Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini

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KEYWORDS

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ABSTRACT

Background

Chronic non-communicable diseases (NCDs) have not received adequate attention in Eswatini (formerly Swaziland) due to the high burden of HIV/AIDS, tuberculosis and other communicable diseases. However, in 2019, NCDs were estimated to account for 45.86% of all deaths in the country with cardiovascular diseases, diabetes mellitus and chronic respiratory conditions amongst the top ten causes of death. Persistent shortages of medicines in public health facilities in Eswatini have been observed resulting in patients purchasing their medicines from private retail pharmacies.

Aim

The aim of the study was to determine the availability, price and affordability of selected chronic medicines and a few comparator acute medicines in private retail pharmacies in Eswatini.

Methodology

A cross-sectional study design adapted from the standardized World Health Organization/Health Action International (WHO/HAI) methodology was used. The survey was conducted in 39 private retail pharmacies in Eswatini using the WHO/HAI data collection tool. Data on price and availability was collected for a total of 46 medicines used for a wide range of acute and chronic conditions. For each medicine, price and availability was collected for the originator brand (OB) and the lowest priced generic (LPG) equivalent. Medicine prices obtained during the survey were expressed as ratios relative to a standard set of international reference prices (IRP). The medicine price ratio (MPR) is calculated as the median unit price of an individual medicine divided by the IRP from the Management Sciences for Health (MSH) drug price indicator guide.

Affordability was determined using the daily income of the lowest paid unskilled government worker. Treatment costing one day's wage or less is considered to be affordable. Data was analyzed using Excel and the medicine price workbook from the WHO/HAI manual.

Results

The mean availability of all surveyed medicines was lower than the 80% target set by WHO for essential medicines, with LPGs (65.7%) more available than OBs (24.1%). Corporate chain pharmacies had higher mean availability of both OBs (24.1%) and LPGs (75.5%). Individually owned pharmacies' mean availability was lower than the corporate pharmacy chains, with 7.2% for OBs and 61.8% for LPGs. The overall availability of LPGs for acute conditions was 34.5% higher than those medicines for chronic conditions - 94.9% for acute medicines and 60.4% for chronic medicines. Corporate chain pharmacies prices were lower than the individually owned pharmacies when LPGs were considered, however for the originator brands the corporate chain pharmacies price ratios were higher than the individual pharmacies. Asthma treatment was not affordable as a month supply of the recommended treatment for the two inhalers, salbutamol and beclomethasone, cost 3.7 days' wage for the lowest priced generic versions. Diabetes mellitus treatment was affordable if only oral LPGs metformin and glibenclamide were used, however, a type 2 diabetes patient who required insulin would not be able to afford the treatment as the whole treatment would cost 6.1 days' wage. Hypertension medicines were generally affordable for both first line (hydrochlorothiazide) and second line (hydrochlorothiazide and atenolol) treatment when LPGs were used. Treatment of dyslipidemia was also affordable with a cost of a month's supply of simvastatin less than a day's wage. Most people being treated for one NCD have co-morbidities and might need medication for hypertension, diabetes mellitus and cholesterol at the same time, making treatment unaffordable. Central nervous system (CNS) medicines were the least affordable, with a month's treatment requiring more than a day's wage of the lowest paid government worker. Treatment of all acute conditions was affordable as the cost was less than a day's wage of the lowest paid unskilled government worker.

Conclusion

The availability of surveyed chronic medicines in private retail pharmacies was lower than the 80% set target. OBs had a very low availability compared to generics. When generics were used as medication for hypertension, dyslipidemia and acute conditions,

treatments were affordable. However, medication for diabetes mellitus, asthma and CNS conditions were unaffordable for the majority of the population as their cost was more than a day's wage of the lowest paid unskilled government worker.

DECLARATION

I declare that **Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini** is my own work, that it has not been submitted before for any degree or examination in any University or College, and that all the sources I have quoted or used have been indicated and acknowledged as complete references.

Tungamirai Zvinavashe: __  **___ August 2021**

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ABBREVIATIONS

GAP	Global action plan
HAI	Health Action International
LMICs	Low- and middle-income countries
LPGs	Lowest priced generics
LPGW	Lowest paid government unskilled worker
MOEE	Ministry of Employment and Entrepreneurship
MOH	Ministry of Health
MOPSI	Ministry of Public Service and Information
MPR	Medicine price ratio
MSH	Management Sciences for Health
NCDs	Non-communicable diseases
OBs	Original brands
OECD	Organization for economic co-operation and development
SDGs	Sustainable development goals
SEP	Single exit price
SNPP	Swaziland national pharmaceutical policy
SSA	Sub-Saharan Africa
UN	United Nations
WHO	World Health Organization

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CHAPTER 1: INTRODUCTION

1.1 Background

Non-communicable diseases (NCDs) are major threats to public health in the 21st century (Mendis & Chestnov, 2013). NCDs are estimated to kill 41million people each year, equivalent to 71% of all deaths globally with 77% of all NCD deaths occurring in low- and middle-income countries (LMICs) (WHO, 2021). Cardiovascular diseases, cancers, respiratory diseases and diabetes account for over 80% of all premature NCD deaths (WHO, 2021). Sub-Saharan Africa (SSA) is facing a double burden of disease with a rising prevalence of NCDs whilst the prevalence of communicable diseases remains high (Iwelunmer et al., 2016). This occurs against a broad background of poverty. According to Mayosi (2013), the number of people with hypertension in SSA will increase by 68% from 7.5 million in 2008 to 12.6 million in 2025. It is projected that NCDs will overtake communicable diseases as major causes of morbidity and mortality (Holmes et al., 2010). Changes in lifestyle have resulted in the emergence of NCDs and it has become a major threat to the health of populations and economic development in many African countries (Kengne et al., 2013). Many SSA countries are limited in capacity to address the increasing NCD burden as they have weak health systems and constrained resources (Peck et al., 2014). It becomes very challenging to ensure that the target population for each NCD has access to affordable treatment (Bigna & Noubiap, 2019). NCDs have not received adequate attention in Eswatini (formerly known as Swaziland) due to the high burden of HIV and AIDS, tuberculosis and other communicable diseases (WHO, 2013). However, in 2016, NCDs were estimated to account for 37% of all deaths in the country, with 13% attributable to cardiovascular diseases, 6% to diabetes in 2016 and 3% to chronic respiratory conditions (WHO, 2016). At the end of 2019 NCDs accounted for 45.86% of all deaths in Eswatini (WHO, 2019).

Health is a fundamental human right and access to essential medicines is a vital component of the health system (Millard et al., 2018). Access to medicines is at the core of universal health coverage and the sustainable development goals (SDGs) (WHO, 2017). Despite international initiatives to achieve universal access to safe and effective medicine as outlined in SDG 3.8, it is estimated that at least a third of the global population lacks access to medicines (Van Den Ham

et al., 2011). In LMICs, in particular, access to quality assured and affordable essential medicines remains a challenge (Zeidi et al., 2013).

One of the nine global targets for prevention and control of NCDs is to ensure 80% availability of affordable basic technologies and essential medicines required to treat NCDs in both public and private facilities (WHO, 2013). However, studies have found that NCDs medicines are frequently less available than those to treat communicable diseases (Cameron et al., 2011). A study conducted in Ghana, showed that 78% public health facilities had the recommended antimalarial drugs whereas less than 35% public facilities had essential diabetes and hypertension drugs (Kushitar & Boatemaa, 2018). In Malawi, a study by Khuluza & Haefele-Abah (2019) showed an average availability of 80% of most of the antibiotics in all sectors as recommended by WHO and a low availability of NCD medicines.

The Covid-19 pandemic has affected access to NCD medicines. This is a great concern as people living with some NCDs are at a higher risk of severe Covid-19 related illness and death (WHO, 2020). According to WHO (2020), countries confirmed that people living with NCDs have not been receiving the necessary care and treatment as resources were reassigned to fight Covid-19. Frequently, the fear that people with NCDs experience decreases the possibility of them seeking medical treatment resulting in worse health outcomes (WHO, 2020). Briesacher et al. (2009) concluded that medication non-adherence was associated with financial burden and suggested that it is important to identify those that are vulnerable to out-of-pocket spending on medication as access to medicines is dependent on price, availability and affordability of medicines.

1.2 Problem statement

Eswatini is facing a double burden of disease. HIV/AIDS and TB are still major contributors to disability and death whilst NCDs are increasingly becoming major contributors to the burden of disease (Ministry of Health (MOH), 2016). NCDs have received inadequate attention in Eswatini, due to the double burden of disease that the country is facing (Shabangu & Suleman, 2015). A chronic shortage of medicines in public health facilities in Eswatini has been observed (Shabangu & Suleman, 2015) and this has resulted in patients being compelled to buy medicines from the private sector (Mhlanga & Suleman, 2014). The MOH (2019) also reported that all

government health facilities had frequent drug stock-outs which highly impacted patients receiving medicines for NCD conditions. The shortage of medicines in government facilities has been attributed to the restricted capacity of the country's medicines warehouse which has the capacity to hold only six months' supply of drugs for the whole country (Shabangu & Suleman, 2015) and failure to pay suppliers on time due to fiscal challenges facing the government (MOH, 2019).

Even though the government offers subsidized health services, patients frequently pay out-of-pocket for medications from private pharmacies when NCD medicines are not available at public sector facilities. (Swaziland, n.d). Out-of-pocket expenditure in the private sector in Eswatini accounts for 42% of the total private health expenditure and is the largest source of health financing, (Foster, 2012). Thus, private retail pharmacies in Eswatini provide essential access to medicines and healthcare services to many patients, with as much as 41.7% of the population reportedly using private health care facilities (Padidar, 2015; Swaziland, n.d).

Due to their chronic and lifelong nature, NCDs require repeated interactions with the health system over long periods of time and this usually includes regular access to medicines (WHO, 2020). The unmet NCD burden can lead to both health and economic consequences, resulting in severe disability, premature deaths and billions of dollars in economic loss each year (WHO, 2020). Analysis of the availability, prices and affordability of chronic medicines in the private retail pharmacies will help to understand how these factors affect access to medicines for patients in Eswatini.

1.3 Research setting

The Kingdom of Eswatini (formerly known as Swaziland) is a landlocked country in Southern Africa with a population of 1 093 238 (Swaziland, 2017). The country is divided into four regions namely, Hhohho with 29.3% of the total population, Manzini with 32.6%, Shiselweni with 18.7% and Lubombo with 19.4%. The country is classified as a lower middle income by the World Bank and 63% of the population lives below the poverty line (Swaziland, 2017). The health care delivery system consists of both formal and informal sectors. The formal sector consists of both public and private facilities and informal sector consists of traditional and

complementary health care providers (MOH, 2009). The public facilities constitute 39% of the health facilities, private for profit 29% and private not for profit 32% (Swaziland, 2017).

There are pharmacies in most of the public facilities, private hospitals and clinics, some of the private not-for-profit facilities and, in addition, there are free-standing private retail pharmacies. Private retail pharmacies in Eswatini are mainly individually owned with a few corporate chain pharmacies. The corporate chain pharmacies are mainly located in major cities with individually owned pharmacies spread across the four regions. The corporate chain pharmacies besides selling medicines also offer primary health care services with an in-house nursing practitioner (Bizcommunity, 2011). Trading licenses for private retail pharmacies are issued by the Ministry of Employment and Entrepreneurship (MOEE) as the Pharmacy Council has not yet been established (Swaziland, 2000). There is currently a total of 39 private retail pharmacies in the country. They are not evenly distributed among the four regions, with Manzini having 15 retail pharmacies, Hhohho 15, Shiselweni 5 and Lubombo 4 (Appendix 1).

1.4 Study aim

The aim of the study was to determine the availability, price and affordability of selected chronic medications and a few comparator acute medicines in private retail pharmacies in Eswatini.

1.5 Study objectives

1. To determine the availability of the selected acute and chronic medications in private retail pharmacies in Eswatini.
2. To determine and compare the prices of these medications in the private retail pharmacies in Eswatini.
3. To compare prices with South African Single Exit Price (SEP) and the Management Sciences for Health (MSH) International Reference Price List.
4. To determine the affordability of the selected chronic medications.

CHAPTER 2 LITERATURE REVIEW

2.1 Introduction

Access to health is a fundamental human right (WHO, 2017). Availability and affordability are prerequisites for universal access to medicines. However, besides the right to health, access to essential medicines remains a challenge in developing countries (Hill, Yang & Bero, 2012). In many LMICs, poor availability and high costs have been shown to be a barrier to accessing treatment for NCDs (Cameron et al., (2009); Wang et al., 2017). Many factors affect access to medicines, these include poor availability, unaffordable medicine prices, unreliable medicine supply systems, unsustainable health financing mechanisms and poor adherence of patients (Hinsch, Kaddah & Schmitt, 2014;Wang et al., 2017). One of the major barriers for access to medicines in developing countries is high prices of medicines (Kasonde et al., 2019). Medicine prices determine access to affordable healthcare in developing countries especially where the public sector is not able to provide sufficient appropriate treatment and care (Hinsch, Kaddar & Schmitt, 2014).

In many LMICs, the pharmaceutical supply chain is neither regulated nor subject to any formal oversight (Ball, 2011). This contributes to problems of availability and affordability of medicines. Major challenges in LMICs remain in the implementation of effective strategies, improper resource allocation and policies that help with equitable access to health (Temu et al., 2014). Kettler, Lehtimaki & Schwalbe (2020) also cited the lack of trained providers or weak health care deliveries as the reasons for poor access to medicines in LMICs. Poor access to medicines results in high out-of-pocket expenditure. High out-of-pocket expenditure on health in many parts of Africa results in financial hardships and this prevents early detection and treatment of the NCDs (Mendis & Chestnov, 2013). According to Piette (2005), high out-of-pocket costs can lead patients to go without their medication which can result in negative consequences to their health. A study conducted by Piette (2005), noted that 40% of those with low-income had to forgo their basic needs because of high medication costs.

WHO recommends that policy makers implement strategies to manage medicine prices to ensure that everyone has access to medicines (Vogler, Kilpatrick & Babar, 2015). Many countries have introduced interventions to reduce medicine prices but very little evidence exists as to their impact (Moodley & Suleman, 2019). One of such interventions suggested by Mhlanga &

Suleman (2014) was for Eswatini to introduce pricing policies which will increase availability and affordability. However, a downward pressure on prices could reduce access by removing incentives for entrepreneurs to own and operate pharmacies, resulting in pharmacies being less geographically accessible to customers (Waning, Maddix & Soucy, 2010). The government will need to strike a balance between affordability, availability and sustainability of pharmacies as the majority of the population in the LMICs relies on private pharmacies. Cameron et al. (2009) stated that the structure of a country's pharmaceutical sector can influence medicine availability, price and affordability.

2.2 Availability of medicines

As part of the 2013-2020 Global Action Plan (GAP) for prevention and control of NCDs, the WHO included a target of >80% availability of affordable essential medicines and basic technologies required to treat major NCDs (WHO, 2013). A 2012 United Nations report stated that, on average, essential medicines are available in only 51.8% of public facilities and 68.5% of private health facilities in LMICs (UN, 2012). International evidence using data from 36 LMICs found that in the public sector availability ranged from 29 to 54% (Bertoldi et al., 2012). A study by Schafermann et al. (2020) conducted between 2017 and 2018 in both private and public facilities reported an availability of 33% and 11% for NCD medicines in the public sector in Cameron and in DR Congo, respectively. With such low availability in the public sector patients turn to the private sector where the prices of generic medicines are frequently 2 to 3.5 times higher than international reference prices (Millard et al., 2018). A study in six LMICs in 2005 reported that though the availability in the private sector was better than the public sector, it was still poor in most LMICs (Mendis et al., 2007). Data collected by WHO between 2016 and 2019 from twenty-four countries showed that human insulin was available in only 61% of health facilities (WHO, 2019). Another study in fifteen LMICs revealed that insulin was available in 56% of public facilities and 39% of private facilities (HAI, 2012). Ewen et al. (2019) also noted that insulin availability was generally lower than the oral medicines for diabetes. Medication availability is a problem in countries where chronic diseases are major problems given the lifelong nature of treatment required (Sarufar et al, 2013). Cameron et al. (2011) noted the low availability of generic chronic medicines in comparison to generic acute medicines in 40 LMICs. Mendis et al. (2007) stated the need to improve availability of chronic medicines especially the ones recommended in country treatment regimens. The studies measured availability for both

acute and chronic medicines however, the differences in availability was not stated. The cited studies were all conducted in both private and public facilities, however most of the results could not be generalized in the countries they were conducted. The study by Schafermann et al. (2020) only surveyed sites in large and small towns and the rural areas were not part of the surveys. Mendis et al. (2007) only surveyed outlets that were within a day's travel from a major urban centre.

2.2.1. Factors that affect availability of medicines

Several factors affect access to medicines in the public sector, with the major ones being shortage of resources and the lack of skilled personnel (Pheage, 2017). Globally, a quarter of all health expenditure is on medicines (Wirtz et al., 2016). In LMICs, medicines account for 20-60% of health spending compared with 18% in countries of the Organization for Economic Co-operation and Development (OECD) (Cameron et al., 2015). Africa's inefficient public sector supply system is often plagued by poor procurement practices that make drugs very costly or unavailable. The poor transport system and lack of storage facilities for pharmaceutical products and weak manufacturing capacity also contribute to lower availability of medicines (Pheage, 2017). This was also observed by Mhlanga & Suleman (2014) in the study conducted in Manzini, Eswatini, in 2013. The Ministry of Health in Eswatini also reported drug shortages that were caused by budget shortfalls and unavailability of funds (MOH, 2019). Another study by Khuluza & Haefele-Abah (2019) in Malawi showed a higher availability of medicines in the private sector which was attributed to the efficiency and profit maximization of the sector. Availability in the private sector is usually linked to the demand for the medicines (Ongarora et al., 2019). However, low availability of insulin in the private sector may be attributed to higher procurement prices and lower demand compared with other medicines (Ewen et al., 2019). In a study by Ewen et al. (2017), in both private and public facilities in ten low-income countries (LICs), the median generic availability across all medicines was 59.1% in the private sector, while the median availability of originator brands was 3.2% in LICs and 10% in 12 LMICs. However, promotion of generic medicines is recommended to be included in the national medicine policy to improve affordability and accessibility of medicines (Hassali et al., 2014).

2.2.2. Availability of medicines in Eswatini

The Eswatini government is solely responsible for procurement and storage of essential medicines for the public health facilities in the country (Shabangu & Suleman, 2015). According to the Swaziland National Pharmaceutical Policy (SNPP) (2011), the current warehouse for the government central medical stores can only accommodate six months' supply of stock. This results in the existing inventory system being overburdened causing stock-outs of pharmaceutical commodities. This was confirmed by Shabangu & Suleman (2015) who reported that the low availability of medicines at government facilities was as a result of stock-outs at the central medical stores ranging from 30 to 180 days. Chronic shortages of medicines were also reported by Mhlanga & Suleman (2014), with a mean availability for the public sector of 68% and 77.5% in the private sector. A study conducted in Eswatini found that seventy-one percent of the patients surveyed did not receive all of their prescribed medicines at each visit to the government hospital (Shabangu & Suleman, 2015). Recent reports by the Eswatini MOH (2019) and Ncube et al. (2020) also noted frequent stock-outs of medicines at public health facilities, particularly NCDs. These shortages negatively affect the management of patients.

2.3. Price of medicines

The price of medicines plays a major role in the affordability and accessibility of medicines. Research shows that consumer access to essential medicines in LMICs is mainly driven or blocked by price (Chowles, 2017). The impact of high medicine prices on the sustainability of healthcare is a growing concern (Cameron et al., 2009). Pharmaceutical prices consist of different components, manufactures' price, wholesaler price and retail price (Aaserud et al., 2006). There are markups and possible taxes at each of these steps giving rise to varying medicines prices.

Medicine prices were shown to be higher in Cameroon than in the DR Congo with median price ratios to an international reference price of 5.69 and 2.17 respectively (Schafermann et al., 2020). A study by Orubu et al. (2019) carried out in selected states in Nigeria in 2018 reported that prices for cardiovascular medicines remain high and potentially unaffordable in the private sector. Several studies have reported high prices for insulin. According to WHO (2019) about 65 million people with type 2 diabetes need insulin, but only half of them are able to access it largely due to high prices. Data collected in Ghana showed that a month's supply of insulin costs

an equivalent of 5.5 days pay per month (WHO, 2019). Another study in China by Liu et al. (2017) reported that a month's treatment with insulin costs at least 4 days wages in both the private and public sector. Insulins availability and prices require close monitoring as the stated surveys reported low availability and high costs of insulins in LMICs.

2.3.1 Factors that affect prices of medicines

Factors that tend to increase the cost of medicines for patients include the interaction of market power, health insurance, the lack of effective incentives for controlling product price, unequal bargaining power between buyers and sellers and lack of adequate information affecting choices regarding medicines (Augustine, Madhavan & Nass, 2018). For example, three manufacturers control most of the global market for insulin, setting prices that are prohibitive for many people and countries (WHO, 2019). Introducing insulin biosimilars in LMICs might increase access to treatment by expanding market competition (McCall, 2018).

Several studies have noted the higher prices of innovator brands or originator brands (OBs) in comparison to their generic equivalents. A study by Mendis et al (2007) showed that in most of the countries OBs were more expensive than their generic equivalents in the private sector. Generic medicines were also found to be more affordable in comparison with OBs in LMICs (Cameron et al., 2009; Ongarora et al., 2019). However, the study by Ongarora et al. (2019) in Kenya focused only on private and public facilities in low-income urban settlements. The high costs of OBs are influenced by their launch prices, and generic versions can only enter the market once the OBs lose their patent exclusivity (Augustine, Madhavan & Nass, 2018). These generics come into the market at a much lower price than the OBs. Owing to this lower cost generic drugs have the potential to lower medicine costs and improve medication adherence (Desai et al., 2018). The high prices of OBs become an issue when the generic equivalents are not available, or when the prescribers prescribe OBs and generic substitution is prohibited (Mendis et al., 2007). Frequently, lack of medicines pricing information makes it difficult for consumers to make informed decisions about purchasing medicines (Perumal-Pillay & Suleman, 2017). For example, insulin supplied in vials tends to be cheaper while pens and cartridges offer more options for patients who can afford them (Ewen et al., 2016).

Retail prices are the result of a series of functions such as product prices, markups, government tax and hidden costs (Bertoldi et al., 2012). In LMICs, taxes on medicines range from 2.9% to

34% (WHO, 2015). Most private retail pharmacies are individually owned and their volume of purchases is usually low comparing with corporate chain pharmacies. The individually owned pharmacies purchase medicines at higher prices than big chains which centralize their procurement process decreasing the medicine costs from wholesalers and sometimes transferring these savings to their customers (Bertoldi et al., 2012).

Prices vary in different countries between corporate chain pharmacies and individually owned pharmacies. Studies have been conducted in the private retail pharmacies in India and United States of America. A study in India reported that corporate chain pharmacies had lower prices compared to individually owned pharmacies, although the study only compared medicines for tuberculosis and diarrhea (Miller & Goodman, 2020). Luo et al (2019) in 2015 similarly reported that individually owned and small chain pharmacies in the United States of America had higher prices for generic drugs than big corporate chain pharmacies. However, a study in the Boston area of the United States of America in 2014 found that although the corporate chain pharmacies had a higher availability their prices were higher than the individually owned pharmacies (Sharma et al., 2016). Of concern was a study carried out in Florida in the United States of America in 2006 which reported that prices in the poorer ZIP codes were higher than other areas (Gellard et al., 2009).

Price regulation policies cap prices that companies charge on medicines making them more affordable for everyone (Hassali et al., 2012). Lack of price regulation policies in Malaysia led to increased market competition (Ahmad & Islahudin, 2018). The increased competition was coupled with increased demand on anti-infectives and antihistamines resulting in high medicine prices in the private sector (Ahmad & Islahudin, 2018). Though generic medicines were preferred in Malaysia due to affordability their prices were still too high (Ahmad & Islahudin, 2018). Mark-ups in Kenya are not regulated and it is possible to obtain the same product at different prices in different outlets (Ongarora et al., (2019).

2.3.2. How countries have addressed prices of medicines

Pharmaceutical pricing and purchasing policies are meant to affect the prices that consumers pay for medicines (Aaserud et al., 2006). The price controls can be targeted at different components of the supply chain such as wholesale prices, retail prices, drug taxes and reimbursement prices (Aaserud et al., 2006). Some of the ways of addressing prices in the private sector is by reducing

taxes and duties on medicines, margin regulation in the supply chain and implementation of pricing policies (Bertoldi et al., 2012).

There are conflicting conclusions on the success of medicine pricing interventions. Briesacher et al (2009) concluded that many governments that had introduced interventions to reduce medicine prices for payers and patients alike had little evidence on their impact. WHO (2015), however, reported some clear successes though many countries were still failing to implement policies and programmes to improve access to affordable medicines. However, WHO (2017) subsequently concluded that price regulation and controls such as maximum retail price are used in several countries with mixed success. The South African government introduced the Single Exit Price (SEP) policy in 2004. This policy was aimed at reducing the prices of medicines and controlling the markup instituted by the various stakeholders along the entire supply chain (Bangalee & Suleman, 2015). The policy allowed for the addition of a dispensing fee in order for the pharmacist or dispensing doctor to make a small mark-up helping to discourage the unnecessary use of high-cost drugs (Chowles, 2017). The SEP also improved medicine price transparency, and ensured that patients pay the same price for medicines irrespective of where they buy them. This led to an overall decrease of 22% in medicine prices in South Africa in the first year after the SEP introduction (Chowles, 2017). However, over a decade after the introduction of SEP, complaints about access to affordable medicines in South Africa still persist (Bangalee & Suleman, 2018).

Factors that affect patients' drug choice include cost, patient perception, advertising and detailing, physicians prescribing patterns and pharmacists (Terrizzi & Meyerhoefer, 2020). The price of OBs internationally was reported to be two and half times more than the lowest priced generics (LPGs) (Cameron et al., 2009). In LMICs this difference could be more than tenfold (Cameron & Laing, 2010). Generic substitution laws can be used to address this. According to Vivian (2008), most of the states in the United States of America had substitution laws that gave the pharmacist the ability to dispense an equivalent generic in place of the branded drug that would have been prescribed by the physician. In South Africa, the act implemented in 2003 mandated pharmacists to inform all private patients buying prescribed medicines about the benefits of generic alternatives (Deroukakis, 2007). To increase uptake of LPGs quality must be assured (Kishore, Vedanthan & Fuster, 2011) as consumers in LMICs frequently associate

expensive medicines with increased efficacy and quality (Kamat & Nichter, 1998). Use of generic medicines results in major savings in healthcare expenditure as they are usually lower in price than OBs (King & Kanavos, 2002). However, the generic and OB prices for some medicines like salbutamol inhaler are almost the same in Rwanda (Bizimana, Kayamba & Heidi, 2020) and Kenya (Ongarora et al., 2019). Ongarora et al. (2019)'s survey concentrated on low-income urban settlements whereas Bizimana, Kayamba & Heidi (2020) only surveyed eighteen medicines and the survey was conducted in 2019 with 2015 MSH prices which could have resulted in erroneous price ratios. Despite some interventions in the supply chain being implemented, there is general lack of evidence in the literature pertaining to the outcomes of pricing regulations in LMICs (Bangalee & Suleman, 2015).

2.3.3. Medicine prices in Eswatini

There are currently no medicine price controls in Eswatini (SNPP, 2011) and this is likely to lead to an increased markup of medicines in the pharmaceutical supply chain which will contribute to overall high medicine prices (Ahmad & Islahudin, 2018). Brazil, similarly, has experienced a combination of poor distribution of essential medicines by the public sector and weak legislation in medicine prices (Bangalee & Suleman, 2015). This impacted on access to medicines and placed additional financial burdens on patients. A study by Mhlanga & Suleman (2014) in 2013 reported that the mean availability of medicines in Eswatini was 68% in the public sector, with prices in the private sector for LPGs 7.32 times more that the MSH international reference prices. A similar study conducted in different regions of the WHO found that the average prices of generic medicines ranged from 1.9 to 3.5 times international reference prices (Cameron et al., 2011). The Eswatini prices, at 7.32 times more, are therefore extremely high.

2.3.4 Single exit price and Management Sciences for Health reference prices

The reference prices published by MSH provide an objective source of information on medicine prices (Shankar, 2014). The reference prices can be used by procurement agencies, public health facilities and non-governmental organizations to procure and use medicines in a more cost-effective manner (Shankar, 2014). The MSH reference price guide contains prices from pharmaceutical suppliers, international development organizations and government agencies (MSH, 2015). These prices do not include insurance and transportation costs. Unfortunately, the MSH reference price resource has not been updated since 2015 which poses a limitation on its

usefulness. The SEP was introduced in 2004 in neighboring South Africa to improve access to medicines by improving price transparency and reducing prices (Naidoo & Suleman, 2021). The publicly available SEP price includes the ex-manufacturer price, logistic fee and value added tax (Moodley & Suleman, 2019). The SEP price is reviewed every year and it is the only price available to the private sector before the addition of a regulated dispensing fee (Moodley & Suleman, 2019).

2.4 Affordability of medicines

The affordability of essential medicines is a core challenge for any health system working to achieve Universal Health Coverage (Perumal-Pillay & Suleman, 2017). Affordability of medication is the relationship between prices of the medicine and the user's ability to pay for them (Obuaku, 2014). Therefore, affordability is heavily dependent on the price of the medicines and the disposable income of the purchaser. The majority of the population in LMICs do not have health insurance, so out-of-pocket payments are a major source of health care financing (Niens & Brouwer, 2013). Out-of-pocket medicine payments may force patients to forego other essential purchases such as food if the prices of the essential medicines exceed their budgets (Niens & Brouwer, 2013).

The WHO/HAI (2008), expresses affordability of medicines as the number of days' wages the lowest paid unskilled government worker (LPGW) needs to spend to procure a course of treatment of a particular medicine. The main advantage of the method is that it is easy to apply and understand and can be used to compare data across different countries (Niens et al., 2012). However, this method might overestimate the affordability of medicines because most of the people in poorer countries earn less than the LPGW (Niens et al., 2012). The proportion of people living in poverty remains high at 58.9% in Eswatini, with 70% of the rural population living below the national poverty line and 25% are considered extremely poor (MOH, 2019) . Regionally Lubombo has the highest prevalence of poverty 69% followed by Shisweleni 68% (Zwane, 2011).

A study conducted by Mhlanga & Suleman (2014) in Manzini, Eswatini showed that affordability of the LPGs for most of the chronic conditions was less than one day's wage with OBs being more than one day's wage. Diabetes mellitus treatment was the most unaffordable as

the treatment cost 6.7 days wage (Mhlanga & Suleman, 2014). This is comparable with the data obtained by Ewen et al. (2017), where OBs were less affordable than LPGs in both public and private sectors in LMICs , whilst no more than one day's wage being needed for all therapeutic groups in the private sector of upper middle-income countries. Sado & Sufa (2016) reported that medicines were unaffordable for treatment of common conditions prevalent in Ethiopia at both private and public facilities. This was because the cost of medicines was equivalent to a day or more days' wages for the LPGW. The complexity of the problem of affordability shows the need for comprehensive policy solutions.

Some of the examples of initiatives to improve access to affordable medicines include: the Novartis access program in Kenya that aims to provide treatment for NCDs with fifteen affordable medicines at a cost of USD1 per monthly treatment (Novartis Global, 2017). In Sweden, costs are reduced by the availability of LPGs and mandatory generic substitution (Goodman et al., 2009).

In conclusion, studies have repeatedly documented the low availability, high prices and poor affordability of key essential medicines for NCDs in LMICs in both public and private pharmacies (Robertson et al., 2015). There is need to survey the availability, price and affordability of NCDs medicines in Eswatini to identify the effects it has on universal access to health for all.

CHAPTER 3 METHODOLOGY

3.1 Study design

This study used a cross-sectional design adapted from the standardized World Health Organization/Health Action International (WHO/HAI) methodology as in Measuring Medicine Prices, Availability, Affordability and Price Components (2nd Edition) (WHO/HAI, 2008). The reasons for the choice of a cross-sectional study design include (Bonita, Beaglehole & Kjellstrom, 2006):

- It is relatively easy and quick to conduct with no long periods of follow up;
- It can measure prevalence for all factors under study, in this case the issues of availability, price and affordability, at the same time;
- It can provide a lot of information on the provision of health services within a community under study and the population that bears the burden of the disease;
- The information can be used for health planning, policy making and resource allocation.

The guidelines and tools for the survey are provided in the WHO/HAI manual. The primary use of this methodology is investigating availability, price and affordability of medicines at the national level across healthcare sectors, with the intention of identifying specific issues that may require policy interventions to improve access (WHO/HAI, 2008). It is designed to measure medicine prices and availability at a certain point in time, but can be used to monitor them over a period of time (WHO/HAI, 2008). The methodology can also be used to identify trends across countries. The advantage of the WHO/HAI methodology is that it has been validated and is standardized across surveys to improve comparability (Cameron, 2013). Studies have been conducted using the WHO/HAI methodology in both the public and private sectors, although most are in the public sector. Data quality control is undertaken at multiple points throughout the data collection, entry and analysis to limit potential for incorrect data (WHO/HAI, 2008).

Finally, data is also available for a large number of low- and middle-income countries (LMICs) from all regions to allow for global and regional analysis (Cameron, 2013). The chronic non-communicable diseases (NCDs) that were assessed in this study include diabetes mellitus, hypertension and asthma. These were the most common chronic NCDs in Eswatini in 2016, with cardiovascular conditions accounting for 13% of the deaths, diabetes mellitus 6% and chronic respiratory infections at 3% (WHO, 2016). Cancer was not considered.

3.2 Study population and sampling

3.2.1 Study population

The survey was conducted in 39 private retail pharmacies (see Appendix 1) in the four regions of Eswatini, namely Hhohho, Lubombo, Manzini and Shiselweni. Most of the private retail pharmacies are in the two largest cities, Mbabane and Manzini (Hhohho and Manzini regions, respectively), with a few in the other smaller towns.

3.2.2 Selection of retail pharmacies

The sampling method used was total population sampling. All the private retail pharmacies in Eswatini were surveyed. The list of private retail pharmacies was obtained from one of the major wholesalers in Eswatini as it was not available from the MOEE. This method was chosen because the number of private pharmacies in Eswatini is relatively small. The advantages are that it allowed the researcher to paint a much more complete picture and eliminate the risk of biased sample selection that is often encountered in random study sampling (Crossman, 2019).

A list of 44 private retail pharmacies was obtained from one of the major wholesalers in Eswatini as neither the Ministry of Health (MOH) nor the Ministry of Employment and Entrepreneurship (MOEE) had a list of all the private retail pharmacies. Only 39 private retail pharmacies were surveyed, three had closed down at the time of data collection, one did not agree to the survey and one could not be reached as the telephone number was no longer in use and no other contact details were available. The surveyed private retail pharmacies did not include unlicensed drug stores, drug sellers in the informal sector and pharmacies in the private clinics and hospitals or health facilities operated by private companies (WHO/HAI, 2008).

3.2.3 Selection of medicines

A total of 46 medicines were surveyed in this study (see Appendix 2). They included 14 from the WHO/HAI core list suggested for international comparison, 29 from the Eswatini essential medicine list and 3 added to the supplementary list which were chosen based on local needs,

disease burden, existing availability and utilization. The WHO/HAI methodology specifies a core list of global medicines which were adapted in this survey. The global core list is a list of 14 medicines selected based on global disease burden and included in all WHO/HAI surveys. Adapting the list in this study ensured that the data on comparable products was collected in the survey thereby allowing international comparisons to be made, as well as collecting more detailed data on medicines used for chronic conditions. The 32 supplementary medicines were specific for the chronic conditions under study and 29 of them were from the Eswatini essential medicine list. For each medicine data was collected on the originator brand (OB), defined as the product that was first authorized worldwide for marketing, and the lowest priced generic (LPG) equivalent available in each facility.

3.3 Data collection

3.3.1 Data collection tool

Information on availability, price and affordability of medicines was obtained using an interviewer administered data collection tool (see Appendix 3) which was developed using the medicine price data collection form of the WHO/HAI manual. All the survey medicines were uploaded onto the WHO/HAI electronic data workbook. The workbook was populated with relevant information for each medicine e.g. strength, dosage form, brand name, reference price, pack size etc. The reference prices were obtained from the Management Sciences for Health (MSH) international medical products price guide 2015 edition. The survey form was then automatically generated from the survey workbook.

3.3.2 Data collection process

Data was collected from the 1st of October 2020 to the 30th of November 2020 by two researchers who are pharmacists and were trained in the WHO/HAI methodology. Due to the Covid-19 restrictions data was collected in person for the local pharmacies and telephonically for the pharmacies in the outskirts. At the time of data collection inter-country travel was not permitted. The researchers phoned the pharmacies first to make an appointment for a suitable time for data collection.

Medicine availability and price were recorded on the standard form. For each of the listed medicines data was collected and reported on:

- Availability of the OB and price paid by patients
- Availability of the LPG and price paid by patients

Where the drug was not available on the day of data collection, non-availability was reported without price data.

Prices of recommended pack sizes were noted. However, where the recommended pack size was not available, the price of the larger size was recorded and the unit price calculated accordingly. Several data validation checks were conducted during and after collection to ensure data quality. These included double checking data collection forms for accuracy and completeness after each data collection visit. During the data collection for local pharmacies the pharmacist validated the data by asking to see the available products. This could not be done with the data collected telephonically.

Data was entered into a standardized programmed MS Excel workbook provided as part of the WHO/HAI methodology toolkit. A manual check was performed after data was entered into the workbook. Data was then checked using the double entry and data checker functions of the workbook. Erroneous entries and potential outliers were verified and corrected as required.

Affordability was determined using the daily incomes of the lowest paid unskilled government worker (LPGW) which was obtained from the Eswatini Ministry of Public Service and Information (MOPSI).

A pilot study was conducted before data collection. One pharmacy from each of the four regions was surveyed. This provided researchers with practical experience in collecting data and served as a check of the appropriateness of the list of survey medicines (WHO/HAI, 2008). The list of medicines was reviewed after the pilot study to include the medicines on the global core list (acute medicines). Medicines that were not kept by private retail pharmacies in Eswatini were also removed from list.

3.4 Data analysis

Data analysis was conducted using the WHO/HAI Medicine Price Workbook. Availability of individual medicines was calculated as the percentage of medicines outlets where the medicine was found. Mean availability was also reported for all the medicines surveyed and was used for comparisons across a group of medicines, regions, as well as for corporate and individually owned pharmacies.

Medicine prices obtained during the survey are expressed as ratios relative to a standard set of international reference prices (IRP) to facilitate cross country comparisons (WHO/HAI, 2008). IRPs are the medians of recent procurement or tender prices offered by both not-for-profit suppliers to developing countries for multi-source products (WHO/HAI, 2008).
The Medicine price ratio (MPR) is calculated as the median unit price of an individual medicine across all facilities within a sector divided by the supplier IRP from the MSH drug price indicator guide. (MPR) = Median local unit price in $ / international reference unit price in $
The MPR shows how much higher or lower the local price is than the IRP.

MPRs were calculated for medicines with price data from at least two private retail pharmacies. The exchange rate used to calculate MPRs was US$1 to 16.28 Emalangeni. This was the commercial buy rate on the first day of data collection (www1.oanda.com). Medicine price analysis included median prices of individual medicines, ratio of median local price to IRP, median MPR across a group of medicines and variations between the OB and the LPG. Analysis was also carried out for variations in prices across registered private retail pharmacies including the 25th and 75th percentiles and maximum and minimum levels. The medicine price workbook incorporates the MSH international reference prices, and enables various analysis and comparisons.

In addition, the prices found in Eswatini private retail pharmacies were compared with the Single Exit Price (SEP for regional price comparisons. The SEP is used in neighboring South Africa and is the price which manufacturers must sell medicines to all pharmacies irrespective of the volume sold (Moodley & Suleman, 2019). The SEP is composed of ex-manufacturer price, logistics fees and valued added tax component (15%) (Moodley & Suleman, 2019). There is also a maximum dispensing fee that pharmacies can add to the SEP. This differs depending on the SEP of the

medicine (medicineprices.org.za). Comparisons were made with SEP alone and SEP plus the maximum dispensing fee.

Affordability was calculated using the median prices collected during the survey. The monthly cost of the treatment for chronic conditions and full course for acute conditions was then compared with the daily wage of the lowest paid unskilled government worker (LPGW) which was 111.1 Swazi Lilangeni equivalent to US$6.82 (MOPSI, 2020). The daily wage is used to determine the number of days wages needed to pay for the treatment. Treatments costing one day's wage or less are generally considered affordable (MSH, 2015).

3.5 Validity and reliability

To prevent selection bias total population sampling was used for the private retail pharmacies. The medicines selected were drawn from the different groups of medicines on the global core list including acute medicines, anti-hypertensives, anti-diabetics, lipid lowering medicines, anti-asthmatics and CNS medicines. Measurement bias was reduced by using a standardized and validated questionnaire. Standard interviewers' techniques were ensured as only two researchers who had adequate knowledge of the WHO/HAI methodology conducted the interviews. To improve reliability the methodology was based on World Health Organization and Health Action International Manual which provides detailed methodology to conduct a reliable survey to measure availability and affordability of medicines which allows for international comparison (www.haiweb.org). A pilot study was also conducted to improve and refine the data collection tool.

3.6. Limitations

This study focused on the availability and prices of selected chronic medications and seven acute medicines from private retail pharmacies; therefore, it cannot be used to generalize the overall availability of all medicines in the country. The data was collected at a specific point in time and may not represent the availability of medicines over time. Some of the data was collected telephonically (due to Covid-19 restrictions in the country at the time of data collection) and availability data collected could not be validated by the researcher for all pharmacies. In addition, the availability of medicines might have been affected by the Covid-19 pandemic. The MSH reference prices have not been updated since 2015 and might not reflect the correct prices.

Affordability was measured using the daily wage of the lowest paid government worker which might be an overestimation of affordability as there is high unemployment in Eswatini and no minimum wage set for the informal sector (Verite, 2013). The study only examines the issue of price as a barrier to access medicines and does not consider the additional costs of care or other constraints to care faced by patients with chronic diseases.

The study used total population sampling and one of the limitations of this sampling method is that non-response from some of the pharmacies as was noted from this study may skew results if their prices and availability were different from the others. However, in this study there was only one refusal and one facility that could not be reached.

3.7. Ethics considerations

Prior to the commencement of the study, ethical clearances were obtained from the Biomedical Research Ethics Committee of the University of Western Cape (BM19/10/11 see Appendix 4) and from the Ministry of Health Ethics Committee in Eswatini (see Appendix 5). The ethical clearance letters were used to request permission from the managers for the registered private pharmacies. Participants were given an Information Sheet (see Appendix 6) and Consent Form (see Appendix 7) to sign before participating in the study. The Information Sheet detailed issues of confidentiality of participants, ensuring no harm to participants, the voluntary nature of participation, as well as the ability to withdraw from the study at any time.

The privacy and anonymity of the respondents was respected. Privacy was ensured by keeping all information provided by respondents confidential. Individual registered pharmacies were not identified and codes were used to identify the private retail pharmacies. Only the two researchers had access to the names of the pharmacies. The data collected from each registered private retail pharmacy was stored in a password protected laptop and was only be used for the purposes of the research.The results of the study will be used only for the purpose of this research. They will be disseminated to the Eswatini Ministry of Health who will further disseminate them to other appropriate authorities. Presentation of the research findings at local and international conferences and publication in an academic journal will be considered.

CHAPTER 4 RESULTS

4.1 Introduction

This chapter reports the results of the analysis. The results are categorized into various sections to demonstrate how the study objectives were met. The sections are:

- Availability of surveyed medicines
- Prices of surveyed medicines
- Comparison of prices with international reference prices from the region
- Affordability of selected medical conditions

4.2 Availability of medicines

Availability and price were measured for a specific list of all 46 surveyed medicines (see appendix 2) and did not account for alternative dosage forms and therapeutic alternatives. These included selected acute medicines which are part of the global core medicines and a broad list of selected chronic medicines. The results presented only indicate availability at a specific time on the day of data collection at each facility. This might not reflect the average availability of medicines over time.

4.2.1. Availability of all surveyed medicines

Table 1: Mean availability of all medicines (N= 46)

Facilities	Originator brand(OB)	Lowest priced generic(LPG)
All(n=39)	12.1%	65.7%
Corporate Chain stores(n=11)	24.1%	75.5%
Individual owned Pharmacies(n=28)	7.4%	61.8%
Hhohho region(n=15)	11.0%	64.6%
Manzini region(n=15)	17.8%	72.8%
Shisweleni region(n=5)	7.8%	60.0%
Lubombo region(n=4)	0.0%	50.0%
Facilities in major cities(n=27)	15.9%	71.0%
Facilities in small towns(n=12)	3.4%	53.6%

n – Number of pharmacies N – number of medicines

The mean availability of all medicines was considerably lower than the 80% target set by WHO for essential medicines, with lowest priced generic (LPGs) being 65.7% and originator brands (OBs) 24.1% available. Corporate chain pharmacies had a higher mean availability of both OBs (24.1%) and LPGs (75.5%) compared to individually owned pharmacies with a mean availability of 7.4% for OBs and 61.8% for LPGs (Table 1).

Manzini region had the highest mean availability for both OBs and LPGs, 17.8% and 72.8% respectively. Next, was Hhohho region, 11% for OBs and 64.6% for LPGs. In Shisweleni region the mean availability was 3.2% lower than the Hhohho region for OBs and 4.6% lower for LPGs. Lubombo had the lowest mean availability with no original brands and only 50% of the LPGs (Table 1).

The major cities had the most retail pharmacy stores (27) and most of the corporate chains (two of the corporate chains are in small towns and nine in the major cities). Small towns had twelve private pharmacies. Pharmacies in the major cities had a mean availability of 15.9% for OBs and

71% for LPGs. In contrast, the mean availability in pharmacies in small towns was very low with 3.4% for OBs and 53.6% for LPGs (Table 1).

4.2.2 Availability of acute and chronic medicines

Table 2: Mean availability of acute & chronic medicines

Facilities	Acute medicines(N=7)		Chronic medicines(N=39)	
	Originator brand	Lowest priced generic	Originator brand	Lowest priced generic
All(n=39)	11.4%	94.9%	12.2%	60.4%
Corporate Chain stores(n=11)	16.9%	93.5%	25.4%	72.3%
Individual owned Pharmacies(n=28)	9.2%	95.4%	7.1%	55.8%
Hhohho region(n=15)	11.4%	94.3%	10.9%	59.3%
Manzini region(n=15)	14.3%	93.3%	18.5%	69.1%
Shisweleni region(n=5)	11.4%	97.1%	7.2%	53.3%
Lubombo region(n=4)	0%	100%	0%	41.0%
Facilities in major cities(n=27)	14.3%	94.2%	16.2%	66.9%
Facilities in small towns(n=12)	4.8%	96.4%	3.2%	45.9%

List of medicines (see Appendix 2)

The overall availability of LPGs for acute conditions was approximately 1.5 times higher than those medicines for chronic conditions, 94.9% for acute medicines and 60.4% for chronic medicines (Table 2). The OBs availability was almost the same for both acute (11.4%) and chronic (12.2%) medicines. All the regions had a mean availability above 90% of LPGs for the surveyed acute medicines. The mean availability of LPGs for chronic medicines in all the regions was below the WHO target of 80%, with the highest being Manzini region at 69.1% and the lowest Lubombo region at 41%. OBs had very low availability in all the regions for both acute and chronic medicines and no OBs were found in Lubombo for either acute or chronic medicines. The results show that LPG acute medicines are more available in all the regions than the LPG chronic medicines.

4.2.3 Availability of hypertension medicines

Table 3: Mean availability of hypertension medicines (N=12)

Facilities	Originator brand	Lowest priced generic
All(n=39)	16.2%	80.8%
Corporate Chain stores(n=11)	30.3%	87.9%
Individual owned Pharmacies(n=28)	10.7%	78%
Hhohho region(n=15)	13.9%	80.6%
Manzini region(n=15)	26.1%	87.2%
Shisweleni region(n=5)	6.7%	75%
Lubombo region(n=4)	0%	64.6%
Facilities in major cities(n=27)	22.2%	86.1%
Facilities in small towns(n=12)	2.8%	68.8%

Number of medicines = 12 (*Amlodipine 5mg & 10mg tabs, Atenolol 50mg tabs, Bisoprolol 5mg tabs, Captopril 25mg tabs, Enalapril 10mg tabs, Furosemide 40mg tabs, Hydrochlorothiazide 25mg tabs, Ibersatan 150mg tabs, Nifedipine 20mg tabs, Propranolol 40mg tabs & Spironolactone 25mg tabs*)

The mean availability of hypertension medicines was 20% higher (80.8%) than the overall availability of all chronic medicines (60.4%). Mean availability of all hypertension medicines in all pharmacies was 80.8% for LPGs and 16.2% for OBs (Table 3). The LPGs just met the 80% target availability set by the WHO. Corporate chain stores had the highest mean availability of hypertension medicines, with 87.9% for LPGs and 30.3% for OBs. The mean availability of LPGs for individually owned pharmacies was 78% and 0.7% for OBs. Manzini region, which had the largest number of corporate chain stores, had the highest mean availability of 87.2% for LPGs and 26.1% for OBs. Hhohho also had a high mean availability of 80.6% for LPGs and 13.9% for OBs. Lubombo, on the other hand, had the lowest mean availability of 64.6% for LPGs, which is way below the recommended 80% target for LPGs. The retail pharmacies in major cities had a high mean availability of 86.1% LPGs compared to the ones in the small

towns (68.8%) and 22.2% availability of OBs in comparison with 2.8% in small towns (Table 3). Overall, hypertension medicines are more readily available in the major cities than in small towns when LPGs are considered.

4.2.4 Availability of diabetes medicines

Table 4: Mean availability of diabetes medicines (N=5)

Facilities	All Diabetes medicines(N=5)		Oral diabetes medicines(N=3)		Insulin(N=2)	
	Originator brand	Lowest priced generic	Originator brand	Lowest priced generic	OB Pens (Eli Lilly)	OB Vials (Novo Nordisk)
All(n=39)	12.3%	70.3%	17.1%	87.2%	5.1%	44.9%
Corporate Chain stores(n=11)	25.5%	83.6%	30.3%	90.9%	18.2%	72.7%
Individual owned Pharmacies(n=28)	7.1%	65.0%	11.9%	85.7%	0%	33.9%
Hhohho region(n=15)	12.0%	72.0%	20.0%	86.7%	0%	50.0%
Manzini region(n=15)	17.3%	77.3%	20.0%	91.1%	13.3%	56.7%
Shisweleni region(n=5)	8.0%	60.0%	13.3%	86.7%	0%	20.0%
Lubombo region(n=4)	0%	50.0%	0%	75%	0%	12.5%
Facilities in major cities(n=27)	16.3%	77.8%	22.2%	90.1%	7.4%	59.3%
Facilities in small towns(n=12)	3.3%	53.3%	5.6%	80.6%	0%	12.5%

Number of medicines = 5 (*Glibenclamide 5mg tabs, Gliclazide 80mg tabs, Insulin NPH 100iu/ml vial, Insulin Regular 100iu/ml vial & Metformin HCL 500mg tablets*)

Mean availability for all diabetes LPGs medicines was 4.6% higher (70.3%) than the overall mean availability for all surveyed medicines (65.7%). There was a marked difference in the availability of oral diabetes medicines and insulin. Mean availability of oral diabetes medicines was high with an overall mean availability of 87.2% for LPGs and 17.1% for OBs whereas the overall mean availability of insulin was very low with a mean availability of 44.9% for OB vials and 5.1% for the OB pens (Table 4). No generic or biosimilars were found in the pharmacies and only two OBs (Novo Nordisk and Eli Lilly) were available in the private retail pharmacies. One of the brands had a higher price than the other as it was only available as pens and no vials and the difference in prices and dosage form was used to classify the insulin. The most available insulin was the vials in comparison to pens.

Corporate chains had higher mean availability of both LPGs and OBs, for both oral diabetes medications (90.9% and 30.3%) and insulin (72.7% for OB vials and 18.2% for OB pens)

compared to individually owned pharmacies. Mean availability of oral LPG anti diabetics was very high in all the regions except Lubombo (75%) which was lower than the WHO target. However, insulin mean availability was extremely low in comparison with the oral medicines in all the regions. The two regions with the highest mean availability of OB insulin vials were Manzini (56.7%) and Hhohho (50%). Shisweleni and Lubombo had the lowest mean availability of OB insulin vials 20% and 12.5% respectively. Retail pharmacies in small towns had the lowest mean availability of OB insulin vials, 12.5% in comparison to 59.3% for the retail pharmacies in the major cities (Table 4). Oral LPG diabetes medicines are available in all the regions however; insulin availability is low in all the regions.

4.2.5 Availability of asthma medicines

Table 5 Mean availability of asthma medicines (N=10)

Facilities	Originator brand	Lowest priced generic
All(n=39)	6.7%	52.6%
Corporate Chain stores(n=11)	16.4%	63.6%
Individual owned Pharmacies(n=28)	2.9%	48.2%
Hhohho region(n=15)	6.0%	50.7%
Manzini region(n=15)	10.0%	62.7%
Shisweleni region(n=5)	4.0%	46.0%
Lubombo region(n=4)	0%	30.0%
Facilities in major cities(n=27)	8.9%	59.6%
Facilities in small towns(n=12)	1.7%	36.7%

Number of medicines = 10 (*Aminophylline 100mg tabs, Beclomethasone 50mcg & 100mcg inhaler, Budesonide 200mcg inhaler, Hydrocortisone 100mg injection, Ipratropium Bromide 20mcg inhaler, Prednisolone 5mg tabs, Salbutamol 4mg tabs, Salbutamol 100mcg inhaler & Theophylline 200mg tabs*)

The mean availability of LPG asthma medicines (52.6%) was lower than LPG hypertension medicines (80.8%) and LPG oral diabetes medicines (70.3%). The overall mean availability for asthma medicines was 52.6% for LPGs and 6.7% for OBs. Corporates had a higher mean availability than individually owned pharmacies for both LPGs (63.6% compared with 48.2%) and OBs (16.4% compared with 2.9%) respectively (Table 5). Manzini region had the highest mean availability of LPGs and OBs for asthma (62.7% and 10.0%), Hhohho had a slightly lower mean availability of (50.7% and 6.0%) for LPGs and OBs. Lubombo had the lowest mean availability of LPGs (30%) and no OBs were available. Retail pharmacies in major cities had a higher mean availability for both LPGs and OBs (59.6% and 8.9%) than retail pharmacies in small towns (36.7% and 1.7%) though the mean availability was lower than the overall availability of all the surveyed medicines and also lower than the WHO set target of 80%. Availability of asthma medicines is generally low in all the regions.

4.2.6 Availability of Central nervous system (CNS) medicines

Table 6: Mean availability of CNS medicines (N=10)

Facilities	Depression medicines(N=3)		Epilepsy medicines(N=3)		Psychosis medicines(N=4)	
	OB	LPG	OB	LPG	OB	LPG
All(n=39)	1.7%	61.5%	27.4%	35.0%	10.3%	13.5%
Corporate Chain stores(n=11)	6.1%	66.7%	48.5%	63.6%	25%	34.1%
Individual owned Pharmacies(n=28)	0%	59.5%	19.0%	23.8%	4.5%	5.4%
Hhohho region(n=15)	0%	60%	28.9%	26.7%	6.7%	13.3%
Manzini region(n=15)	2.2%	71.1%	35.6%	55.6%	16.7%	18.3%
Shisweleni region(n=5)	6.7%	53.3%	20%	20%	10%	10%
Lubombo region(n=4)	0%	41.7%	0%	8.3%	0%	0%
Facilities in major cities(n=27)	1.2%	66.7%	35.8%	45.7%	12.0%	17.6%
Facilities in small towns(n=12)	2.8%	50.0%	8.3%	11.1%	6.3%	4.2%

Antidepressants (*Amitriptyline 25mg tabs, Diazepam 5mg tabs, Fluoxetine 20mg caps).*
Antipsychotic (*Fluphenazine Decanoate 25mg inj, Haloperidol 5mg tabs, Olanzapine 5mg tabs, Risperidone 2mg tablets)*
Antiepileptic (*Phenytoin 100mg tabs, Carbamazepine 200mg tabs & Sodium Valproate 200mg tabs*)

LPG antidepressants were the most available of all the CNS medicines with a mean availability of 61.5% in comparison with 35% for LPG antiepileptics and 13.5% for LPG antipsychotics. Antiepileptic medicines had the highest OB mean availability at 27.4%, in comparison to 10.3% for OB antipsychotics and OB antidepressants were the least availability at 1.7%.

Corporate pharmacies had a higher mean availability than individually owned pharmacies for all the three therapeutic groups (Table 6), however, the mean availability of antipsychotic LPGs was still very low even in corporate pharmacies (34.1%). Manzini region had the highest availability of LPGs for all groups of medicines with 71.1% for antidepressants, 55.6% for antiepileptics and

18.3% for antipsychotic medicines. Lubombo region had no antipsychotic medicines, very low mean availability of antiepileptics (8.3%) and fairly high mean availability of antidepressants (41.7%). The availability of all the three groups of CNS medicines was very low across all the regions.

4.2.7 Availability of dyslipidemia medicines

Table 7: Mean availability of dyslipidemia medicines (N=2)

Facilities	Originator brand	Lowest priced generic
All(n=39)	12.8%	83.3%
Corporate Chain stores(n=11)	36.4%	90.9%
Individual owned Pharmacies(n=28)	3.6%	80.4%
Hhohho region(n=15)	13.3%	83.3%
Manzini region(n=15)	20%	90%
Shisweleni region(n=5)	0%	80%
Lubombo region(n=4)	0%	62.5%
Facilities in major cities(n=27)	18.5%	90.7%
Facilities in small towns(n=12)	0%	66.7%

Number of medicines = 2 (*Atorvastatin 10mg tabs & Simvastatin 20mg tabs*)

The two medicines listed in the essential medicines list in Eswatini in this therapeutic class were included in the survey (Table 7). Dyslipidemia medicines were generally available in most of the pharmacies with an overall mean availability of 83.3% for LPGs and 12.8% for OBs. The OBs mean availability was low in all the pharmacies, although higher in corporate chain pharmacy stores (36.4%) in comparison with 3.6% for individually owned pharmacies. In Shisweleni and Lubombo, retail pharmacies in small towns had no OBs available on the day of the survey. The mean availability for LPGs in three of the regions (Manzini, Hhohho and Shisweleni) was very good with a mean availability ranging from 80% to 90%, however, Lubombo region had a lower mean availability of 62.5%. Retail pharmacies in the major cities had a very high mean

availability of 90.7% for LPGs and 18.5% for OBs in comparison with 66.7% in small towns for LPGs and no OBs.

4.3 Prices of medicines

The median unit prices in the MSH price reference guide were used for comparison. These are the median of actual procurement prices offered by not-for-profit suppliers or international tender prices to LMICs (MSH, 2015). The MSH prices are old as they were last updated in 2015 and might not be a true representation of the current prices. However, they can be used for comparison purposes. Price ratios were used in the analysis instead of prices. The WHO/HAI methodology uses price ratios rather than price comparisons to allow for international and national comparisons.

4.3.1 Medicine price ratios for all surveyed medicines

Table 8: Median value of medicine price ratios for all medicines (N=46)

Facilities	Originator brand	Lowest priced generic	Ratio OB/LPG
All(n=39)	17.92	5.55	3.23
Corporate Chain stores(n=11)	17.92	5.04	3.56
Individual owned Pharmacies(n=28)	11.04	6.18	1.79
Hhohho region(n=15)	14.50	4.11	3.53
Manzini region(n=15)	16.53	5.81	2.85
Shisweleni region(n=5)	6.38	4.31	1.48
Lubombo region(n=4)		7.21	
Facilities in major cities(n=27)	16.53	5.55	3.00
Facilities in small towns(n=12)	6.38	5.53	1.15

Reference Price MSH 2015 (https://mshpriceguide.org/en/home/)

Corporate pharmacy chain prices of LPGs were 1.14 lower than the individually owned pharmacies, however, the corporate chains price ratios for OBs were higher than the individual pharmacies (Table 8). This might be because of the lower mean availability of OBs in individually owned pharmacies (7.4%) compared to that in the corporate chains (24.1%) (Table 1). Purchasing LPGs resulted in approximately three times saving where OBs were available.

Hhohho region had the lowest prices for LPGs with patients paying 4.11 more than the MSH reference price, followed by Shisweleni with a median value of 4.31. Lubombo region had the highest median price ratio of 7.21. Manzini region prices were higher than Hhohho and Shisweleni, however, when the pharmacies in Manzini were classified as corporate and

individually owned the corporates had a median MPR value of 4.56 compared to the individual owned pharmacies with a median MPR of 6.10. The prices for all medicines was on average 5 times higher than the 2015 MSH reference prices and OBs prices were 3.23 times higher than the LPGs.

4.3.2 Medicine price ratios for acute and chronic medicines

Table 9: Median values of medicine price ratios for acute and chronic medicines

Facilities	Acute medicines(N=7)		Chronic medicines(N=39)	
	Originator brand	Lowest priced generic	Originator brand	Lowest priced generic
All(n=39)	26.34	6.23	17.92	5.41
Corporate Chain stores(n=11)	31.07	5.6	17.92	5.02
Individual owned Pharmacies(n=28)	21.74	7.72	11.04	6.03
Hhohho region(n=15)	6.59	7.97	17.87	3.91
Manzini region(n=15)	21.50	5.76	16.53	5.95
Shisweleni region(n=5)	6.38	6.83	13.84	4.27
Lubombo region(n=4)	-	9.26	-	6.38
Facilities in major cities(n=12)	21.5	5.76	16.53	5.28
Facilities in small towns(n=27)	6.38	8.23	13.84	5.48

Reference price MSH 2015 (https://mshpriceguide.org/en/home/)
Number of medicines = 7 Acute (*Amoxicillin 500mg caps, Ceftriaxone 1g inj, Ciprofloxacin 500mg tabs, Co-trimoxazole 8+40mg/ml susp, Diclofenac 50mg tabs, Omeprazole 20mg tabs & Paracetamol 24mg/ml susp*)
For chronic medicines see Appendix 2

Acute medicines had a median price ratio of 6.23 for LPGs and 26.34 for OBs with an OB/LPG ratio of 4.22. Chronic medicines had a median price ratio of 5.41 for LPGs and 17.92 for OBs with an OB/LPG ratio of 3.31 (Table 9). OBs chronic medicines had very high medicine price ratios compared to LPG chronic medicines.

Of the acute medicines, diclofenac had the highest OB/LPG ratio of 4.22 (median price for OB was 46.08 and LPG 10.92). Omeprazole had the highest LPG median price ratio of 19.60, minimum and maximum MPR of 9 and 29.04 respectively and IQR of 16.01 – 21.53 (Appendix 8). Only paracetamol suspension and diclofenac tablets had OBs, all the other acute medicines were only available as LPGs (Appendix 8).

CNS medicines had the highest median price ratios from the surveyed chronic medicines (Appendix 8). Chronic medicines price ratios were lower than the acute medicines; however acute medicines are usually given for a shorter period than chronic medicines. This might result is cheaper treatment costs for acute medicines than the chronic medicines.

4.3.3 Medicine price ratios for hypertension medicines

Table 10: Median values of medicine price ratios for hypertension medicines (N=12)

Facilities	Originator brand	Lowest priced generic	Ratio OB/LPG
All(n=39)	24.63	6.00	4.11
Corporate Chain stores(n=11)	20.90	4.39	4.76
Individual owned Pharmacies(n=28)	25.05	8.09	3.10
Hhohho region(n=15)	22.76	4.49	5.07
Manzini region(n=15)	26.66	7.18	3.71
Shisweleni region(n=5)	-	4.62	
Lubombo region(n=4)	-	8.64	
Facilities in major cities(n=12)	24.63	5.8	4.25
Facilities in small towns(n=27)	-	7.91	

Number of medicines = 12 (*Amlodipine 5mg & 10mg tabs, Atenolol 50mg tabs, Bisoprolol 5mg tabs, Captopril 25mg tabs, Enalapril 10mg tabs, Furosemide 40mg tabs, Hydrochlorothiazide 25mg tabs, Ibersatan 150mg tabs, Nifedipine 20mg tabs, Propranolol 40mg tabs & Spironolactone 25mg tabs*)

Hypertension medicine prices were 6 times higher than the MSH prices with a median price ratio of 6 for LPGs and 24.63 for OB. Corporate pharmacies had a lower median price ratio of 4.39 for LPGs than individual owned pharmacies (8.09) (Table 9). The OBs are 4.11times more expensive than the LPGs, however, when individual hypertension medicines were compared

furosemide had the highest OB/LPG ratio (Appendix 8). A patient who bought furosemide OB would pay 22 times more than the one who bought the LPG. The minimum MPR for OB furosemide was 71.46 and maximum 135.94, LPG furosemide minimum MPR was 2.06 and maximum 9.77. Spironolactone had the least difference of 1.08 between the OB and LPG, so the saving was minimal. Hydrochlorothiazide had a higher median price ratio than expected, 11.43 for LPG and 19.03 for OB (Appendix 8). Buying the surveyed hypertension medicines in Lubombo region was almost double the price of buying them in Hhohho region. Pharmacies in major cities had a lower median MPR of 5.8 in comparison with those in the small towns (7.91) for LPGs.

4.3.4 Medicine price ratios for diabetes medicines

Table 11: Median values of medicine price ratios for diabetes medicines (N=5)

Facilities	All diabetes medicines(N=5)		Oral (N=3)		Insulins(N=2)	
	Originator brand	Lowest priced generic	Originator brand	Lowest priced generic	OB Pens (Eli Lilly)	OB Vials (Novo Nordisk)
All(n=39)	8.44	5.02	4.42	3.51	12.62	5.96
Corporate Chain stores(n=11)	8.44	5.02	4.32	2.33	12.62	5.35
Individual owned Pharmacies(n=28)	5.08	6.18	5.08	4.10	-	6.54
Hhohho region(n=15)	4.42	4.46	4.42	3.27	-	5.07
Manzini region(n=15)	8.44	6.08	4.42	3.19	12.62	6.5
Shisweleni region(n=5)	4.48	3.8	4.48	3.80	-	-
Lubombo region(n=4)	-	7.64	-	7.64	-	-
Facilities in major cities(n=12)	8.44	5.02	4.42	2.87	12.62	5.96
Facilities in small towns(n=27)	4.48	4.76	4.48	4.1	-	5.42

Number of medicines = 5 (*Glibenclamide 5mg tabs, Gliclazide 80mg tabs, Insulin NPH 100iu/ml vial, Insulin Regular 100iu/ml vial & Metformin HCL 500mg tablets*)

Insulins had higher MPRs than oral diabetes medicines. The ratio of OB/LPG for oral diabetes medicines was very low as the only available OB in the pharmacies was metformin which had an OB/LPG ratio of 1.85. Corporate pharmacy chains had a lower MPR of 2.33 for oral LPGs in comparison to 4.10 for individually owned pharmacies. In the two regions (Manzini and Hhohho) median MPRs were almost similar (3.19 and 3.27), Shisweleni not too high either (3.80), however, Lubombo region had a median MPR that was double that of Shisweleni (Table 11). Oral diabetes medicines were cheaper than the insulin. The available insulins were from two different originator brands and were therefore reported separately. The two companies were Eli Lilly and Novo Nordisk. The Eli Lilly insulin was only available as pens and had median MPRs that were double that of the Novo Nordisk which was widely available as vials. Pens are generally more expensive than vials.

4.3.5 Medicine price ratios for asthma medicines

Table 12: Median values of medicine price ratios for asthma medicines (N=10)

Facilities	Originator brand	Lowest priced generic	Ratio OB/LPG
All(n=39)	6.07	3.49	1.74
Corporate Chain stores(n=11)	5.18	3.2	1.62
Individual owned Pharmacies(n=28)	5.13	3.62	1.42
Hhohho region(n=15)	4.72	3.29	1.43
Manzini region(n=15)	6.07	3.49	1.74
Shisweleni region(n=5)	-	2.83	
Lubombo region(n=4)	-	5.53	
Facilities in major cities(n=12)	6.07	3.2	1.90
Facilities in small towns(n=27)	-	3.41	

Number of medicines = 10 (*Aminophylline 100mg tabs, Beclomethasone 50mcg & 100mcg inhaler, Budesonide 200mcg inhaler, Hydrocortisone 100mg injection, Ipratropium Bromide 20mcg inhaler, Prednisolone 5mg tabs, Salbutamol 4mg tabs, Salbutamol 100mcg inhaler & Theophylline 200mg tabs*)

The MPRs for LPG asthma medicines were three times more than the MSH prices, except in Lubombo region where the ratios were five times more than the MSH prices. The OB/LPG ratio for all the pharmacies was less than two (Table 12). Salbutamol inhaler and theophylline tablets were the ones with the highest OB/LPG ratio of 2 and 3.9 respectively (Appendix 8). Salbutamol tablets was only available as a generics, however, the MPR was 23.69 with a minimum of 9.6 and a maximum of 49.91 (Appendix 8). Patients in Lubombo were paying 5.51 times more than the MSH prices in comparison to those in Shisweleni who were paying 2.83 times more and Manzini and Hhohho 3.49 and 3.29 times more respectively.

4.3.6 Medicine price ratios for CNS medicines

Table 13: Median values of medicine price ratios for CNS medicines (N=10)

Facilities	Depression medicines(N=3)		Epilepsy medicines(N=3)		Psychosis medicines(N=4)	
	OB	LPG	OB	LPG	OB	LPG
All(n=39)	32.71	8.0	13.22	10.58	48.94	53.75
Corporate Chain stores(n=11)	32.71	9.06	12.93	10.58	48.94	53.75
Individual owned Pharmacies(n=28)	-	8.0	15.62	10.10	162.19	59.69
Hhohho region(n=15)	-	3.5	14.35	5.62	162.19	43.38
Manzini region(n=15)	32.71	11.52	12.96	8.94	21.85	53.75
Shisweleni region(n=5)	-	12.80	23.20	7.20	119.11	35.28
Lubombo region(N=4)	-	14.44	-	14.61	-	-
Facilities in major cities(n=27)	32.71	8.0	12.96	10.58	21.85	53.75
Facilities in small towns(n=12)	-	8.32	23.20	6.87	76.02	35.28

Number of medicines = (3 Antidepressants (*Amitriptyline 25mg tabs, Diazepam 5mg tabs, Fluoxetine 20mg caps).* *4* Antipsychotic (*Fluphenazine Decanoate 25mg inj, Haloperidol 5mg tabs, Olanzapine 5mg tabs, Risperidone 2mg tablets)* *3* Antiepileptic (*Phenytoin 100mg tabs, Carbamazepine 200mg tabs & Sodium Valproate 200mg tabs*)

CNS medicines had the highest median MPRs in comparison to other chronic conditions. The availability was lower (Table 6) and the prices higher (Table 13) making them less accessible. Patients in Eswatini pay eight times more than the MSH prices for generic antidepressants and 32.71 times more for the OBs. Amitriptyline was only stocked as the generic and has the highest median price ratio of 16.63 (Appendix 8). Diazepam was the only medicine with an OB and LPG, the OB four times more expensive than the LPG (Appendix 8).

Antiepileptic medicines had an overall OB/LPG ratio of 1.2. Carbamazepine had the highest OB/LPG ratio of 2 with a medicine price ratio of 22.77(OB) and 10.58(LPG). Sodium valproate had the lowest median price ratio for both the OB (5.68) and LPG (4.07) (Appendix 8). Corporates had a slightly higher median price ratio for LPG than individual owned pharmacies. This could have been because of the higher availability of LPGs at corporates (63.6%) compared to 23.8% for individual owned pharmacies (Table 6).

Antipsychotics had the highest median price ratios for both the OBs and LPGs. The LPGs had a median price ratio of 53.75 in comparison with the OBs which had a median price ratio of 48.94. The MPR for LPGs was higher than that of OBs due to fluphenazine decanoate which was only available as an OB and had the lowest MPR in comparison to other antipsychotics. However, when the analysis was only for the three antipsychotics that had both the OB and LPG the median price ratio for OBs was higher (76.02) and LPG (53.75). Risperidone was the most expensive with a median price ratio for both the OB (162.19) and LPG (74.37) (Appendix 8). CNS medicines had high MPRs and very low availability as noted in Table 6. The CNS medicines are therefore not accessible.

4.3.7 Medicine price ratios for dyslipidemia medicines

Table 14: Median values of medicine price ratios for dyslipidemia medicines (N=2)

Facilities	Originator brand	Lowest priced generic
All(n=39)	11.31	2.39
Corporate Chain stores (n=11)	11.31	2.28
Individual owned Pharmacies(n=28)	11.04	2.39
Hhohho region(n=15)	14.5	2.16
Manzini region(n=15)	11.31	2.39
Shisweleni region(n=5)	-	2.34
Lubombo region(n-=4)	-	3.35
Facilities in major cities(n=12)	11.31	2.36
Facilities in small towns(n=27)	-	3.09

Number of medicines = 2 (*Atorvastatin 10mg tabs & Simvastatin 20mg tabs*)

The median price ratios for the dyslipidemia medicines were 2.39 for LPGs and 11.31 for OBs. Patients buying OBs were paying 4.73 times more than the LPGs. Availability of medicines in three of the regions was above 80% except Lubombo which had an availability of 62.5% (Table 7). A high availability and low median price ratio meant that the dyslipidemia medicines were accessible in most of the pharmacies. Atorvastatin had the highest OB/LPG ratio of 6.06, with a median price ratio of 16.25 for OB and 2.68 for LPG (Appendix 8); however, the generics had a higher availability of 84% in comparison to 20.5% for OB (Table 7).

4.3.8 Comparison of MSH reference price and South African Single Exit Price (SEP)

As described in the methods section the South African Single Exit Price has also been used as an international reference price to compare Eswatini prices with an external reference. .

Table 15: Comparison of MPR for MSH reference price and South African Single Exit Price (SEP)

Conditions	OB MSH	LPG MSH	OB SEP	LPG SEP	OB SEP + dispensing fee	LPG SEP + dispensing fee
All	17.92	5.55	4.31	2.03	2.55	1.04
Hypertension	26.63	6	5.15	2.11	2.96	0.91
Diabetes	8.44	5.02	3.49	1.85	1.54	1.07
Asthma	6.07	3.49	3.51	1.73	1.62	0.88
Cholesterol	11.31	2.39	9.52	1.98	4.48	0.93
Depression	32.71	8	24.34	3.23	5.5	1.34
Epilepsy	20.77	10.58	1.89	1.50	1.21	1.02
Pyschosis	48.94	53.75	3.72	2.1	2.55	1.38
Acute	26.34	6.23	10.73	2.56	5.88	1.13

Note MSH 2015, SEP January 2021

Only SEP lowest generic prices were uploaded in the workbook. The median price ratios for using SEP were 2.73 times lower than when MSH reference prices were used. The SEP are updated every year whereas the MSH prices used for this survey were last updated in 2015. The highest OB/LPG ratio for SEP based price ratios was for antidepressants with a ratio of 7.54, however the medicine price ratios were still lower than the MSH based medicine price ratios.

SEP plus dispensing fee represents the maximum prices patients expect to pay in the pharmacies which is why the LPG SEP plus dispensing fee price are almost similar with the medicine prices in Eswatini. The median price ratios for OB are also lower than the MSH reference prices. Some of the prices charged in Eswatini for hypertension medicines, asthma medicines and cholesterol medicines are lower than the prices charged in South Africa when the maximum dispensing fee is added. This may not reflect the correct picture of prices charged by the retail pharmacies in South Africa as some decide to charge a lesser dispensing fee than the stipulated ones to be competitive. Eswatini therefore has comparable prices with South Africa as reflected by the SEP plus dispensing fee prices in Table 15.

4.4 Affordability

Affordability was measured using the day's wage of the lowest paid unskilled government worker. The cost of a month's supply of medicines for chronic conditions and a full course for acute conditions were compared with the daily wage of a lowest paid government worker. This

analysis expresses prices in relation to an individual patient's ability to pay (MSH, 2015). Treatments that cost one day's wage or less are generally considered affordable (MSH, 2015). However, the costs do not include other healthcare costs like consultation and diagnostic tests. Affordability was calculated using LPGs.

To calculate the affordability rate in day's wages of the Lowest Paid Government Worker (LPGW), Standard Treatment Guidelines were consulted for a number of conditions. The Eswatini standard treatment guidelines were used. These calculations are for a notional 70kg patient with a "typical" presentation of the condition. In reality some patients may need lower or higher dosages but this is the average that has been used to make these calculations. A similar approach is used when defining the "Defined Daily Dose" measurement. (WHO The ATC/DDD Methodology at https://www.who.int/tools/atc-ddd-toolkit/methodology). Affordability was analyzed for the common chronic conditions and one acute condition (Table 16)

Table 16: Conditions and medicines used to calculate affordability

Condition	Medicine and dosage	Days' supply	Reference
Asthma	Salbutamol inhaler 2puffs three times a day & Beclomethasone 50mcg inhaler two puffs twice a day	30	Eswatini treatment guidelines (2012)
Diabetes	Glibenclamide 5mg twice a day & Metformin 500mg three times a day When insulin is added to the oral medicines Insulin only treatment	30 30 30	Eswatini treatment guidelines (2012)
Hypertension	1st line Hydrochlorothiazide 25mg once daily 2nd line:	30	Eswatini treatment guidelines (2012)

	Hydrochlorothiazide 25mg once daily & Atenolol 50mg once daily	30	
Cholesterol	Simvastatin 20mg once daily	30	Eswatini treatment guidelines (2012)
Depression	Amitriptyline 25mg three times a day	30	Eswatini treatment guidelines (2012)
Epilepsy	Carbamazepine 200mg twice a day	30	Eswatini treatment guidelines (2012)
Psychosis	Haloperidol 5mg twice a day	30	Eswatini treatment guidelines (2012)
Acute respiratory infections	Amoxicillin 500mg three times a day	7	Eswatini treatment guidelines (2012)

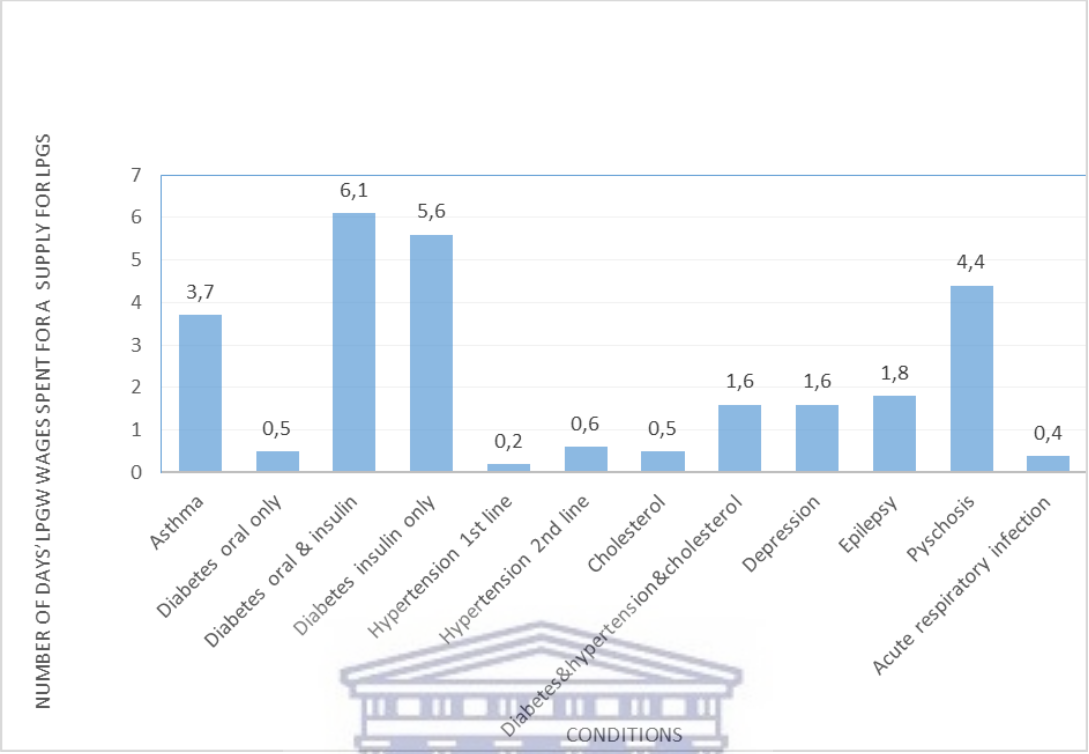

Figure 1: Affordability of selected conditions

Asthma treatment was not affordable as a month supply as the recommended treatment for the two inhalers cost 3.7 days' wage for the LPGs. Diabetes treatment was affordable if only oral LPGs were used. However, a patient with type 2 diabetes who requires insulin would not be able to afford the treatment as the whole treatment would cost 6.1 days' wages. Hypertension medicines are generally affordable for both first line and second line treatment when LPGs are used. Dyslipidemia treatment was also affordable with a cost of less than a day's wage. Many patients with an NCD may have co-morbidities and might need medication for hypertension, diabetes and dyslipidemia at the same time. The treatment then becomes unaffordable when the patient has to buy for all three conditions.

CNS medications were shown to have the highest median price ratios and all the three treatments are not affordable as they require more than a day's wage with psychosis treatment costing 4.4 days' wage. On the other hand, acute medicines were generally affordable as most of them are only taken for a few days.

When patients buy originator brands, then the cost of the medicines will not be affordable, as an example simvastatin LPG costs 0.5 day's wage whereas the OB costs 1.5 days' wage.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter discusses the major findings of this study which assessed the availability, price and affordability of selected medicines in private retail pharmacies in Eswatini. The results will be discussed in comparison with previous published studies. Several studies in Eswatini have highlighted the shortages of medicines in the public sector. Studies that were conducted in 2012 and 2013 reported that NCD medicines were frequently out of stock in the public sector (Mhlanga & Suleman, 2014: Shabangu & Suleman, 2015). A recent study by Ncube et al. (2020) similarly reported on shortages of medicines in the public facilities. This means that many patients in the country end up relying on private retail pharmacies for their medicine supplies (Shabangu & Suleman, 2015).

The study focused on 46 medicines, 39 selected chronic medicines and seven comparator acute medicines that are part of the WHO/HAI global core medicines list. Medicine selection was limited to medicines with an MSH reference price. The discussion focuses on chronic medicines and some comparisons will be made between the chronic and acute medicines. Alternative strengths, dosage forms or therapeutic alternatives were not considered. The quality of the Lowest Priced Generics (LPGs) could not be considered as Eswatini has no facilities to check the quality of medicines that are used in the country (Mhlanga & Suleman, 2014).

5.2 Availability of medicines

The results of this study show that the availability of all surveyed medicines was lower than the WHO target of 80%. Medicines are frequently not available in the public facilities and patients rely on the private sector for their supplies. A low availability of these medicines in the private sector has a negative impact on these patients. The availability was for the day of the survey only and did not capture stock fluctuations over time (Kaiser et al., 2019). Covid-19 pandemic might have affected deliveries and consumption of medicines. However, data was collected over a period of two months in different pharmacies; therefore, it provides an estimate of what patients face daily (Cameron et al., 2009).

Mean availability for all surveyed (chronic and acute) LPG medicines was 65.7% and OB medicines was 12.1%. This was lower than the findings from Mhlanga and Suleman (2014) which reported a mean availability of 77.5% for LPGs and 40% for OB. This could be because of the different times of the survey and different sample sizes and product selection. The study by Mhlanga & Suleman (2014) only focused on Manzini region with a sample size of ten private retail pharmacies and 16 chronic medicines. In this study, Manzini region mean availability of chronic medicines only was 69.1% for LPGs and 18.5% for OBs.

The overall availability findings for this study are comparable with a multi-country study by Cameron et al. (2009), which reported a private sector availability ranging from 14.8% in Chad to 79% in Ethiopia for LPGs. In the same study OBs were less available than generics in low-income countries (22.5%) and low-middle income countries (43.7%). Biziman, Kayumba & Heide (2020) also reported availability for all medicines of 71.3% in the private sector in Rwanda. The Eswatini availability though it was low was better than what many other LMICs have reported. Acute medicines were more available than chronic medicines with an overall availability of surveyed medicines of 94.9% and 60.4% for acute and chronic medicines respectively. A multi-country study by Cameron et al. (2011) reported that in LMICs generic medicines for acute disease medicines were more available than the chronic disease medicines in the private sector (66.2% and 54.7% respectively). Kasonde et al. (2019) similarly reported that availability for NCD medicines was lower than availability of medicines for infectious diseases in Bangladesh.

In this study, Manzini region had the highest overall mean availability for all surveyed medicines of 72.8% for LPGs and 17.8% for OB and Lubombo region had the lowest mean availability of 50% for LPGs and no OBs. The availability for corporate chains was higher 75.5% for LPGs and 24.1% for OBs compared with independent pharmacies 61.8% and 7.4% for LPGs and OBs respectively. This is comparable to the findings in Boston by Sharma et al (2016) where chains had a higher availability than independent pharmacies. Availability in the cities was higher - 71% for LPGs and 15.9% for OBs compared to pharmacies in small towns with 53.6% and 3.4% for LPGs and OBs, respectively.

Hypertension medicines were available in most of the retail pharmacies with an overall mean availability of 80.8% for LPGs. Manzini region had a mean availability of 87.2% for LPG hypertension medicines in this survey which is lower than Mhlanga & Suleman's (2014) study which reported that hypertension medicines like atenolol, enalapril and nifedipine were found in all the outlets in Manzini.

Of the diabetes medicines, the oral drugs had a higher availability of 87.2% for LPGs in comparison with insulin with an availability of 44.9% for the lowest priced OB. The study by Mhlanga & Suleman (2014) reported that metformin and glibenclamide were available in all facilities in Manzini. In this study Manzini region had a 91.1% mean availability for LPG oral diabetes medicines. Kaiser et al. (2019) reported a high availability of metformin and glibenclamide in comparison with insulin in Zambia. High private sector availability for a nearly identical basket of oral diabetes medicines in 12 LMICs in Africa and Asia was reported by Ewen et al. (2019). The low availability of insulin observed will affect the diabetic patients whose lives depend on these medicines. Insulin was only available as OBs and no generic or biosimilars were found in any pharmacy. This was also reported in Zambia (Kaiser et al., 2019) and by Ewen et al. (2019), who also noted that availability of biosimilars was lower than the OBs in 13 LMICs. This might be because of the limited competition on the global insulin market (Kaiser et al., 2019). Three manufacturers (Eli Lilly, Novo Nordisk & Sanofi) currently control more than 90% of the global market for insulin (WHO, 2019). Eli Lilly and Novo Nordisk were the only available brands of insulin in the Eswatini pharmacies.

Of all the medicines surveyed, CNS drugs were the least available. Ewen et al. (2017) also reported that CNS medicines were the least available in all the three country income groups in their study - 11.4%, 5.8% and 29.3% for low, lower-middle and upper-middle income groups.

5.3 Price of medicines

This study used MSH reference prices to calculate medicine price ratios (MPR). The reliability of MPRs depends on the number of suppliers used to determine the MSH price ratios. When a few or no suppliers are available, the buyer price is used and this can result in a skewed MPR

(Mhlanga & Suleman, 2014). In addition, the MSH prices were last updated in 2015 and might not reflect the correct prices.

The MPR for LPGs for all pharmacies were 5.41 times the international reference price (IRP) price for all chronic medicines whereas OBs were 17.97 times the IRP price. Mhlanga & Suleman (2014) reported higher MPRs of 41.06 and 8.67 for OBs and LPGs respectively for the surveyed chronic medicines. This could be attributed to the number of facilities that were surveyed and the differences in the years when the surveys were conducted. In this study OBs for all surveyed chronic medicines cost 3.31 times more than their equivalent LPGs. However, in the Mhlanga & Suleman (2014) study OBs were 4.73 times more than their LPG equivalent. The MPR for LPGs (5.04) was lower in corporate chains than individually owned pharmacies (6.18) for all the surveyed medicines. Overall, corporate chains charged lower prices to the patients in comparison to the independent pharmacies. Luo et al (2019) similarly reported that independent pharmacies had higher prices than big chain pharmacies in United States of America. Meanwhile, in the Boston area, the big corporate chain pharmacies had higher prices than individually owned pharmacies (Sharma et al., 2016). Although corporate chains prices were lower than the individually owned pharmacies when LPGs are considered, the MPR of OBs was higher in corporate chains than individually owned pharmacies. This might be because of the lower mean availability of OB in individually owned pharmacies (7.4%) compared to that in the corporate chains (24.1%).

Retail pharmacies in the cities had lower MPR for acute medicines and some of the chronic conditions in comparison with retail pharmacies in the small towns. Regionally, Lubombo region had the highest prices in comparison to all the other regions. Buying the surveyed hypertension medicines in Lubombo region was almost double the price of buying them in Hhohho region. Lubombo region was reported to have the highest prevalence of poverty 69% compared to 68% in Shisweleni (Zwane, 2011). This means that medicines in the poorest region were less available and more expensive making them less accessible. This was similarly reported in Florida where prices were higher in poor ZIP codes (Gellad et al., 2009). Consistent with the study by Wang et al. (2017) in Asia, the OBs were more costly than their generic equivalents in this study. This becomes an issue when generic equivalents are not available, when prescribers prescribe OBs

and when generic substitution is prohibited (Mendis et al., 2007). The use of generic medicines would result in the reduction of patients' expenditure (Cameron et al., 2011; Wang et al., 2017).

The MPR for all the surveyed medicines was 5.55 (range 1.37 – 74.34) for LPGs and 17.92 (range 2.97 – 168.24) for OBs with an OB/LPG ratio of 3.23. Mhlanga & Suleman (2014) reported a MPR of 8.67(1.68 – 53.66) for LPGs and 41.6 (range 4.25 – 168.75) for OBs in the private sector. The OBs in the same study were 4.73 times more than their equivalent generics. Cameron et al. (2009) reported a percentage difference in price of 300% between OBs and LPGs in the private sector in developing and middle-income countries. In a study in Malawi and Sri Lanka the cost of OBs was three times more than LPGs in the private sector (Mendis et al., 2007).

Prices for salbutamol inhaler was reported to be very low in all WHO regions with MPR ranging from 3 to 7 in the private sector (Cameron et al., 2009). In this study salbutamol inhaler had a lower median price ratio of 0.8 for LPGs and 1.62 for OB. This was way below the median price ratio in other WHO regions. However, in Kenya, salbutamol was the only medicine with a median price ratio for the LPG which was higher than the OB (Ongarora et al., 2019).

CNS medicines had the highest LPGs MPR of all the chronic medicines groups. Psychosis medicines had the highest MPR of 53.75 for LPGs followed by epilepsy medicines with an MPR of 10.58 for LPGs and depression medicines with an MPR of 8 for LPGs. Low availability of CNS medicines in government facilities in Eswatini was reported by MOH (2019). Thus, CNS medicines had a very low availability and high prices limiting their accessibility. Insulin had a higher MPR of 12.62 for the pens in comparison with a MPR of 5.96 for vials (OBs). Ewen et al. (2019) similarly reported that insulins in vials were cheaper than pens and cartridges in 13 LICs and LMICs. The MPR for insulins in Lusaka, Zambia were higher than in this study, with insulin OBs having an MPR of 38.46 and LPGs having an MPR of 7.69 (Kaiser et al, 2019).

Higher prices in the private sector can be attributed to price components in the supply chain which include among other things transport, salaries, rental, taxes and duty (Biziman, Kayumba & Heide, 2020). Eswatini has no medicine pricing policy for the private sector which is the same problem that Rwanda is facing (Biziman, Kayumba & Heide, 2020). Similarly, in Malawi, prices

varied across private pharmacies possibly because of the lack of price regulations and price information (Mendis et al., 2007).

5.4 Affordability of medicines

Affordability was measured using the salary of the Lowest paid Government Worker (LPGW). This widely used measure of affordability is recommended in the WHO/HAI manual. More than a day's wage for a course of acute disease medicines or for a month of treatment for a chronic disease is considered unaffordable. As stated previously, this might not be a true representation as most patients in LMICs earn less than the wages of the lowest paid government worker (Mendis et al., 2007). In addition, the assessment does not look at other costs like transport, household expenditures, if the patient has other co-morbidities and if some other family members have illnesses (Kasonde et al., 2019).

In this study diabetes treated with oral medicines, hypertension and dyslipidaemia medicines were affordable costing 0.5 days wages, 0.6 days wages and 0.5 days wages respectively when LPGs were used. Mhlanga & Suleman (2014) similarly reported that medicines surveyed for these three conditions were generally affordable when LPGs were used with standard treatment costing less than a day's wage of LPGW.

However, when a patient has comorbidities, such a hypertension, diabetes and dyslipidaemia and needs medicines for all three conditions then the treatment becomes unaffordable (1.6 days wages). Similarly, a study in Bangladesh found that a comorbid patient with diabetes, hypertension and dyslipidaemia would need five days' wages per month on medicines (Kasonde et al., 2019). In the private sector in Rwanda treatment for chronic conditions with amitriptyline, captopril, metformin, salbutamol inhaler and simvastatin were unaffordable, with simvastatin as the least affordable costing 6.6 days' wages for 30 tablets (Bizman, Kayumba & Heide, 2020). In this study the above medicines were affordable if LPGs were used except amitriptyline with a cost of 1.6 days' wage. Cameron et al. (2009) reported that treatment for conditions such as acute respiratory infections and diabetes were affordable in most LMICs when LPGs were used. However, when the OBs were used then the treatments were not affordable. Wang et al. (2017) reported similar findings where treatment for chronic diseases was less affordable in most countries when OBs were used instead of LPGs. However, a fairly recent study found that in the

DR Congo and Cameron NCD medicines were not affordable (Schafermann et al., 2019). One month's treatment with metformin cost 4.9 days wages in DR Congo and 2.8 days wages in Cameron. Treatment of diabetes was only affordable when oral medicines were used; when insulin was added then treatment was unaffordable. A month's supply of regular insulin cost 5.6 days wages. Similar results were also reported in Accra, Ghana where a month's supply of insulin cost the equivalent of 5.5 days wages (WHO, 2019). In some LMICs, insulin was not affordable for people on low wages as they needed 2.2 – 15.6 days' wages to purchase 10ml (Ewen et al., 2019). For example, in Lusaka, Zambia a month's supply of LPG insulin costs the equivalent of 12 days wages (Kaiser et al., 2019).

The first line treatment for hypertension hydrochlorothiazide was affordable with a cost of 0.2 day's wage for a month supply. However, in DR Congo it was not affordable as it was only available as an OB and the price was 53 times higher than the MSH reference price (Schafermann et al., 2019).

Salbutamol inhaler on its own was affordable, however, if used in combination with beclomethasone as stated in the Eswatini treatment guidelines the cost was 3.7 day's wage. The cost of one month's combination treatment for asthma ranged from 1.3 days wage in Bangladesh to 9.2 days wages in Malawi (Mendis et al., 2007).

The proportion of people living in poverty is high at 58.9% in Eswatini, with 70% of the rural population living below the national poverty line (MOH, 2019). The treatments that were said to be affordable may be too costly for the majority of the population who earn less than the LPGW. The pharmacies in rural areas (small cities) had low availability and higher prices in comparison to the pharmacies in major cities. Medicines are therefore less accessible to the most vulnerable groups of the population.

5.5 SEP and MSH reference prices

This is the first known study that has compared SEP and MSH price references. When the MSH reference prices were used the MPR was higher for both OBs and LPGs. However, when the SEP with or without the dispensing fee was used as reference prices the Eswatini MPRs were lower. This might be because the MSH reference prices are out-dated, as they were last updated

in 2015, whereas the SEP is current. MSH prices are procurement prices offered by not for profit suppliers or international tender prices (MSH, 2015) whereas the SEP are set by the South African government annually to be used in the private sector. These are prices that manufacturers and wholesalers sell to private pharmacies and hospitals irrespective of the volume sold (Moodley & Suleman, 2019). Researchers should therefore consider using the SEP rather than the out-dated MSH reference prices. The Eswatini SEP ratios with a dispensing fee had an MPR of 1.04 for all the surveyed medicines for LPGs. This shows that the prices charged in Eswatini private retail pharmacies are similar to the prices charged by South African private pharmacies. Antipsychotics had an MPR of 53.75 for LPGs using the MSH reference prices making them the most expensive medicines. However, when the SEP is used then the MPR for antipsychotics LPGs was lower 2.1 and 1.38 for SEP and SEP plus dispensing fee respectively. However mental health medicines remained the most expensive medicines irrespective of which reference price (MSH or SEP) were used.

CHAPTER 6: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

The availability of surveyed medicines in the private retail pharmacies in Eswatini was suboptimal. This is of concern as a large proportion of the population of the country relies on private retail pharmacies for their chronic medicines as they are not always available in the public facilities. Corporate chain pharmacies had higher availability and lower prices than the individually owned pharmacies. Availability of medicines was higher in the major cities than in small towns which are predominantly rural. Regionally, Lubombo had the lowest availability and highest prices in comparison to the other regions.

When generics were used for management of chronic conditions such as hypertension, dyslipidemia, type 2 diabetes oral medicines and for managing acute conditions, these were affordable when compared to the wages of the Lowest Paid Government Worker. However, medication for diabetes (insulin), asthma and CNS conditions were unaffordable for the majority of the population by the same metric. High prices and low availability noted for some medicines are key factors that hinder access to treatment. There is a need to improve access to affordable medicines for all chronic diseases, especially for patients in rural areas as this study's findings showed poor access to medicines in the Lubombo region which is predominantly rural. Also, improvements in access to medicines for managing mental health conditions and for diabetes treated with insulin.

6.2 Recommendations

With respect to the findings of this study, the following recommendations are made:

1. As was noted in previous studies, medicines were often unavailable in the public sector which is the sector where the majority of the population accesses their medicines supplies. There is need for the authorities to improve access to medicines in all the public sector facilities especially for chronic conditions.
2. Regular follow up comprehensive surveys on medicine availability, prices, price components and affordability for the whole country and in all sectors are needed. Such

surveys would allow policy makers to focus on the areas of greatest need when designing interventions.

3. There is need for policies to control national drug prices to ensure that medicine availability and prices are monitored and reported.
4. The authorities should consider exempting all medicines, particularly essential medicines, from taxes and duties since all medicines in the country are imported.
5. Educating prescribers and dispensers on the importance of generic prescribing and adhering to standard treatment guidelines may improve access. At the dispensing level mandatory generic substitution policies would help to reduce medicine costs and improve access, especially in chain pharmacies.

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APPENDICES

Appendix 1: List of retail pharmacies per region

Hhohho Region (15)
Clicks Pharmacy Mbabane
Clicks Pharmacy Gables
Linkmed Mbabane
Linkmed Cornerplaza
Greencross Pharmacy
Philani Pharmacy
Mbabane Pharmacy
Ezulwini Pharmacy
Genesis Mbabane City
Genesis Mbabane Checkers
Link Pharmacy Woodlands
Connection Pharmacy Mbabane
Connection Pharmacy Nhlangano
Well Pharmacy
Piggs Peak Pharmacy

Manzini Region (15)
Clicks Manzini
Linkmed Riverside
Linkmed Lifestyle
Linkmed Matshapha
Dignity Pharmacy Manzini
Dignity Pharmacy Matshapha
Onward Pharmacy
Linkmed the Hub
Sound Health Mahala
Sound Health Moneni
Sound Health Akunalutfo
Sound Health Malkerns
Swazi Chemist
Genesis Matsapha
Limpide Pharmacy

Shisweleni Region (4)
Clicks Nhlangano
Linkmed Nhlangano
Connection Pharmacy
Nhlangano Pharmacy
Genesis Nhlangano

Lubombo Region (4)
Big Bend Pharmacy

Rehoboath Pharmacy
Matata Pharmacy
Connection Plaza Simunye

Appendix 2: List of 46 Core and supplementary medicines surveyed

	Core medicines surveyed			
	International non-proprietary name, strength, dosage form	**Therapeutic class**	**Group**	**Listed in Swazi EML**
1	Amitriptyline 25 mg cap/tab	Antidepressant	NCD	Y
2	Bisoprolol 5 mg cap/tab	Antihypertensive	NCD	N
3	Captopril 25 mg cap/tab	Antihypertensive	NCD	Listed as 12.5mg
4	Diazepam 5 mg cap/tab	Anxiolytic	NCD	Y
5	Metformin 500 mg cap/tab	Antidiabetic	NCD	Y
6	Omeprazole 20 mg cap/tab	Anti-ulcerant	NCD	
7	Salbutamol inhaler (100 mcg/dose) dose (inhaler)	Anti-asthmatic	NCD	Y
8	Simvastatin 20 mg cap/tab	Serum-lipid reducing	NCD	Listed as 10MG
9	Amoxicillin 500 mg cap/tab	Antibacterial	Infectious	Y
10	Ceftriaxone injection (1 g/vial) vial	Antibacterial	Infectious	Y
11	Ciprofloxacin 500 mg cap/tab	Antibacterial	Infectious	Y
12	Co-trimoxazole suspension (8+40 mg/ml) ml	Antibacterial	Infectious	Y
13	Diclofenac 50 mg cap/tab	Anti-inflammatory	Uncategorized	Y
14	Paracetamol suspension (24 mg/ml) ml (suspension)	Antipyretic	Uncategorized	Y
	Supplementary Medicines Surveyed			
	International non-proprietary name, strength, dosage form	**Therapeutic class**	**Group**	
15	Amlodipine 10mg tablets	Anti-hypertensive	NCD	Y
16	Aminophylline 100 mg cap/tab	Anti-asthmatic	NCD	N
17	Amlodipine 5 mg cap/tab	Antihypertensive	NCD	Y
18	Irbesatan 150mg	Antihypertensive	NCD	Y
19	Atorvastatin 10 mg cap/tab	Serum-lipid reducing	NCD	Y
20	Beclometasone (100 mcg/dose) dose	Anti-asthmatic	NCD	Y
21	Carbamazepine 200 mg cap/tab	Anticonvulsant/Antiepileptic	NCD	Y
22	Atorvastatin 10mg	Serum-lipid reducing	NCD	Y
23	Fluoxetine 20 mg cap/tab	Antidepressant	NCD	
24	Fluphenazine Decanoate (25 mg/ml) ml (ampoule)	Antipsychotic	NCD	Y
25	Furosemide 40 mg cap/tab	Antihypertensive	NCD	Y
26	Glibenclamide 5 mg cap/tab	Antidiabetic	NCD	Y
27	Gliclazide 80 mg cap/tab	Antidiabetic	NCD	Y
28	Hydrochlorothiazide 25 mg cap/tab	Antihypertensive	NCD	Y
29	Hydrocortisone 100 mg vial (injection)	Medicine used in anaphylaxis	NCD	Y
30	Insulin neutral soluble (100 IU/ml) ml	Antidiabetic	NCD	
31	Propranolol 40mg	Antihypertensive	NCD	Y
32	Nifedipine 20 mg SR cap/tab	Antihypertensive	NCD	Y
33	Phenytoin 100 mg cap/tab	Anticonvulsant/Antiepileptic	NCD	Y
34	Prednisolone 5 mg cap/tab	Medicine used in anaphylaxis	NCD	Y
35	Sodium Valproate 200 mg cap/tab	Anticonvulsant/Antiepileptic	NCD	Y
36	Spironolactone 25 mg cap/tab	Antihypertensive	NCD	Y

37	Intermediate acting Insulin – Isophane	Antidiabetic	NCD	Y
38	Beclomethasone 50mcg Inhaler	Antiasthmatic	NCD	Y
39	Salbutamol 4mg	Antiasthmatic	NCD	Y
40	Ipratropium Bromide	Antiasthmatic	NCD	N
41	Budesonide	Antiasthmatic	NCD	N
42	Risperidone 2mg	Antipsychotic	NCD	Y
43	Olanzapine 5mg	Antipsychotic	NCD	Y
44	Haloperidol 5mg Tab	Antipsychotic	NCD	Y
45	Theophylline 200mg Tab	Antiasthmatic	NCD	Y
46	Atenolol 50mg tablets	antihypertensive	NCD	Y

Appendix 3: Medicine price data collection form

Medicine Price Data Collection Form

Use a separate form for each medicine outlet

Date : _____ Survey area number : _____

Name of town/village/district : _____

Name of medicine outlet (optional): _____

Medicine outlet unique survey ID (mandatory): _____

Distance in km from nearest town (population >50 000): _____

Type of medicine outlet :

q Public sector facility (specify level of care below):
- q Primary care facility
- q Secondary care facility
- q Tertiary care facility

q Private sector medicine outlet

q Other sector medicine outlet (please specify): _____

Type of price :

q Procurement price q Price the patient pays

Type of data:

q Sample outlet q back-up outlet q validation visit

Name of manager of the medicine outlet: _____

Name of person(s) who provided information on medicine prices and availability (if different from manager):

_____

Name of data collectors :

_____

_____

Verification

To be completed by the area supervisor at the end of the day, once data have been verified

Signed:_____ Date:_____

Medicine Price Data Collection Form

Lowest priced generic equivalent product:
determined at facility

A	B	C	D	E	F	G	H	I	J
Generic name,	Medicine Type	Brand or product	Manufacturer	Available yes/no	Pack size recommen	Pack size	Price of pack	Unit price (4	Comments

dosage form, strength		name(s)			ded	found	found	decimal places)	
Aminophylline 100mg cap/tab	Originator brand				1000			per cap/tab	
	Lowest-priced generic				1000			per cap/tab	
Aminophylline 250mg inj	Originator brand				10			per inj	
	Lowest-priced generic				10			per inj	
Amitriptyline 25 mg cap/tab	Originator brand	Tryptanol	MSD		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Amlodipine 5mg cap/tab	Originator brand	Norvasc	Pfizer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Amlodipine 10mg cap/tab	Originator brand	Norvasc	Pfizer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Amoxicillin 500 mg cap/tab	Originator brand	Amoxil	GSK		21			per cap/tab	
	Lowest-priced generic				21			per cap/tab	
Atenolol 50 mg cap/tab	Originator brand	Tenormin	AstraZeneca		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Atorvastatin 10mg cap/tab	Originator brand	Lipitor	Pfizer		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Beclomethasone 50mcg dose	Originator brand	Becotide	GSK		200			per dose	
	Lowest-priced generic				200			per dose	
Beclomethasone 100mcg dose	Originator brand	Becotide	GSK		200			per dose	
	Lowest-priced generic				200			per dose	
Bisoprolol 5mg cap/tab	Originator brand	Cardicor/Concor	Merck		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Budesonide 200mcg dose	Originator brand	Pulmicort	AstraZeneca		200			per dose	
	Lowest-priced generic				200			per dose	
Captopril 25 mg cap/tab	Originator brand	Capoten	BMS		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Ceftriaxone injection 1 g/vial vial	Originator brand	Rocephin	Roche		1			per vial	
	Lowest-priced generic				1			per vial	
Chlorpromazine 50mg cap/tab	Originator brand	Largactil	Sanofi		56			per cap/tab	
	Lowest-priced generic				56			per cap/tab	
Ciprofloxacin 500 mg cap/tab	Originator brand	Ciprobay	Bayer		10			per cap/tab	
	Lowest-priced generic				10			per cap/tab	
Co-	Originator brand	Bactrim	Roche		100			per	

trimoxazole suspension 8+40 mg/ml millilitre								millilitre	
	Lowest-priced generic				100			per millilitre	
Crbamazepine 200mg cap/tab	Originator brand	Tegretol	Novartis		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Diazepam 5 mg cap/tab	Originator brand	Valium	Roche		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Diclofenac 50 mg cap/tab	Originator brand	Voltaren	Novartis		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Enalapril 10mg cap/tab	Originator brand	Renitec	MSD		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Fluoxetine 20mg cap/tab	Originator brand	Prozac	Lilly		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Fluphenazine Decanoate 25mg inj	Originator brand	Modecate	BMS		1			per inj	
	Lowest-priced generic				1			per inj	
Furosemide 40mg cap/tab	Originator brand	Lasix	Sanofi		250			per cap/tab	
	Lowest-priced generic				250			per cap/tab	
Glibenclamide 5 mg cap/tab	Originator brand	Daonil	Sanofi		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Gliclazide 80mg cap/tab	Originator brand	Diamicron	Servier		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Haloperidol 5mg cap/tab	Originator brand	Serenace	Pfizer		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Hydrochrolothiazide 25mg cap/tab	Originator brand	Ridaq	Aspen		500			per cap/tab	
	Lowest-priced generic				500			per cap/tab	
Hydrocortisone 100mg inj	Originator brand	Solucortef	Bayer		1			per inj	
	Lowest-priced generic				1			per inj	
Insulin Glargine Lilly Basaglar 100 iu/ml vial	Originator brand	Basaglar	Lilly		10			per vial	
	Lowest-priced generic				10			per vial	
Insulin Glargine Sanofi Lantus 100 iu/ml vial	Originator brand	Lantus	Sanofi		10			per vial	
	Lowest-priced generic				10			per vial	
Insulin NPH 100 iu/ml vial	Originator brand	Humulin N	Lilly		10			per vial	
	Lowest-priced generic				10			per vial	
Insulin Regular 100 iu/ml vial	Originator brand	Humulin R	Lilly		10			per vial	
	Lowest-priced generic				10			per vial	
Ipratropium Bromide	Originator brand	Atrovent	Ingelheim		200			per dose	

20mcg dose	Lowest-priced generic				200			per dose	
Irbesatan 150mg cap/tab	Originator brand	Aprovel	Sanofi		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Metformin HCL 500 mg cap/tab	Originator brand	Glucophage	BMS		50			per cap/tab	
	Lowest-priced generic				50			per cap/tab	
Nifedipine 20mg cap/tab	Originator brand	Adalat	Bayer		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Olanzapine 5mg cap/tab	Originator brand	Zyprexa	Lilly		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Omeprazole 20 mg cap/tab	Originator brand	Losec	AstraZeneca		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Paracetamol suspension 24 mg/ml millilitre	Originator brand	Panado	GSK		60			per millilitre	
	Lowest-priced generic				60			per millilitre	
Phenytoin 100mg cap/tab	Originator brand	Epanutin	Pfizer		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Prednisolone 5mg cap/tab	Originator brand	Merticoten			1000			per cap/tab	
	Lowest-priced generic				1000			per cap/tab	
Propranolol 40mg cap/tab	Originator brand	Inderal	AstraZeneca		1000			per cap/tab	
	Lowest-priced generic				1000			per cap/tab	
Risperidone 2mg cap/tab	Originator brand	Risperdal	Janssen		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Salbutamol 4mg cap/tab	Originator brand	Ventolin	GSK		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Salbutamol inhaler 100 mcg/dose dose	Originator brand	Ventolin	GSK		200			per dose	
	Lowest-priced generic				200			per dose	
Simvastatin 20 mg cap/tab	Originator brand	Zocor	MSD		30			per cap/tab	
	Lowest-priced generic				30			per cap/tab	
Sodium Valproate 200mg cap/tab	Originator brand	Epilim	Sanofi		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	
Spironolactone 25mg cap/tab	Originator brand	Aldactone	Pfizer		60			per cap/tab	
	Lowest-priced generic				60			per cap/tab	
Theophylline 200mg cap/tab	Originator brand	Nuelin	Inova		100			per cap/tab	
	Lowest-priced generic				100			per cap/tab	

Before leaving the facility :
Data collectors should check that the data collection form is legible, accurate and complete before leaving the facility and returning completed forms to the area supervisor. They should report any problems as soon as possible. They should also check to see whether at least half of the survey medicines were available, to determine whether a visit to a back-up facility is required.

Appendix 4: Ethics Clearance University of Western Cape

UNIVERSITY of the WESTERN CAPE

50 YEARS of hope, action & knowledge

04 August 2020

Ms T Zvinavashe, Mr W Siduna and Dr H Bradley
School of Public Health
Faculty of Community and Health Science

Ethics Reference Number: BM19/10/11

Project Title: Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini

Approval Period: 24 July 2020 – 24 July 2023

I hereby certify that the Biomedical Science Research Ethics Committee of the University of the Western Cape approved the scientific methodology and ethics of the above mentioned research project.

Any amendments, extension or other modifications to the protocol must be submitted to the Ethics Committee for approval.

Please remember to submit a progress report annually by 30 November for theduration of the project.

Permission to conduct the study must be submitted to BMREC for record-keeping.

The Committee must be informed of any serious adverse event and/or termination of the study.

Ms Patricia Josias
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NHREC Registration Number: BMREC-130416-050

FROM HOPE TO ACTION THROUGH KNOWLEDGE.

Appendix 5: Ethics Clearance Eswatini Ministry of Health

RESEARCH PROTOCOL CLEARANCE CERTIFICATE

BOARD REGISTRATION NUMBER	**FWA 00026661/IRB 00011253**								
PROTOCOL REFERENCE NUMBER	**SHR225/2020**								
Type of review	Expedited	X		Full Board					
Name of Organization	**Student (Master's)**								
Title of study	Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini								
Protocol version	1.0								
Nature of protocol	New	X	Amendment		Renewal		Extension		
List of study sites	All retail Pharmacies in Eswatini								
Name of Principal Investigator	Mrs. Zvinavashe, Tungamirai								
Names of Co- Investigators	N/A								
Names of steering committee members in the case of clinical trials	N/A								
Names of Data and Safety Committee members in the case of clinical trials	N/A								
Level of risk (Tick appropriate box)	Minimal		More than minimal	High					
	X								
Clearance status (Tick appropriate box)	Approved	X		Disapproved					
Study approval validity period	Start date	21/09/2020		End date	21/09/2021				
Secondary approval validity end dates	Renewal end date			Extension end date					
Signature of Chairperson									
Signing date	21/09/2020								
Secretariat Contact Details	Name of contact officers	Babazile Shongwe							
	Email address	ethicsswaziland@gmail.com							
	Telephone no.	(00268) 2404 4810							

ESWATINI HEALTH & HUMAN RESEARCH REVIEW BOARD
21 SEP 2020
P.O. BOX 5, MBABANE H100 (+268) 2404 4810
EHHRRB

APPROVAL CONDITIONS

Ref.	Conditions	Indication of conditions (tick appropriate box)	
1	Implementation of approved version of protocol	✓	
2	Submission of end of project report (Hard copy)	✓	
3	Submission of end of project report (Soft copy)	✓	
4	Submission of data sets		

List of reviewed documents

Ref.	Documents	Reviewed documents (tick appropriate box)
1	Completed application form	✓
2	Cover letters	✓
3	Evidence of administrative permission to conduct the research by involved institutions/sites (where applicable)	
4	Detailed current resume or curriculum vitae of Principal Investigator/s including Principal Investigators declaration	✓
5	Summary resume or biography for other investigator(s)	✓
6	Evidence of approval/rejection by other Ethics Committees, including comments and requested alterations to the protocol, where appropriate.	✓
7	Research protocol (see outline in Annex 1)	✓
8	Questionnaires and interview guides (with back-translated versions where applicable)	✓
9	Case report forms (CRFs), abstraction forms and other data collection tools	
10	Participant/subjects Information Statement(s) (where applicable)	✓
11	Informed consent form(s) including photographic and electronic media consent statements.	✓
12	Advertisements relevant to the study (where applicable)	
13	Source of funding and detailed budget breakdown including material and incentives to participants if applicable	✓
14	Notification form for adverse effects/events.	
15	Proof of payment	✓
16	Proof of insurance cover for research subjects in clinical trials or where applicable	
17	Any other special requirements should be stated, if applicable	

Appendix 6: Information sheet

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2809 Fax: 27 21-959 2872

E-mail: soph-comm@uwc.ac.za

PARTICIPANT INFORMATION SHEET

Project Title: Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini.

What is this study about?

My name is Tungamirai Zvinavashe, a post graduate Master of Public Health (MPH) student at the University of Western Cape. I am conducting research which is a requirement for the MPH. You are invited to participate in this research because your pharmacy is a registered private pharmacy in Eswatini. The aim of the study is to determine the availability, price and affordability of selected chronic medications in registered private pharmacies in Eswatini. The study will focus on medicines for three non-communicable diseases (NCDs), namely diabetes, hypertension and asthma.

What will I be asked to do if I agree to participate?

You will be asked to give information about the name of the pharmacy, the pharmacy manager , the availability of the medicines under study and their prices. The information you provide will be recorded on a standardized medicine prices data collection form.

Would my participation in this study be kept confidential?

To protect your identity, your pharmacy identity will be replaced with a study identification number. I will be the only one who can link your completed data form to your pharmacy as I will be the only one with access to the identification details.

To ensure your confidentiality, all data will be kept in a locked filing cabinet in a locked room with restricted access, data forms will have identification codes without names and computers with the study data will be password protected. The name of your pharmacy will not appear in the final report.

What are the risks of this research?

There may be some risks from participating in this research study. As a private pharmacy you will be revealing some of your pricing practices to the researcher . We will nevertheless ensure that the data is kept strictly confidential.

What are the benefits of this research?

This research is not designed to help you personally, but the results may help the investigator learn more about availability, prices and affordability of selected chronic medications. We hope that, in the future this may be helpful in contributing to policies that will ensure availability and affordability of essential medicines in Eswatini.

Do I have to be in this research and may I stop participating at any time?

Your participation in this research is completely voluntary. You may choose not to take part at all. If you decide to participate in this research, you may stop participating at any time. If you decide not to participate in this study or if you stop participating at any time, you will not be penalized or lose any benefits to which you otherwise qualify.

What if I have questions?

This research is being conducted by Tungamirai Zvinavashe, School of Public Health at the University of the Western Cape. If you have *any* questions about the research study itself, please contact Tungamirai Zvinavashe at: 0026876622886 or 3814791@myuwc.ac.za.

Supervisors:

Dr Hazel Bradley, School of Public Health, University of the Western Cape, Robert Sobukwe Road, Bellville 7535, South Africa

Email: hbradley@uwc.ac.za Tel: 0027219592630

Prof Richard Laing, Boston University School of Public Health, 801 Massachusetts Avenue, Boston, MA 02118, USA/ School of Public Health, University of the Western Cape, Robert Sobukwe Road, Bellville 7535, South Africa

Email: richardl@bu.edu Tel: 00161 7414 1445

Should you have any questions regarding this study and your rights as a research participant or if you wish to report any problems you have experienced related to the study, please contact:

Prof Uta Lehman

Director School of Public Health

University of the Western Cape

Private Bag X17

Bellville 7535

ulehmann@uwc.ac.za

Prof Anthea Rhoda

Dean, Faculty of Community & Health Sciences

University of the Western Cape

Private Bag X17

Bellville 7535

chs-deansoffice@uwc.ac.za

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building,
C-Block, Top Floor, Room 28

This research has been approved by the University of the Western Cape's Senate Research Committee. (REFERENCE NUMBER: to be inserted on receipt thereof from SR)**.**

Appendix 7: Consent form

UNIVERSITY OF THE WESTERN CAPE

Private Bag X 17, Bellville 7535, South Africa

Tel: +27 21-959 2809 Fax: 27 21-959 2872

E-mail: soph-comm@uwc.ac.za

CONSENT FORM

Title of Research Project: Availability, price and affordability of selected chronic medications in private retail pharmacies in Eswatini.

The study has been described to me in language that I understand. My questions about the study have been answered. I understand what my participation will involve and I agree to participate of my own choice and free will. I understand that my identity will not be disclosed to anyone. I understand that I may withdraw from the study at any time without giving a reason and without fear of negative consequences or loss of benefits.

Participant's Name (Optional): _____

Participant's Signature: _____

Date: _____

BIOMEDICAL RESEARCH ETHICS ADMINISTRATION
Research Office
New Arts Building,
C-Block, Top Floor, Room 28

Appendix 8: Medicine availability and price summary

Medicines Availability And Price Summary

		Medicines Availability in Outlets								
		Brand					Lowest Price			
Medicine Name	Medicine list	Public (n=80)	Private (n=39)	Private (n=39)	(n=3)	Private (n=39)	Procurement (n=80)	Public (n=80)	Private (n=39)	(n=3)
Aminophylline	Supplementary		0.0%	17.9%					5.55	
Amitriptyline	Global		0.0%	89.7%					14.63	
Amlodipine	Supplementary		17.9%	76.9%		57.81			14.58	
Amlodipine	Supplementary		17.9%	76.9%		24.63			6.73	
Amoxicillin	Global		0.0%	100.0%					4.10	
Atenolol	Supplementary		0.0%	100.0%					8.61	
Atorvastatin	Supplementary		20.5%	84.6%		16.25			2.68	
Beclomethasone	Supplementary		0.0%	56.4%					2.72	
Beclomethasone	Supplementary		0.0%	61.5%					1.84	
Bisoprolol	Global		35.9%	69.2%		4.25			2.05	
Budesonide	Supplementary		5.1%	2.6%		2.97				
Captopril	Global		0.0%	97.4%					1.60	
Ceftriaxone Injection	Global		0.0%	82.1%					7.72	
Ciprofloxacin	Global		0.0%	100.0%					6.23	
Co-trimoxazole suspension	Global		0.0%	94.9%					2.38	
Cbamazepine	Supplementary		48.7%	41.0%		20.77			10.58	
Diazepam	Global		5.1%	35.9%		32.71			8.00	
Diclofenac	Global		10.3%	100.0%		46.08			10.92	
Enalapril	Supplementary		12.8%	87.2%		4.86			3.91	
Fluoxetine	Supplementary		0.0%	59.0%					3.50	
Fluphenazine Decanoate	Supplementary		7.7%	0.0%		20.40				
Furosemide	Supplementary		20.5%	89.7%		77.87			7.89	
Glibenclamide	Supplementary		0.0%	94.9%					6.03	
Gliclazide	Supplementary		0.0%	74.4%					2.16	
Haloperidol	Supplementary		5.1%	7.7%		76.02			53.75	
Hydrochrolothiazide	Supplementary		30.8%	94.9%		19.03			11.43	
Hydrocortisone	Supplementary		23.1%	48.7%		6.07			6.07	
Insulin NPH	Supplementary		5.1%	41.0%		8.44			6.90	
Insulin Regular	Supplementary		5.1%	48.7%		16.80			5.02	
Ipratropium Bromide	Supplementary		7.7%	0.0%		27.53				
Irbesatan	Supplementary		30.8%	38.5%		34.87			14.38	
Metformin HCL	Global		51.3%	92.3%		4.42			3.51	
Nifedipine	Supplementary		5.1%	94.9%		31.24			5.27	
Olanzapine	Supplementary		12.8%	15.4%		21.85			12.37	
Omeprazole	Global		0.0%	87.2%					19.60	
Paracetamol suspension	Global		69.2%	100.0%		6.59			2.36	
Phenytoin	Supplementary		2.6%	41.0%					12.40	
Prednisolone	Supplementary		2.6%	100.0%					3.30	
Propranolol	Supplementary		0.0%	53.8%					3.76	
Risperidone	Supplementary		15.4%	30.8%		162.19			74.37	
Salbutamol	Supplementary		0.0%	94.9%					23.69	
Salbutamol Inhaler	Global		20.5%	97.4%		3.36			1.65	
Simvastatin	Global		5.1%	82.1%		6.36			2.11	
Sodium Valproate	Supplementary		30.8%	23.1%		5.68			4.07	
Spironolactone	Supplementary		23.1%	89.7%		3.31			3.79	
Theophylline	Supplementary		7.7%	46.2%		14.61			3.68	