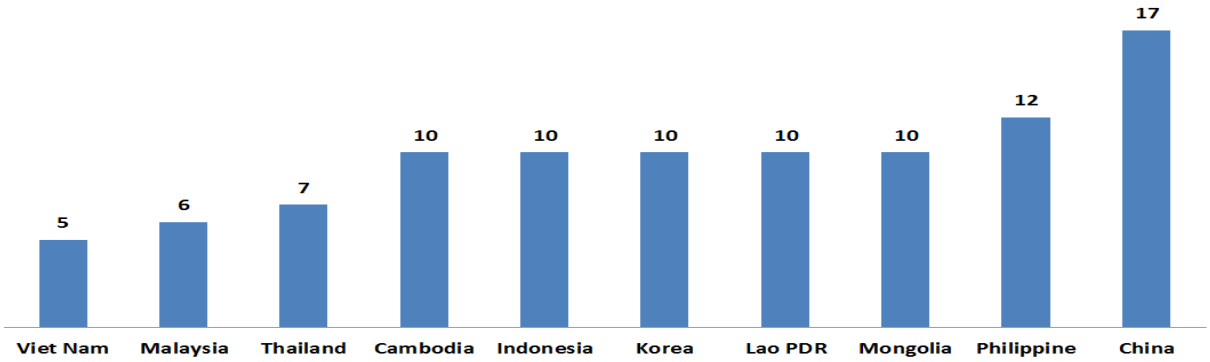
Medicines prices can be decreased by removing duties and taxes and regulating mark-ups on medicines. Tariffs may increase medicines costs by increasing the final price of essential NCD medicines. Reduction of tariffs may enhance purchasing power for the public payer if sales taxes and other price components are controlled, leading to improving availability and affordability of essential medicines. Global trend of import tariffs has been to reduce or eliminate tariffs; however, some countries, such as China, India, and Brazil, where they have established pharmaceutical industries,

continue to impose tariffs to protect local industry and raise revenue(Warren Kaplan 2016).

Based on the United Nations Conference on Trade and Development World Integrated Trade Solution website, the majority of countries have no import tariffs on retail insulin. The share of countries without tariffs increased from 52% in 2004 to 77% in 2013. The average global weighted import tariffs decreased from less than 3.5% in 2004 to 1.9% in 2013. The global average of the weighted retail insulin has been consistently less than that of the total class of pharmaceuticals from 2004 to 2013. In 2013, the highest import tariffs were imposed in most countries from Latin America (Argentina, Brazil, Paraguay, and Uruguay), with more than 10% of import tariffs on retail insulin(Warren Kaplan 2016; Beran, Ewen et al. 2017).

Many countries still impose VAT and other taxes on medicines. Given the fact that these taxes can be considered a tax on the sick, these taxes should be removed. VAT on insulin were in range of 0-24% with average VAT levels of 8.3% in OECD countries (0-25%); 4.6% in non-OECD high-income countries (0-21%); 7% in both upper-(0-24%) and lower-middle income countries (0-20%); and 7% in low-income countries (0-18%)(Warren Kaplan 2016; Beran, Ewen et al. 2017). In Viet Nam, 5% import duties and 5% VAT were imposed on medicines in the public and private sectors(Beran, Binh et al. 2009). VAT on medicines were imposed 5% in Viet Nam, 17% in China, 10% in Indonesia, 7% in Thailand, and 10% in Korea(World Health Organization 2018).

Figure 3.3.1 | **Value-added taxes on medicines in selected countries (%)**



Source: WHO Regional office for the Western Pacific, 2018.

The cumulative effect of taxes and mark-ups added to the selling prices can be substantial(Beran, Ewen et al. 2016). For the 11 selected countries (China-Shandong, El Salvador, Ethiopia, India, Malaysia, Mali, Mongolia, Morocco, Uganda, Tanzania, Pakistan), whole sale mark-ups were in range

of 2% in Pakistan and a combined mark-up by wholesalers, importers, and distributors of 380% in El Salvador; retail mark-ups were in range of 10% in Mongolia and 552% in El Salvador. Different mark-ups were generally imposed on originator and generics medicines, with higher mark-ups for generics (regressive mark-up schemes). In China (Shandong), total cumulative mark-up was 24-35% in the public sector and 11-33% in the private sector in 2007; in Malaysia, 19-46% in the public sector and 65-149% in the private sector; in Mongolia, 32% in the public sector and 68-98% in the private sector(Cameron, Ewen et al. 2009).

In China, in 2009, the Government introduced an essential medicines program for public primary health facilities to ensure access to safe, effective, and affordable medicines. Along with it, a zero-profit drug policy was introduced to remove the mark-up for sale of medicines, aiming for reducing the incentives for providers to prescribe unnecessary medicines and reduce prices for medicines. The zero mark-up policy eliminated the market between wholesale and retail prices of essential medicines at public health facilities in primary care. After the zero mark-up polices, the availability of essential medicines decreased from 2010 and 2012, in particular, in primary hospitals (from 27.4% to 22.3% for lowest-priced generics). However, expenditure per outpatient prescription was decreased in all the national EML and some non-national EML areas(Mao Wenhui 2015). For example, the drug cost per visits dropped by 4.5 USD for outpatient services and 45.8 USD for inpatient services, and the proportion of drug expense in the total expense per visit reduced by 11.7% in outpatient visits and by 3.9% in inpatient visits in county hospitals in western rural China over the period between 2010 and 2011(Zhou, Su et al. 2015).

Increased use of generic medicines could improve affordability of NCD medicines. Policies to promote generics include INN prescription for providers, generic substitution policies for pharmacists, procurement and reimbursement decisions on generic use, and so on. Pro-generic policies may lead to considerable cost savings(Hogerzeil, Liberman et al. 2013; Wirtz, Hogerzeil et al. 2017). In China, hospital purchasers could save about 1.4 billion (2014 USD) and 2.8 billion (2014 USD)through switching from originator antihypertensives and antidiabetics to locally produced generic equivalents, respectively(Sun, Ren et al. 2016). In France, implementation of a generic substitution policy saved about 2 billion USD in 2008(Hogerzeil, Liberman et al. 2013).

However, policies to promote generics have not made much progress. INN prescribing is mandatory in Indonesia, Mongolia, Nepal, and Sri Lanka. Few countries in the Asia-Pacific region apply generic substitution policy. Generic substitution by pharmacists is voluntary in China and Fiji; generic substitution by pharmacists is not allowed in India(International Pharmaceutical Federation 2017).

IV. Case studies: Viet Nam, China, Indonesia, Thailand, and Korea

1. Introduction

World Bank classifies countries by their income level into four categories: high income countries, upper-middle income countries, lower-middle income countries and low income countries. In 2016, World Bank classified Korea as a high income country, China and Thailand as upper-middle income countries, and Viet Nam and Indonesia as lower-middle income countries. In 2016, Korea's GDP per capita was $36,957. The GDP per capita of the two upper-middle income countries – Thailand and China – were $17,110 and $15,285, respectively. The GDP per capita of the two lower-middle income countries – Indonesia and Vietnam – were $11,609 and $6,296, respectively(WorldBank 2019).

Table 4.1.1 | **General characteristics in the case countries, 2016**

	Viet Nam	China	Indonesia	Thailand	Korea
Country classifications by income level	lower-middle	upper-middle	lower-middle	upper-middle	high income
GDP per capita (USD PPP)	6,296	15,285	11,609	17,110	36,957
Total population (million)	94	1,379	262	69	51
Life expectancy at birth	76	76	69	75	82
65+ years old % of total population	6.9	10.1	5.2	11.0	13.4
Age dependency ratio, old (% of working-age population)	9.9	14.0	7.7	15.3	18.4

Source: World Bank, 2019.

Such indicators like proportion of the elderly population, age dependency ratio, and the prevalence of the non-communicable diseases can illustrate the status of aging in Asian countries. World's most populous country – China – has total population of 1,379 million with life expectancy at birth of 76 years. The next populous country among these five countries is Indonesia. The total population of Indonesia is 262 million and their life expectancy at birth is 69 years. On the other hand, the total population of Viet Nam and Thailand are 94 million and 69 million. Their life expectancy at birth is 76

years and 75 years old, respectively. The least populous country among these countries is Korea. The total population of Korea is 51 million and their life expectancy at birth is 82 years old(WorldBank 2019). Noticeably, life expectancy at birth of high income country is higher than lower income countries. The proportion of elderly population is highest in Korea with 13.4%. Next are Thailand and China with 11.0% and 10.1%. Viet Nam has 6.9% of elderly population. Indonesia has the least proportion of the elderly population with 5.2%(WorldBank 2019). Since life expectancy at birth of high income country is higher, the proportion of elderly population is also generally higher in the higher income countries than lower income countries. The age dependency ratio of elderly population to productive age population is the highest among the five countries - the ratio in Korea is 18.4%. After Korea, Thailand and China also have high ratios. The ratios are 15.3% and 14.0% in Thailand and in China, respectively. On the other hand, the ratio in Viet Nam is 9.9%, and 7.7% in Indonesia(WorldBank 2019).

Table 4.1.2 | **Non-communicable diseases in the case countries, 2016**

	Viet Nam	China	Indonesia	Thailand	Korea
NCD % total causes of death	77	89	73	74	80
CVDs % NCD	31	43	35	23	23
Diabetes % NCD	4	2	6	4	4
Diabetes prevalence (2017) (% of population aged 20 to 79)	6.0	9.7	6.3	7.0	6.8

Note: NCD stands for non-communicable diseases; CVDs, cardiovascular diseases.
Source: WHO, 2018; World Bank, 2019.

77% of total deaths in Viet Nam are caused by non-communicable diseases. Of all non-communicable diseases 31% are cardiovascular diseases and 4% are diabetes. 89% of total deaths in China are caused by non-communicable diseases. Of all non-communicable diseases, 43% are cardiovascular diseases and 2% are diabetes. 73% of total deaths in Indonesia are caused by non-communicable diseases. Of all non-communicable diseases, 35% are cardiovascular diseases and 6% are diabetes. 74% of total deaths in Thailand are caused by non-communicable diseases. Of all non-communicable diseases, 23% are cardiovascular diseases and 4% are diabetes. 84% of total deaths in Korea are caused by non-communicable diseases. The diabetes prevalence among population aged 20 to 79 years old is 6.0% in Viet Nam, 9.7% in China, 6.3% in Indonesia, 7.0% in Thailand, and 6.8% in Korea(WorldBank 2019).

2. Viet Nam

2.1. General characteristics of the health system

The current health expenditure (CHE) per capita is $356, which is 5.7% of GDP in 2016(WorldBank 2019). The financing scheme of Viet Nam consists of 44.6% of out-of-pocket expenditure, 22.3% of insurance contribution, 27.0% of general taxation, and 6.1% of other private expenditure(WHO 2019). On the other hand, pharmaceutical expenditure per capita is $124. Pharmaceutical expenditure is 33.2% of CHE and is 2.3% of GDP in 2016(OECD/WHO 2016).

Table 4.2.1 | **General characteristics of the health system in Viet Nam, 2016**

Indicators	Figures
Current health expenditure (CHE) per capita(USD PPP)	356
Current health expenditure (CHE) % GDP	5.7
Out-of-pocket (OOP) % CHE	44.6
Insurance contribution % CHE	22.3
General taxation % CHE	27.0
Other private % CHE	6.1
Pharmaceutical expenditure per capita (USD PPP)	124
Pharmaceutical expenditure % CHE	33.2
Pharmaceutical expenditure % GDP	2.3

Source: WHO, 2019; World Bank, 2019; OECD/WHO, 2016.

The first compulsory health insurance was created in 1992. The insurance covered salaried employers. The contribution rate was 3% of their salaries, which was paid by 2% from employers and 1% by employees. In 2008, the Health Insurance Law was passed and it stipulated the insurance to cover up to 80% to 100% of the cost of health care services and medicines(Nguyen 2011).

However, the coverage rates of health insurance differ depending on the beneficiaries' employment status. In 2011, the enrolment rate into health insurance of formal workers is 56%, while the enrolment rate of informal workers is only 19%. As the current health insurance scheme has been pooled into a single system called a Social Health Insurance (SHI), the benefit packages for both formal and informal workers are the same. However, the coverage rates of health insurance between self-employed workers and employed workers are different because the previous system used to divide beneficiaries into different groups depending on their employment status. As the insurance scheme inherited the older system, different sub-schemes exist within the single insurance scheme. Formal workers register through the compulsory scheme, while informal workers have the option of joining through a voluntary scheme. Formal workers get their insurance coverage through their employers. Formal workers have to pay one third of their insurance premiums, and two thirds of

health insurance premiums are paid by their employers out of the payroll. On the other hand, informal workers have to pay their premium out-of-pocket at a local insurance agency(Le, Groot et al. 2019).

2.2. Availability and affordability of NCD medicines

One example that shows the availability and affordability of NCD medicines in Viet Nam is the study performed by Wang, Sun et al.(2017). They performed an analysis on the availability and affordability of 15 selected essential medicines for chronic diseases in the Asia Pacific Region. The data used in this study are the medicine prices and availability data from the Health Action International (HAI) global database. The 15 medicines included in this research were Captopril (Cardiovascular diseases), Atenolol (Cardiovascular diseases), Nifedipine retard (Cardiovascular diseases), Hydrochlorothiazide (Cardiovascular diseases), Losartan (Cardiovascular diseases), Amitriptyline (Neuropsychiatric diseases), Carbamazepine (Neuropsychiatric diseases), Phenytoin (Neuropsychiatric diseases), Fluoxetine (Neuropsychiatric diseases), Glibenclamide (Diabetes), Metformin (Diabetes), Beclometasone inhaler (Respiratory diseases), Salbutamol inhaler (Respiratory diseases), Omeprazole (Gastric ulcer), and Ranitidine (Gastric ulcer) . These selected medicines for the study are the essential medicines used to treat cardiovascular diseases, diabetes, chronic respiratory diseases, gastric ulcer, and neuropsychiatric diseases. Most of these medicines are included in the Essential Medicines List (EML) of the WHO or in the EML of most of the Asia Pacific Region countries. Wang, Sun et al. expressed the affordability of the medicines as ratio of a medicine's median price to a median international reference price (IRP). Furthermore, affordability of the NCD medicines was assessed in term of the number of days' wages needed by the lowest-paid unskilled government worker to purchase a month's treatment for the disease(Wang, Sun et al. 2017).

According to the study of Wang, Sun et al., the availability of the NCD medicines in the public sector was lower than the availability of the NCD medicines in the private sector, and generics were more widely available than originator brands in both public and private sectors. In terms of the availability of NCD medicines, the median availability of originator brand is 12.1% in the public sector and is 27.3% in the private sector. On the other hand, the median availability of lowest-price generics is 21.2% in the public sector and is 54.5% in the private sector.

In terms of the price of NCD medicines, Viet Nam had to pay 2.49 times the IRP to procure lowest-price generics, and 11.41 times the IRP to procure innovative brands. The median price ratio of originator brands is 33.74 in the public sector and 32.36 in the private sector. The median price ratio of lowest-price generics is 8.59 in the public sector and 5.47 in the private sector. In terms of the affordability of NCD medicines, 1.6 day's wages is required to purchase originator brands in the public sector, and 1.4 day's wages in the private sector. Furthermore, 0.3 day's wages is required to purchase lowest-price generics in the public sector, and 0.2 day's wages in the private sector(Wang, Sun et al. 2017).

Another example that shows the availability and affordability of NCD medicines in Viet Nam is the study performed by Nguyen, Knight et al.(2009). They used the same data source and methods, but with different medicine list. They included 42 medicines – 25 core medicines included by WHO/HAI, and 17 supplementary medicines. The 42 medicines included Atenolol (high blood pressure), Captopril (hypertension), Glibenclamide (diabetes), Hydrochlorothiazide (high blood pressure), Losartan (high blood pressure), Lovastatin (cardiovascular disease), Metformin (diabetes), Nifedipine (hypertension, angina), Digoxin (atrial fibrillation, atrial flutter, heart failure), Enalapril (high blood pressure, diabetic kidney disease, heart failure), Furosemide (heart failure, liver scarring, kidney disease, high blood pressure), Gliclazide (diabetes), Nifedipine (hypertension, angina), and other medicines for infectious diseases(Nguyen, Knight et al. 2009).

In terms of the availability of NCD medicines, lowest-price generics overall had higher availability than originator brands. The mean availability of originator brands was 19.6%; the mean availability of lowest-price generics was 33.6%(Nguyen, Knight et al. 2009).

In terms of the price of NCD medicines, public procurement price was 8.29 times the IRPs for 23 originator brands. Furthermore, the public procurement price was 1.82 times the IRPs for 33 lowest-price generics. While the prices across the originator brands were stable, prices across the lowest-price generics varied. In addition, originator brands were 5.6 times more expensive than lowest-price generics in the private sector(Nguyen, Knight et al. 2009).

2.3. Procurement policies and essential medicine lists

Public hospitals in Viet Nam purchase medicines using a tendering system. The Ministry of Health periodically announces the price ceiling of tendered medicine prices in order to control the medicine price(Nguyen 2011). The medicine supply system involves many intermediaries between

manufacturers and consumers. In Viet Nam, there are 180 domestic pharmaceutical manufacturers, 90 importers, 800 domestic wholesalers/distributors, 3 foreign direct investment enterprises investing in drug logistics, 438 foreign pharmaceutical companies, 39,172 retail medicine outlets, 13,460 public healthcare facilities, 74 private hospitals and more than 30,000 private health clinics(Nguyen, Vitry et al. 2017).

The current Essential Medicine Lists (EMLs) is established in 2013 by the Government, containing 466 essential medicines. However, EMLs were not used as the basis for pharmaceutical procurement, reimbursement, and prescribing. Hence, the Government developed alternative expanded lists of main medicines. The current main western medicines lists, which was established in 2011, contains 957 essential medicines(Nguyen, Vitry et al. 2017).

2.4. Pharmaceutical policies for NCD

2.4.1. Pricing policies

Due to the rapid increment of medicine price, the Vietnamese Government in 2003 tried to stabilize the price by making the medicine price more transparent. Wholesalers and retailers are required to publish the price online and they are not allowed to sell the medicines at higher price(Nguyen 2011). As one of the pricing policies, Viet Nam uses external price referencing called 'International Comparison Systems'. The system compares price of medicines in Viet Nam to that of other comparable countries in order to ensure that the prices of medicines in Viet Nam are reasonable. However, the Viet Nam laws do not explicitly specify the type of prices to be compared(Nguyen 2011). In fact, when individuals purchase their medicines, they pay a minimum of 18–49% more than when the medicines arrive in the country due to different mark-ups along the supply chain(Beran, Ewen et al. 2018).

Although health economics research existed since the 1990s, economic evaluations are still limited. However, awareness of HTA as a tool for priority setting is rising. Hence, the Ministry of Health appointed the Vietnamese Health System and Policy Institute (HSPI) as the national HTA institute(Tantivess, Chalkidou et al. 2017).

2.4.2. Policies for generics

Viet Nam's National Medicine Policy, which was adopted in 1996, did not include generic medicine policy. Finally in 2009, Vietnamese Ministry of Health and WHO signed an Aide Memoire on Strategic Collaboration in Pharmaceuticals to develop policies to boost the use of generic medicines(Nguyen, Hassali et al. 2013). Furthermore, in 2014, the government initiated a plan to develop generic medicines production in Viet Nam by 2030. However, generic medicine policy has not been implemented yet(Nguyen, Vitry et al. 2017).

3. China

3.1. General characteristics of the health system

The current health expenditure (CHE) per capita is $761, which is 5.0% of GDP in 2016(WorldBank 2019). The financing scheme of China consists of 35.9% of out-of-pocket expenditure, 38.7% of insurance contribution, 19.4% of general taxation, and 6.1% of other private expenditure(WHO 2019). Pharmaceutical expenditure per capita is $288. Pharmaceutical expenditure is 39.4% of CHE and is 2.2% of GDP(OECD/WHO 2016).

Table 4.3.1 | **General characteristics of health system in China, 2016**

Indicators	Figures
Current health expenditure (CHE) per capita(USD PPP)	761
Current health expenditure (CHE) % GDP	5.0
Out-of-pocket (OOP) % CHE	35.9
Insurance contribution % CHE	38.7
General taxation % CHE	19.4
Other private % CHE	6.1
Pharmaceutical expenditure per capita (USD PPP)	288
Pharmaceutical expenditure % CHE	39.4
Pharmaceutical expenditure % GDP	2.2

Source: WHO, 2019; World Bank, 2019; OECD/WHO, 2016.

The National Health and Family Planning Commission is in charge of the health system in China. The health scheme is financed from public, social, private insurance, and out-of-pocket payments. Although many hospitals are still owned by the government, not all services are paid by the government(Wang and Zhu 2016). The three principal medical insurance schemes are the Urban Employee Basic Medical Insurance (UEBMI), the Urban Resident Basic Medical Insurance (URBMI), and the New Rural Cooperative Medical Scheme (NRCMS). Other supplementary schemes include

the Enterprise Supplementary Medical Insurance, the Commercial Health Insurance, the Civil Servants Medical Subsidy, and the Medical Security, for specific groups(Ngorsuraches, Meng et al. 2012).

The main Chinese health insurance – the Basic Medical Security – covers working and non-working urban population, rural population, and people suffering from economic difficulties. In 2015, about 1.3 billion urban and rural population were insured by the Basic Medical Security(Fang 2017). More specifically, 274.16 million people – about 37.5% of the urban residents – were enrolled in the UEBMI. In addition, 299.06 million people – about 40.9% of the urban residents – were enrolled in the URBMI. Lastly, 0.8 billion people – about 98.7% of the rural residents – were enrolled in the NRCMS in 2013(Su, Zhou et al. 2018).

UEBMI, a compulsory scheme, was initiated in 1998 for the formal workers living in the urban area. UEBMI is financed by payroll taxes of 6% from employers and 2% from the employees. UEBMI provides inpatient care by a pooled fund, while it provides outpatient care from the Individual Account. URBMI, a voluntary scheme, was established in 2007 for the rest of urban residents. It covers informal workers, children, students, elderly, and unemployed people in urban areas. URBMI provides inpatient care by the Social Pooling Account, and it provides outpatient care from the Household Account. The financing source of URBMI is insured residents and local government. In 2013, the average per capita financing support of URBMI was US$ 61.3(RMB 380), of which US$19.4(RMB 120) was charged to the insurers. Lastly, NRCMS, a voluntary scheme, was established in 2003 for the rural residents. Same as URBMI, NRCMS provides inpatient care by the Social Pooling Account, and it provides outpatient care from the Household Account. In 2013, the average per capita financing support of NRCMS was US$ 59.7 (RMB 370), of which US$14.5 (RMB 90) was charged to the insurers(Su, Zhou et al. 2018).

3.2. Availability and affordability of NCD medicines

The Chinese Government plans to achieve universal access to health care by 2020. One of the key policy is to ensure drug safety, quality, and affordability(Fang 2017). One example that shows the availability and affordability of NCD medicines in China is the study performed by Wang, Sun et al.(2017). According to the study of Wang, Sun et al.(2017), the availability of the NCD medicines in the public sector was lower than the availability of the NCD medicines in the private sector, and generics were more widely available than originator brands in both the public and private sectors.

The median availability of originator brand is 3.3% in the public sector and is 10.0% in the private sector. In addition, the median availability of lowest-price generics is 6.7% in the public sector and is 11.7% in the private sector(Wang, Sun et al. 2017).

In terms of the price of NCD medicines, China only pays 1.26 times the IRP to procure lowest-price generics. However, China had to pay 9.08 times the IRP to procure innovative brands. The median price ratio of originator brands is 20.20 in the public sector and 13.84 in the private sector. The median price ratio of lowest-price generics is 1.81 in the public sector and 0.92 in the private sector. In terms of the affordability of NCD medicines, 5.0 day's wages is required to purchase originator brands in the public sector, and 2.3 day's wages in the private sector. Furthermore, 0.4 day's wages is required to purchase lowest-price generics in the public sector, and 0.3 day's wages in the private sector(Wang, Sun et al. 2017).

3.3. Procurement policies and essential medicine lists

The health service delivery system in China includes county hospitals, community health organizations, township health centres and village clinics. Since 2012, county-level hospitals are under public healthcare facilities reforms. These hospitals used to highly depend on medicine sales while their services were undervalued (Fang 2017).

A centralized medicine procurement system was introduced in 2010 by the tendering system. The system consists of two parts. In the first part, technical proficiencies and volume capabilities of manufacturers were carefully reviewed. In the second part, of those manufacturers which passed the first part, a manufacturer with lowest price bid win the contract. After the reform in 2010, the price of essential medicines decreased by 16.9% from 2009 to 2011(Barber, Huang et al. 2013).

However, as the economic system changed, the government reformed pharmaceutical procurement system again. A new public medicine procurement policy (NPMPP) was initiated in 2015(Hu, Chen et al. 2019). It used to be a centrally controlled supply system, but it is changed into a market-oriented system. The pharmaceuticals only could sell medicines to wholesalers in the former system. But they can also sell medicines directly to hospitals. After the reform, domestic pharmaceutical production grew, and many imported medicines began to enter the domestic market(Fang 2017). Hu, Chen et al.(2019) assessed the effects on medicine price after the introduction of NPMPP. Their research showed that while the price growth rate of emergency medicines and gynaecological medicines

increased statistically significantly, the price growth rate of paediatrics decreased statistically significantly(Hu, Chen et al. 2019).

The National Basic Medical Insurance Drug Formulary List, developed by the Ministry of Human Resources and Social Security, is the primary reimbursement formulary in China. The positive reimbursement list is divided into two classes. Generally, class A includes essential and cheaper drugs. On the other hand, class B includes optional and more expensive drugs. Class B drugs have co-payments by the users. The development of the drug formulary consists of the six steps. The first step is the clinical benefit and safety assessment. Next, pharmacoeconomic evaluation and budget impact are analysed. Thirdly, professional groups review and form the preliminary list. In the fourth step, more than 2,000 experts involves in the national and provincial level voting. Then consultation experts suggest some reimbursement limitations. Lastly, the ministry approves the drug formulary(Ngorsuraches, Meng et al. 2012).

Furthermore, the essential drug lists in China covers 520 molecules, consisted by 317 Western medicines and 203 traditional Chinese medicines(Fang 2017). The number of traditional medicines increased from 102 in 2009 to 203 in 2012(Aitken 2015). The Ministry of Health is responsible for the creating the national essential medicine list. The Ministry of Health should form a committee consisting of experts from different fields, such as medicine, pharmaceutical economics, pharmacy, health insurance, and pricing. The committee is divided into two groups - a consult group and a review group. In order to create the national essential medicine list, the consult group first proposes candidate lists. The review group then votes on the candidate list and decides the draft list. The draft list is then reviewed by government departments before the final approval(Aitken 2015).

Recently, Chinese government puts emphasis on evidence-based assessment and pharmaco-economic evidence to adjust the essential medicine list and drug reimbursement list. Although use of HTA in policy making is not widespread yet in China, it demonstrates that policymakers are recognizing the importance of HTA(Wang and Zhu 2016). Using pharmaacroeconomic analysis, Chinese HTA program compares the benefits and costs of medicines, and analyses the impact on the medical insurance. After the examination, the experts suggests for payment limitation to some expensive medicines(Ngorsuraches, Meng et al. 2012).

The history of first HTA institutions goes back to the 1990's. The Chinese Ministry of Health, with the support of World Bank and WHO, established four HTA institutions: State Key Lab of HTA in Fudan University, Appraising Center of Biomedical Engineering Technology in Zhejiang University, Medical

Ethic Evaluation center in Peking University, and Chinese Evidence-based Medicine Center in Sichuan University. Recently, China National Health Development Research Center coorperated with England's National Institute for Health and Clinical Excellence (NICE) to reform the payment system using HTA (Wang and Zhu 2016).

3.4. Pharmaceutical policies for NCD

3.4.1. Pricing policies

The price of medicine is determined by the tendering system for the generic drugs, and by the direct negotiation for the patent drugs. After the tendering system, hospitals and manufacturers starts a secondary negotiation to finalize the actual medicine volumes and the actual medicine price. Finally, hospitals obtain 15% mark-up by prescribing and dispensing medicine to patients(Mossialos, Ge et al. 2016).

There has been argues that hospitals have economic incentives to lead patients to prescribe more drugs in quantity and more expensive drugs. Hence, in 2014, the government pushed a reform and restricted around 2,000 county-level hospitals not to increase mark-up on drug prices. On the other hand, zero mark-up was introduced in public health institutions in 2011. Almost all primary care facilities implemented zero mark-up. In 2015, all country-level hospitals and urban pilot hospitals also implemented zero mark-up. All urban hospitals were commended by the State Council to implement zero mark-up by 2017(Fang 2017).

3.4.2. Policies for generics

There are more than 10,000 types of generic drugs in China, and the market share of generics account for 85%(Fang 2017). Generic medicines, usually 20% to 90% cheaper than the innovative medicines, can reduce the increasing health expenditure. For example, switching four medicine's procurement from innovative medicines to generics medicine can potentially save US $370 million(Hassali, Alrasheedy et al. 2014). The Chinese government, however, does not have a national policy to boost the use of generic medicines. Yet, the government do have policy to improve the quality of generic medicines. In 2012, the China Food and Drug Administration announced the goal of elimination of generic drugs which fail the quality evaluation(Fang 2017).

4. Indonesia

4.1. General characteristics of the health system

The current health expenditure (CHE) per capita is $363, which is 3.1% of GDP in 2016(WorldBank 2019). The financing scheme of Indonesia consists of 37.3% of out-of-pocket expenditure, 18.5% of insurance contribution, 26.8% of general taxation, and 17.4% of other private expenditure(WHO 2019). Pharmaceutical expenditure per capita is $104. Pharmaceutical expenditure is 34.7% of CHE and is 1.2% of GDP(OECD/WHO 2016).

Table 4.4.1 | General characteristics of health system in Indonesia, 2016

Indicators	Figures
Current health expenditure (CHE) per capita(USD PPP)	363
Current health expenditure (CHE) % GDP	3.1
Out-of-pocket (OOP) % CHE	37.3
Insurance contribution % CHE	18.5
General taxation % CHE	26.8
Other private % CHE	17.4
Pharmaceutical expenditure per capita (USD PPP)	104
Pharmaceutical expenditure % CHE	34.7
Pharmaceutical expenditure % GDP	1.2

Source: WHO, 2019; World Bank, 2019; OECD/WHO, 2016.

In 2014, a huge difference was made in Indonesia's health insurance scheme. Indonesia's health insurance scheme was separated into several schemes until the merger in 2014. The biggest three social health insurances were Asuransi Kesehatan(Askes), Jaminan Kesehatan Masyarakat(Jamkesmas), and Jaminan Sosial Tenaga Kerja(Jamsostek). While Askes is a mandatory social health insurance for civil servants and the military, Jamkesmas is voluntary insurance for poor and near poor, and Jamsostek is a social security program for laborers and their dependents(Wasir, Irawati et al. 2019). Each of them had separate benefit packages(Aizawa 2019).

Among the three insurance schemes, Askes was established first in 1968. In 1992, Jamsostek was established, and Jamkesmas was established in 2005. Askes provided both inpatient and outpatient services, but only through public health care providers. Jamsostek, on the other hands, provided through public and private providers; however, such catastrophic health care service like cancer treatment and heart surgeries were not covered. Jamkesmas provided benefit packages through

public providers. The insurance was a non-contributory premium policy and insured people were not required to pay any premium(Aizawa 2019).

In 2014, the government merged pre-existing insurance schemes and introduced Jaminan Kesehatan Nasional–Kartu Indonesia Sehat (JKN-KIS). JKN-KIS is managed by Indonesia's National Healthcare Security Agency, namely Badan Penyelenggara Jaminan Sosial–Kesehatan (BPJS-Kesehatan)(Wasir, Irawati et al. 2019). JKN-KIS is continuously expanding the access to healthcare by providing subsidized health insurance scheme for the very poor. JKN-KIS is designed to achieve UHC by the end of 2019. By the time JKN-KIS achieves the UHC, JKN-KIS would be the largest single payer healthcare system in the world(Fossati 2017).

4.2. Availability and affordability of NCD medicines

In Indonesia, the availability of the NCD medicines in the public sector was lower than the availability of the NCD medicines in the private sector, and generics were more widely available than originator brands in both the public and private sectors. In terms of the availability of NCD medicines, the median availability of originator brand is 1.8% in the public sector and is 16.4% in the private sector. Furthermore, the median availability of lowest-price generics is 60.1% in the public sector and is 52.4% in the private sector(Wang, Sun et al. 2017).

As with the price of NCD medicines, Indonesia had to pay 1.13 times the IRP to procure lowest-price generics. The patient prices were lower in the public sector than in the private sector. The median price ratio of originator brands is 16.50 in the public sector and 150.03 in the private sector. The median price ratio of lowest-price generics is 3.65 in the public sector and 4.17 in the private sector. In terms of the affordability of NCD medicines, 3.0 day's wages is required to purchase originator brands in the public sector, and 7.0 day's wages in the private sector. Furthermore, 0.4 day's wages is required to purchase lowest-price generics in the public sector, and 0.4 day's wages in the private sector(Wang, Sun et al. 2017).

4.3. Procurement policies and essential medicine lists

After the decentralization reform in 1999, health services were decentralized to provincial and district governments. As a result, the responsibility of planning and management of health service delivery is also decentralized from the central to local governments(Mahendradhata, Trisnantoro et

al. 2017). The health care service is delivered in local levels can be divided into provincial levels and district/municipality levels. The provincial governments operate provincial hospitals. The district/municipality governments also operate their own district/municipality hospitals. The relationship between the Ministry of Health, provincial health offices, and district/municipality health offices are not hierarchical. Each level has its own duties and authorities(Mahendradhata, Trisnantoro et al. 2017).

Public hospitals used to procure pharmaceuticals through bidding and direct contract(Mahendradhata, Trisnantoro et al. 2017). However, the introduction of JKN-KIS also influenced the delivery of health services significantly. After the government merged the health insurance schemes and introduced JKN-KIS, healthcare facilities do not perform their own tender for procuring medicines. Furthermore, the Indonesian government introduced the e-Catalogue, liked to the Government Procurement Agency of Goods/Services (LKPP) portal, in order to improve efficiency and transparency in medicine procurement (Wasir, Irawati et al. 2019). All public health facilities must procure medicines using e-Catalogue. Though the Ministry of Health claims that e-Catalogue system resulted in budget efficiency, only limited types and stocks of medicines can be accessed using e-Catalogue. Many medicines listed in the National Formulary are not still listed on the e-Catalogue (Mahendradhata, Trisnantoro et al. 2017). With an approval of the hospital's medical committee, hospitals can procure National Formulary medicines not listed in the e-Catalogue. However, the procedure takes a long time(Wasir, Irawati et al. 2019).

There are two drugs lists in the national health system. The National Essential Medicines List (DOEN) serves as the base for medicine procurement. The National Formulary (FORNAS) lists the medicines that should be available in health care facilities to be used within the JKN system. The Ministry of Health is responsible for ensuring the availability of 484 essential medicines for primary care as listed in the DOEN(Mahendradhata, Trisnantoro et al. 2017). The processes of creating list of DOEN and FORNAS are similar. An expert committee develops the list. FORNAS is an expanded version of DOEN as in that it expands into a larger list from DOEN(Aitken 2015).

Indonesia government periodically updated the national EML in every three to four years. However, the national EML had little influence in the country because both the public and private sector poorly followed the EML. Both the public and private sector used their own medicine reimbursement lists that cover more than the EML does(Holloway 2011). The problem with using their own medicine reimbursement instead of the national EML was that their medicine reimbursement lists were not

evidence based(Wasir, Irawati et al. 2019).

After the merger of the insurance scheme in 2014, the different formularies are also merged into a single National Formulary(Wasir, Irawati et al. 2019). The National Formulary Committee selects the FORNAS lists based on the treatment standards and current evidence (Mahendradhata, Trisnantoro et al. 2017). After 2014, beneficiaries of the JKN-KIS can obtain listed medicines from health care facilities without any charge. Patients need to pay out of pockets to buy the medicines not listed on the National Formulary.

4.4. Pharmaceutical policies for NCD

4.4.1. Pricing policies

The Indonesian government sets a price ceiling on the retail price of generic medicines. Furthermore, the government applies ERP for the imported brand medicines. After the policy reforms in 2010, the price of both generic and brand medicines were reduced compared to 2004(Abdel Rida, Mohamed Ibrahim et al. 2017).

4.4.2. Policies for generics

In Indonesia, the private sector dominates the pharmaceutical market with 75% of market share with 16,000 types of drugs, of which only 10% are generic drugs. Total number of pharmaceutical manufactures is 202, of which 78.2% are certified Good Manufacturing Practices. There are about 2,400 major pharmaceutical suppliers, 5,000 drug stores, and 22,000 pharmacies (apotek). However, half of the drugs in the market are sold in general stores, street vendors and supermarkets. In 2013, the total pharmaceutical expenditure is US$ 5.4 billion, of which 59% were registered drugs and 41% were over the counter drugs. The total pharmaceutical expenditure is expected decline because JKN-KIS encourages the use of generic drugs(Mahendradhata, Trisnantoro et al. 2017).

5. Thailand

5.1. General characteristics of the health system

The current health expenditure (CHE) per capita is $635, which is 3.7% of GDP in 2016(WorldBank

2019). The financing scheme of Thailand consists of 12.1% of out-of-pocket expenditure, 8.9% of insurance contribution, 66.9% of general taxation, and 12.1% of other private expenditure(WHO 2019). Pharmaceutical expenditure per capita is $333. Pharmaceutical expenditure is 35.0% of CHE and is 2.3% of GDP(OECD/WHO 2016).

Table 4.5.1 | General characteristics of health system in Thailand, 2016

Indicators	Figures
Current health expenditure (CHE) per capita(USD PPP)	635
Current health expenditure (CHE) % GDP	3.7
Out-of-pocket (OOP) % CHE	12.1
Insurance contribution % CHE	8.9
General taxation % CHE	66.9
Other private % CHE	12.1
Pharmaceutical expenditure per capita (USD PPP)	333
Pharmaceutical expenditure % CHE	35.0
Pharmaceutical expenditure % GDP	2.3

Source: WHO, 2019; World Bank, 2019; OECD/WHO, 2016.

In Thailand, there are three main insurance schemes: the Universal Coverage of Healthcare (UC) Scheme, the Civil Servant Medical Benefit Scheme (CSMBS) and the Social Security scheme (SSS). The Universal Coverage of Healthcare Scheme was introduced in 2002(Hassali, Alrasheedy et al. 2014) and about 75% of the total population are covered by this scheme. About 22% of the total population are covered by the Civil Servant Medical Benefit Scheme and the Social Security scheme. About 2% of the total population are still not covered by the health insurance. Established in 1978, the CSMBS covers all government employees, their dependents, and retirees. Established in 1990, the SSS covers employees in the private sector. Unlike the Civil Servant Medical Benefit Scheme, the Social Security Scheme only covers them. The UC Scheme covers populations who are not eligible for the Civil Servant Medical Benefit Scheme and the Social Security Scheme(Ngorsuraches, Meng et al. 2012).

As the characteristics of each scheme differ, the sources of financing differ. While the Civil Servant Medical Benefit Scheme is fully covered by general tax, the Social Security Scheme is a compulsory insurance scheme, which the source of funds comes from employees, employers, and the government. The Universal Coverage Scheme – a social welfare scheme – is primarily funded by general tax. The operators of each schemes also differ; the Civil Servant Medical Benefit Scheme by the Ministry of Finance, the Social Security Scheme by the Social Security Office, the Universal Coverage Scheme by the National Health Security Office(Ngorsuraches, Meng et al. 2012).

Their payment systems also differ. The CSMBS uses DRG for inpatient services and fee-for-service for ambulatory services. Its beneficiaries are limited to use services in public hospitals only. On the other hand, the beneficiaries of SSS can use both public and private hospitals. The payment system of SSS is capitation for both inpatient services and ambulatory services. The UC scheme uses DRG for inpatient services and capitation for ambulatory services(Ngorsuraches, Meng et al. 2012).

5.2. Availability and affordability of NCD medicines

In Thailand, the availability of the NCD medicines in the public sector was lower than the availability of the NCD medicines in the private sector, and generics were more widely available than originator brands in both the public and private sectors. The median availability of originator brand is 10.0% in the public sector and is 47.6% in the private sector(Wang, Sun et al. 2017).

For the price of NCD medicines, the median availability of lowest-price generics is 80.0% in the public sector and is 52.4% in the private sector. Thailand only had to pay 1.50 times the IRP to procure lowest-price generics. However, Thailand had to pay 5.55 times the IRP to procure innovative brands. The patient prices were lower in the public sector than in the private sector. The median price ratio of originator brands is 22.82 in the public sector and 35.19 in the private sector. The median price ratio of lowest-price generics is 8.93 in the public sector and 13.58 in the private sector. In terms of the affordability of NCD medicines, 2.2 day's wages is required to purchase originator brands in the public sector, and 1.2 day's wages in the private sector. Furthermore, 0.3 day's wages is required to purchase lowest-price generics in the public sector, and 0.4 day's wages in the private sector(Wang, Sun et al. 2017).

5.3. Procurement policies and essential medicine lists

Thailand has a decentralized medicine procurement system. Before 2017, the selection criterion in the tender was the lowest price. After the establishment of the Public Procurement Act, the selection criterion is expanded to "price-performance". Furthermore, to increase the quality and transparency, transparent documentation of hospital purchasing decisions are required(Assawamakin, Holtorf et al. 2019).

The Health Intervention and Technology Assessment Program (HITAP), known as a subsidiary research institute of Thailand's Ministry of Health, was established in 2007 to conduct HTA and

provide evidence and recommendations to decision makers. HITAP's research on cost-effectiveness analysis is used for the coverage decisions like reimbursable medicines list and benefit package of UHC scheme(Tantivess, Chalkidou et al. 2017). The role of Health Intervention Technology Assessment Program (HITAP) is to conduct economic evaluations on expensive medicines. Every year HITAP surveys various stakeholders including providers, payers, patient advocacy groups and academia to create a list of medicines to be evaluated(Ngorsuraches, Meng et al. 2012).

The process of development of the reimbursement list consists of 5 steps. First, industry submits applications. Second step is clinical benefit and safety is assessments. Third, pharmacoeconomic evaluation and budget impact are analysed. Fourth step is price negotiation. Lastly, an approval from the ministry is the final step of the process(Ngorsuraches, Meng et al. 2012).

The three insurance schemes have their own benefit package listing. The National Drug Committee, consisting of clinicians and health economists, uses health technology assessment on medicine reimbursement. The committee creates the National List of essential medicines, which works as a reimbursement list for all three schemes(Ngorsuraches, Meng et al. 2012).

The beneficiaries of all three schemes can use drugs on the National List of Essential Medicines. Furthermore, if the beneficiaries of all three schemes get authorization from a physician, they can also receive drugs not included in the list(Holloway 2012). The beneficiaries of the CSMBS have more access to the drugs that are not included on the National List of essential medicines(Holloway 2012). It is because CSMBS is based on fee-for-service system while UC and SSS are based on the capitation system.

5.4. Pharmaceutical policies for NCD

5.4.1. Pricing policies

In Thailand, HTA is one of the tools for pharmaceutical cost containment strategy. Pharmacroeconomics is used in the decision process of the National List of Essential medicine's reimbursement procedure. Results of economic evaluation are used during the medicine price negotiation with the manufacturers for National List of essential medicines(Ngorsuraches, Meng et al. 2012).

Compared to international reference prices, both generic medicines and brand medicines are

expensive in Thailand. This is because Thailand does not regulate the price of medicines in both the private and public sectors. The mark-up ranges were 28% to 41% for the brand medicines, and 20% to 285% for the generic medicines(Hassali, Alrasheedy et al. 2014).

5.4.2. Policies for generics

In some hospitals, a policy of mandatory generic substitution for inpatient was introduced. According to the evaluation of this policy, if the policy is promoted national wide, the estimated savings from the substitution from original to generic medicines is 4 million US dollar(Hassali, Alrasheedy et al. 2014).

6. Korea

6.1. General characteristics of the health system

The current health expenditure (CHE) per capita is $2,712, which is 7.3% of GDP in 2016(WorldBank 2019). The financing scheme of Korea consists of 33.3% of out-of-pocket expenditure, 47.3% of insurance contribution, 11.9% of general taxation, and 7.5% of other private expenditure in current health expenditure(WHO 2019). Pharmaceutical expenditure per capita is $583. Pharmaceutical expenditure is 23.1% of CHE and is 1.7% of GDP(OECD/WHO 2016).

Table 4.6.1 | **General characteristics of the health system in Korea, 2016**

Indicators	Figures
Current health expenditure (CHE) per capita(USD PPP)	2,712
Current health expenditure (CHE) % GDP	7.3
Out-of-pocket (OOP) % CHE	33.3
Insurance contribution % CHE	47.3
General taxation % CHE	11.9
Other private % CHE	7.5
Pharmaceutical expenditure per capita (USD PPP)	583
Pharmaceutical expenditure % CHE	23.1
Pharmaceutical expenditure % GDP	1.7

Source: WHO, 2019; World Bank, 2019; OECD/WHO, 2016.

The Korean National Health Insurance (KNHI) was first introduced in 1977 only for the corporate employees. Universal population coverage was achieved in 1989 when the insurance covered the 97%

of total population. While the major payment system is fee-for-service, the Korean government plans to increase the application of "new-DRG" by 2022. The Korean Ministry of Health and Welfare is in charge of the overall administration of health care system. The Health Insurance Review and Assessment Service (HIRA) is in charge of health insurance review and assessment processes. The National Health Insurance Service (NHIS) is responsible for premium collection and the reimbursement to providers(Kwon, Lee et al. 2015).

6.2. Benefit coverage policies for NCD

Between 2000 and 2013, national spending on medicines was increased by 275.3%. As a result, The Korean government introduced several policies to deal with the issue(Kwon and Godman 2017). Due to fast increasing rates of pharmaceutical expenditure, the Korean government initiated a Drug Expenditure Rationalization Plan (DERP) in 2006(Lee and Kim 2012). In 2006, the government initiated the positive list system in order to maximize the cost-effectiveness of medicine use. In addition, the government also initiated a re-evaluation project to delist drugs in 2007 as a part of DERP(Lee and Kim 2012). Until 2013, around 9,767 drugs with no production and no claims history for two years were delisted. 15,734 medicines are registered under the NHI as of 2014(Kwon and Godman 2017).

In Korea, reimbursement and price decisions are separated. While HIRA is responsible for the reimbursement assessment, NHIS is responsible for the price negotiation with pharmaceuticals(Ngorsuraches, Meng et al. 2012).

The first step to develop the reimbursement list starts with an application from the pharmaceuticals. Pharmaceutical firms need to submit an application to HIRA for a new drug(Ngorsuraches, Meng et al. 2012). Then HIRA evaluates clinical benefit, safety assessment, pharmacoeconomic evaluation and budget impact analysis of potential new drugs to be included in the potential reimbursement list. After the initiation of the positive listing system, 491 medicines were decided for economic evaluation. Until the end of 2013, only 67.4% of the medicines were approved on the basis of cost effectiveness, and 27.7% were not reimbursed. Next step is NHIS's negotiation with the drug manufacturers. During the 60 days of negotiations, NHIS considers the prices in OECD countries and the prices of substitute medicines. If the price negotiation fails, the medicine cannot be listed and it needs to go through all procedure from the beginning(Kwon and Godman 2017). The last procedure is a review by the Health Insurance Policy Review Committee within the ministry. After a review is

done, the ministry publishes the final price of the medicine(Ngorsuraches, Meng et al. 2012).

Furthermore, after one year, the drug price must be renegotiated if the actual consumed volume of the drug exceeds 30% of the expected volume. This policy, the Price Volume Agreements, is common among European countries to regulate physician prescribing habits(Kwon and Godman 2017).

The prices of new medicines are decided after the negotiations between the payer – the National Health Insurance Service – and the manufacturer. Generic drugs are automatically priced by a standard methodology(Kwon and Godman 2017). Before 2012, differential pricing system was used for the price of generics. Since 2012, when new generics are introduced to the market, the price of generics must be 68% of the price of the original drug. Furthermore, as the generics enter the market, the brand medicines must cut their price to 80% of the original price(Bae 2019)

The Korean government also altered co-payment system. Before 2007, patients paid a fixed co-payment of 1,500 KRW for every prescription, unless the total cost does not exceed 10,000 KRW. If the total cost goes beyond the upper limit, patients pay 30% of total pharmaceutical spending. In 2007, government removed fixed co-payment for patients aged between 6 and 64 years old. Instead, government introduced 30% co-insurance scheme(Lee, Bloor et al. 2012). The elderly population pay 30% of co-payment for prescription higher than 12,000 KRW and 20% of co-payment for prescription between 12,000 KRW and 10,000 KRW. For prescription less than 10,000 KRW, the elderly population pay a fixed co-payment of 1,000 KRW for every prescription(NHIS 2019).

The Korean government also implemented different co-payment rates to lower the out-of-pocket payments for patients with catastrophic health care expenditure(NHIS 2019). In 2006, the government initiated the policy of extending the health insurance benefit coverage for cancer, cerebral vascular disease, heart disease and tuberculosis(Choi and Jeong 2012). Patients registered as cancer patients pay only 5% of their total healthcare expenses for five years from the date of registration. Cerebral vascular disease patients and heart disease patients also pay 5 percent of their total health care expenses for up to 30 days. Patients registered as tuberculosis patients pay zero percent of their total health care expenses during the whole treatment period(NHIS 2019)

6.3. Pharmaceutical policies for NCD

6.3.1. Pricing policies

External reference pricing is important to pricing policies in Korea. The maximum prices of newly introduced medicines are determined based on the average price of seven countries – USA, UK, Germany, France, Italy, Switzerland, and Japan. However, there are many limitations to the external reference pricing system. It is because amount of drug usage, distributional structures, economic levels, and the health care systems of all countries differ. The price determined by external reference is instable due to exchange rate fluctuations(Kang, Bae et al. 2016).

The risk sharing system is designed to ensure patient accessibility to expensive treatments that alternative treatments do not exist and are less cost effective. The system sets the listed price higher than the actual payment price and keeps the actual price confidential. Under positive list system, risk sharing systems have the advantage of increased accessibility to patients of severe diseases, but also the disadvantages of administrative and social costs due to the opacity of drug prices(Park 2018).

HIRA monitors the purchase price (claimed price) to prevent financial leakage of the health insurance and to secure transparency in the distribution and trading of medicines. Under the transaction price reimbursement system introduced in November 1999, the medical institution conducted a computer review based on the list of purchase details submitted to the HIRA by the medical institution prior to the payment of the drug expenses. Introduced in October 2010, the low-cost purchase incentive system eliminated the obligation of health institutions to submit a list of their purchase details and changed the system to confirm actual purchase price by comparing the supply details of the medication with the unit cost of the medical institution after paying the drug bill. This means the change from pre-examination to post-monitoring system. In September 2014, the incentive system for low-cost purchases was abolished and the system was switched to the incentive system for reducing prescription and pharmaceutical costs, but the basic framework for the drug price calculation method of health institutions remains intact, so monitoring of the purchase price is still necessary(HIRA 2019)

6.3.2. Policies for generics

Although market share of generics is more than 40% in Korea, there is not active price competition in the generics market(Bae 2019). Physicians in Korea do not prescribe by the international non-proprietary name. They can only prescribe by a specific brand name. Though bioequivalent generic substitution is permitted in Korea, the procedure is complicated and inconvenient. Pharmacists must notify the prescribing physician. The physician can also not agree with the pharmacist. Hence,

generic substitution rate is very low(Ryu and Kim 2017).

6.4. Others (Drug Utilization Review)

In December 2002, a 15-day pharmacy claim data in Seoul and Gyeonggi Province showed that about 4.8 percent of the prescriptions were beyond the U.S. standard for safe use of medicines. Hence, the National Assembly of Korea pointed the urgency of introducing the Drug Utilization Review (DUR) system during inspect of the government offices in 2003(Choi and Park 2010).

The DUR's operation system is fragmented by several institutions in Korea. The Ministry of Health and Welfare is in charge of overseeing the whole DUR system. Ministry of Health and Welfare collects opinions from relevant organizations and also publishes the criteria for the contraindication drug through the link to the DUR insurance benefit. The Ministry of Food and Drug Safety analyses the drug's domestic licensing and foreign information. The Ministry of Food and Drug Safety then notifies contraindication items and precautions based on research findings. HIRA is responsible for applying the safety standards. HIRA is also developing and operating a DUR information system. Medical institutions and pharmacies apply the DUR programs to their own systems. In this system, a warning pop-up shows up if a doctor prescribes a contraindication medicine. However, if the doctor gives a valid reason why the prescription is inevitable for the patient, it can be recognized as an exception(Choi and Park 2010).

For the first time in 2004, the government announced 162 drug combinations to avoid and 10 drug-age precaution(Choi and Park 2010). After the implementation of the DUR system, both drug use and pharmaceutical expenditures decreased. Absolute reduction of drug use was 1.80% to 4.54%. Furthermore, pharmaceutical expenditure was reduced by $2,126 for clinics and $246 for pharmacies(Lee, Choi et al. 2019).

V. Conclusion

Population ageing is one of the largest drivers of the epidemic of chronic diseases, such as cardiovascular diseases, stroke, diabetes, cancer, and dementia. Regardless of income levels in a country, the major causes of death and disability in older people are non-communicable diseases (NCD). Dealing with people with NCDs and multi-morbidity will be challenging in most LMICs where their health systems have been weak, fragmented and largely structured around infectious diseases, acute care, and vertical program such as maternal and child health. These health systems are currently not equipped with resources and capacity to manage changing disease patterns with a burden of NCDs and multi-morbidity, and to comprehensively respond to addressing NCDs.

Access to medicines for NCDs is unacceptably low. There are large disparities between HICs and LMICs, and within countries, in access to medicines for NCDs and for infectious diseases. There are many factors affecting low availability and affordability of NCD medicines in LMICs, such as inadequate funding in the health sector, lack of incentives for managing stock-outs, inability to forecast accurately, inefficient procurement process and distribution systems, low benefit coverage for essential medicines, ineffective generic policies, and so on.

Although the OECD countries with comprehensive benefit coverages for NCD medicines are at different stages in dealing with NCD medicines from LMICs, there are some lessons learned from the OECD countries. With increasing financial burdens due to pharmaceutical spending growth coming from NCD, the OECD countries have focused on pharmaceutical cost containment policies for NCD medicines, applying a range of benefit coverage policies, pricing policies, and policies for generics. Considering a comprehensive benefit coverage and universal population coverage among the OECD countries, in general, they have focused on improving efficiency in reimbursement decisions through changes in internal reference pricings, health technology assessment systems (HTA) and managed entry agreements. Moreover, they have used increased co-payment rates with exemptions for benefit coverage policies. Many OECD countries have used pricing policies for cost containment on pharmaceuticals, including price cuts on ex-factory prices of medicines, decreased mark-ups for distributors, decreased/increased value-added tax (VAT) rates, the use of external price referencing

or changes in the method or basket of reference countries, and so on. OECD countries have strived to promote generic use in order to improve access to affordable NCD medicines, using the three key approaches of International Non-proprietary Names (INN) prescribing for prescribers, generic substitution for pharmacists, and campaign to raise awareness about benefits of generics for patients.

There are some attentions paid to policies for the rational use of NCD medicines in the OECD countries. Patients with NCD may have co-morbidities and may have to take multiple medicines (polypharmacy), which can interact sometimes with fatal effect; this issue may be more critical for older patients with NCD. Medication errors and adverse drug reactions are mostly likely to have impacts on patients who take multiple medicines. Some countries (e.g., Australia) have introduced review and monitoring systems for reducing negative effects of polypharmacy.

On the other hand, there are many challenges for improving availability and affordability of NCD medicines across LMICs. Weak, ineffective, and inefficient procurement systems and supply management systems can result in shortages or undersupply as well as high costs of NCD medicines, which may affect availability of NCD medicines. Interrupting supply and procurement processes of medicines can be detrimental to patients, particularly for NCD patients where many NCD patients need treatment for many years to control their conditions (e.g., hypertension and diabetes). Procurement regulations in many LMICs are often cumbersome and outdated, reducing the flexibility to have medicines at the right time and in the right quantity based on service delivery needs. Pooled procurement can be beneficial to exerting monopsony power through competitive bidding and price negotiation if multiple payers within a country or across countries negotiate prices together.

Availability and affordability of NCD medicines can be significantly improved within existing budgets for medicines through optimizing the selection of medicines in benefit coverage. Patients may face challenges of high OOP at the point of service under limited benefit coverage for NCD medicines, although governments may often be able to procure essential medicines at competitive international prices. This would discourage patients to appropriate use of NCD medicines and reduce adherence to long-term treatment for NCD medicines. WHO's essential medicines lists (EML) and HTA can be used to support reimbursement decisions in LMICs.

In many LMICs, ensuring comprehensive benefit coverage to all people without suffering financial hardship due to high OOP for NCD medicines has not yet been achieved. Expanding benefit coverage for NCD medicines should be a priority to improve availability and affordability of NCD medicines. Exemption or reduction of co-payments for NCD should be properly in place in the co-payment

systems to improve access to affordable NCD medicines. Ceiling on OOP can contribute to financial protection due to services for NCD treatment. However, there is much room for improvement in establishing and implementing the exemption/reduction of co-payment systems in LMICs.

WHO recommends a wide range of medicines pricing policy to deal with financial burdens of NCD medicines including reimbursement limits and co-payments, internal and external reference pricing, decreasing sales taxes and tariffs on medicines, improved regulation on ex-factory prices, regulating distribution price controls, and etc. Many LMICs still impose duties, VAT and other taxes on medicines. Given the fact that these taxes can be considered a tax on the sick, these taxes should be removed. The cumulative effect of taxes and mark-ups added to the selling prices can be substantial. Although increased use of generic medicines could improve affordability of NCD medicines, policies to promote generics have not made much progress in Asia and the Pacific region.

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