A COMPARISON STUDY BETWEEN PUBLIC AND PRIVATE HEALTHCARE SECTOR MEDICINE PRICES IN SOUTH AFRICA.

BY

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Submitted as the dissertation component in partial fulfilment for the degree of Master of Pharmacy (M-PHPE) in the Discipline of Pharmaceutical Sciences, School of Health Sciences, University of KwaZulu-Natal.

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PREFACE

A mini thesis submitted to the School of Health Sciences, Discipline of Pharmaceutical Sciences, University of KwaZulu-Natal, Westville Campus, for the partial fulfilment of the degree of Master of Pharmacy (Pharmacoeconomics). This is a mini thesis in which the chapters are written as a set of discrete research manuscripts, with an overall introduction, literature review, and final summary. The findings of the study are presented in chapter 3, as a manuscript as required by the regulations of the University of KwaZulu-Natal. This manuscript has been submitted for publication to the *Journal of Pharmaceutical Health Services Research*. The reference list is cited according to the instructions for authors as required by the *Journal of Pharmaceutical Health Services Research.* A complete reference list is included at the end of every chapter.

The dissertation consists of four chapters as follows:

Chapter 1: provides an introduction to the study as well as the aims, objectives, and a brief overview of the methodology.

Chapter 2: provides the literature background to the study.

Chapter 3: consists of the results, discussion, and conclusion written in a manuscript format.

Chapter 4: provides the general conclusions, recommendations, limitations, and strengths of the study.

ABSTRACT

Introduction

The adoption of medicine pricing regulations was established to counter the on-going global struggle of high medicine prices. South Africa's healthcare is divided into the private and public sector and each sector functions utilizing different medicine pricing systems i.e. the tender and single exit price (SEP) system. The National Health Insurance (NHI), in its pilot phase in SA, may declare new system changes and improvements. Therefore, increased data on current medicine pricing systems are necessary particularly to assist the NHI process.

Aim

The overall aim of this study was to compare the medicine prices procured in the public tender system with the private SEP system.

Objectives

The objectives of the study were to compare pricing trends, determine price differentials, and equate the average price index of a basket of medicines between the public and private healthcare sectors in South Africa.

Methods

A pricing list consisting of 32 essential medicines available in both the public and private healthcare systems of South Africa was chosen for this study. The price of medicines for the private sector were obtained from the Medicine Price Registry- Open Up website for the period 2014–2018. Public sector medicine prices were obtained from the Department of Health website for the corresponding period. Observations and pricing trends were identified and analysed using Microsoft Excel version 2016.

Key Findings

A total of 74 medicine brands were analysed in the study. It was found that the prices across both sectors had increased over time, however, the majority of brands (87%) displayed higher prices in the private sector in comparison to the public sector. The price differential between the private and public sector medicines yielded positive values with the median of

252.30%.

Conclusion

The study found vast price differences between each pricing system due to the different methodologies practiced. Some of the methods and procedures utilized are known, however, both systems lack complete transparency in the processes applied. Therefore, more transparent medicine pricing systems need to be considered for the future of South Africa's healthcare system as the country transitions toward universal health coverage.

Keywords

Public tender prices, single exit price (SEP), medicine pricing trends

DECLARATION 1 - PLAGIARISM

I, Tarryn Thaver, declare that:

The research reported in this thesis, except where otherwise indicated, is my original work.

1. The work described in this thesis has not previously been submitted to UKZN or other tertiary institutions for purposes of obtaining an academic qualification, whether by myself or any other party.
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Name: Tarryn Thaver

This is to certify that the contents of this thesis are the original work of Mrs. Tarryn Thaver and as the candidate's supervisors, we have approved this thesis for submission.

Signed: 

Name: **Dr Varsha Bangalee** Date: 21/06/2020

Signed: 

Name: **Dr Neelaveni Padayachee** Date: 21/06/2020

DECLARATION 2 – ETHICS APPROVAL

Ethical approval for the study was obtained from the University of KwaZulu-Natal Humanities and Social Science Research Ethics Committee (HSS/0421/019M) – (Annexure 1). Ethics training was additionally completed by means of the National Institute of Health Office of Extramural Research (see Annexure 2).

DEDICATION

I dedicate this thesis to my loving parents: this one is for you mum, and dad. And to my loving husband: - this is ours to share.

ACKNOWLEDGMENTS

I would like to acknowledge my research supervisor, Dr. Varsha Bangalee, for her continuous assistance, guidance, patience, and support throughout the development of this thesis. I am sincerely grateful for all the hours and time you so humbly offered to me. I will always be grateful and without you, this thesis would not be.

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LIST OF ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
CPI	Consumer Price Index
EML	Essential Medicine List
GDP	Gross Domestic Profit
HAI	Health Action International
HIV	Human Immunodeficiency Virus
LMIC	Low - and Middle-Income Countries
NDOH	National Department of Health
NDP	National Drug Policy
NHI	National Health Insurance
NHS	National Health Service
NT	National treasury
PPI	Purchaser Price Index
SA	South Africa
SEP	Single Exit Price
STG	Standard Treatment Guidelines
UHC	Universal Health Coverage
UK	United Kingdom
UKZN	University of KwaZulu-Natal
USA	United States of America
WHO	World Health Organization

Contents

CHAPTER 1: INTRODUCTION

Medicine accessibility and availability is a continuous global challenge and concern (World Health Organization and Health Action International, 2008). Coupled with an increase in the price of daily resources, medicine expenditure is also on the rise. Globally, there have been several efforts to decrease medicine prices and increase accessibility to medicines. Amongst these efforts has been the introduction of medicine pricing policies which aims to regulate medicine prices thus resulting in improved accessibility and availability of medicines.

The private healthcare sector of South Africa (SA) utilizes pricing regulations in the form of the Single Exit Pricing (SEP) system, which regulates medicine prices for this sector. The public healthcare sector of SA is largely government-funded and utilizes a medicine tendering system to avail medicines. These two systems currently function in parallel with its respective concerns, however, with the National Health Insurance (NHI) being in its pilot phase in SA, confirmation on the pricing regulations to be used are still malleable. Research on the impact and use of current pricing regulations is limited and requires further investigation to assist in forecasting trends and policy requirements for the future healthcare system in SA.

This thesis aims to present the pricing trends between the two medicine pricing systems by comparing the prices of specific essential medicines over the preceding five years (2014 - 2018). The current and archived medicine price data were collated to establish the trends that exist in each sector. Observing these trends will provide perspective on the current mechanisms practiced in each pricing system and aid policymakers in future projections for South Africa's healthcare system.

1.1 Background and Rationale Behind the Study

The need for bettering healthcare systems is a priority among most countries worldwide. Systems that can develop and improve the pharmaceutical division are imperative in order to establish sustainable and favourable mechanisms. Several methodologies are thus being applied and investigated to accomplish accessibility as well as the availability of medicine to all citizens as a vital outcome.

The Essential Medicine Lists (EML) is in place to support access to basic medicinal products at adequate pricing, quantity, and quality, in the effort of making medicines available for both the individual and communities at large (World Health Organization, 2019). Access to these medicines ensures that the basic human right to healthcare is prioritized. The efforts of such practice are to ensure that the majority of the population have access to essential needs in a pharmaceutical society where decreased medicine prices are difficult to obtain (van der Gronde, et al., 2017). South Africa's public health sector utilizes the EML with the intent to provide access to the most vital medicinal needs. The procurement of medicines from the EML is done via the medicine tender process and relies on pharmaceutical companies bidding toward the tender contract for specific medicines (Department Health Republic of South Africa, 2020).

The private healthcare sector does not utilize an EML (medicine formularies are more often used to regulate spending in this sector)_, however, pricing regulations were established to achieve some standardization in relation to medicine pricing for this sector. Several regulations in the private sector were implemented to improve access to medicines at affordable prices. One such regulation was the SEP system. The SEP system mandates that the cost of a medicine is sold at a standard price to all consumers (except for the government) as decided by the manufacturer, irrespective of the quantity ordered by the customer as well as the consumption levels used (Bangalee & Suleman, 2018). However, the measures of success of pricing policies and regularities remain multi-dimensional and complex, hence necessitating for further investigations of the current pricing regulations (Bangalee & Suleman, 2015).

The pricing systems currently employed need to exhibit better transparency and consistency in prices throughout the public and private sectors especially with the implementation of the NHI. The procurement processes utilized in the current healthcare system do not function uniformly thus leading to the inconsistency of prices of the same medicinal products in the different sectors. Information concerning current pricing policies and its effects on medicinal prices are vague and require more investigations before conclusive decisions about the functionality of each pricing system can be made. Further understanding of the current medicine pricing systems existing in contrast to each other forms the cornerstone and foundation of this study.

1.2 Aims and Objectives

The overall aim of this study was to compare the medicine prices procured in the public tender system with the private SEP system. This thesis has the following specific objectives:

- To examine the prices of medicines in the public and private sectors to establish the pricing trends that exist
- To determine the medicine price differential between each pricing system
- To equate the average price index between each pricing system

1.3 Significance of the Study

The medicinal procurement systems in use face constraints due to "lack of financial oversight, insufficient communication, and liaison between stakeholders; poor procurement practices; outdated information systems and lack of human resources to support the current system" (Berger, et al., 2010). Further investigation within each medicine pricing system is necessary due to many problems that are encountered by each system. The South African government has employed medicine pricing policies and regulations with the intent of decreasing the medicine cost burden faced by the citizens of SA. The high cost of medicine is one of the many challenges that affect the progress of healthcare and disease management and requires an efficient system to be implemented to address these challenges. The National Drug Policy (NDP) initiated the medicine pricing regulations to improve the healthcare system in SA. However, with trying to improve healthcare by implementing pricing regulations, insight on the current regulations need to be assessed. Hence this research study will avail more information and propose recommendations towards future policy advancements.

Medicine policy regulations are currently utilized within the two-tiered healthcare system. Information on the functionality, effectiveness, productivity, and success of the existing systems is scarce and is necessary for guiding future developments in SA's healthcare system. One of the future healthcare developments currently being phased in is the NHI. With NHI in progress, the medicine pricing procedures that will be undertaken during the initiation of such programs remain indefinite. This makes all available data associated with medicine pricing regulations in SA particularly important especially with the implementation phase of the NHI already on its way. Thus, the lessons gained from this study will assist in expanding knowledge on practices of the present regulatory systems and

recommend improvements that need to be incurred to accommodate the NHI program.

The value of this study will assist and improve the lack of transparency in medicine prices for both healthcare sectors of SA. It has been stated that some public tender medicine prices are approximately one-tenth that of the private medicine prices (Makholwa, 2014). This study will explore if such comparisons in medicine prices exist and the extent of price differences that are encountered. The findings will form a transparent outline of the regulations that are in practice by displaying the actual prices of medicines in each sector.

1.4 Research Methodology

A two-step research approach was used in this study. This consisted of a literature review phase followed by empirical investigations.

1.4.1 Literature Review

A multitude of research articles was explored to form the literature review that provides the background, context, and significance of this study. These included journal articles, books, and papers written in relation to the South African Pharmaceutical Pricing Systems and how it functions. The review explores the pricing systems adopted in SA as well as an overview of the pricing regulations practiced around the world. Similar studies that acquired data on pricing, accessibility, and availability of medicines globally were also viewed. The focus of the review provides insight into the two pricing systems being used in South Africa, i.e.

- The public tender medicine pricing system,
- The private SEP system.

1.4.2 Empirical Investigation

Medicine selection

The intended comparison study was descriptive, quantitative, and retrospective in nature. The study compared the trends that exist between the medicine pricing systems used in SA for the past five years (2014-2018). The public tender system and private SEP system were the two systems that were investigated during the study. In order to compare the trends in medicine prices within each pricing system, a selection of medicines had to be chosen for the study. The basket of medicines chosen for this study was based on that of a study conducted by Xiphu and Mpanza which used the WHO/HAI methodology (Health Action International, 2019) to explore medicine availability, affordability, and prices (Xiphu & Mpanza, 2004). The

medicine list used in the Xiphu and Mpanza study consisted of 42 essential medicines (active ingredients), however, this list was amended to fit the requirements for this study. From the selected 42 medicines, only medicines that appeared on the EML for all five years were chosen and formed the final medicine basket (32 medicines) that would be investigated in the study.

Data Analysis

The data required for the quantitative analysis was sourced using publicly available websites that recorded the medicine prices of the specific medicine list that was used for this study. The SEP list for current and archived data was obtained from the "Medicine Price Registry-Open Up website" (Open Up, 2019). The public tender medicine price lists were obtained from the National Department of Health website where the current and past tender contracts were posted, including the addendum for certain contracts (Department of Health, 2019).

After prices were collected for the selected medicines, Microsoft Excel 2016 analysis tool was used to graphically represent the data. The study was further analysed by listing the trends that were found, calculating the average price difference, and calculating the average price index.

The results from the study were used to answer the objectives of this research and the findings of this thesis were synthesized to form recommendations for the future healthcare programs in SA including the NHI.

1.5 Ethical Approval

Ethical approval for this study was obtained from the University of KwaZulu-Natal Humanities and Social Science Research Ethics Committee (HSS/0421/019M) (see Appendix 1). Ethics training was additionally completed by means of the National Institute of Health Office of Extramural Research (see Appendix 2).

1.6 Chapter Summary

This chapter summarizes the study's rationale and significance, research questions, aims, objectives, and a brief outline of the research methodology.

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CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

South Africa's healthcare system has a unique setup that is controlled by specific policies and regulations. These regulations are instituted in the pharmaceutical sector which is guided by protocols to enhance and improve healthcare, particularly targeting expenditure. This chapter will focus on introducing the South African healthcare structure together with the pharmaceutical pricing regulations that govern this structure. It will provide insight on similar study approaches conducted on accessibility and availability of medicines, and explore comparable regulatory approaches practiced worldwide.

2.2 South Africa's Healthcare System

2.2.1 The Facts and Figures

South Africa (SA) is regarded as a middle-income country (The World Bank group, 2020) with healthcare governed by a unique two-tiered system (Department of Health, 2003). This two-tiered system is divided into the public sector and private sector, with a disproportionate distribution of finances and resources. The public sector renders healthcare to 84% of the population while 16% is covered by the private sector service (National Department of Health, 2015). With approximately 64.7% of the country inhabiting provinces that are considered rural (Mahlathi & Dlamini, 2017), the majority of the population access healthcare via the public health sector. Low-income residents mainly utilize the public healthcare facilities while higher-income residents (some having private medical aid insurance) utilize the private health sector facilities (Gilson & McIntyre, 2007).

The public health sector is funded by the government and 40% of all expenditure on health emanates from the National Treasury (National Treasury, 2006). Public health consumes around 11% of the government's total budget (allocated largely to the nine provincial departments) - which is higher than the 5% Gross Domestic Profit (GDP) recommended by the World Health Organization(World Health Organization, 2020). This reflects the major burden of disease management and treatment that is dependent on the public sector in SA (Jobson, 2015).

While accessibility and availability are a challenge in the public sector, the private sector is challenged with affordability issues. Private healthcare services are funded via out-of-pocket

financing or medical aid insurance benefits, or private health insurance (e.g. dreaded disease cover) or even a combination. Private healthcare needs are met by either clinic or hospital facilities. It can be approximated that the private sector spends around R120.8 billion annually to cover 16.2% (8.2 million people) of the population, many of which utilize private medical aid insurance (National Treasury, 2011).

The per capita spending on medicine in the private sector is estimated to be ten times that of the public sector (Gray & Matsebula, 2000) which depicts the level of divide amongst the healthcare systems governing SA. A key constraint affecting both sectors are the high prices of medicine (Ngozwana, 2016). The high prices of medicine which is a key component that influences the affordability of healthcare brought about the need for pricing policies and regulations. With the unique functioning of a two-tiered medical system coupled with financial constraints, the pharmaceutical system of SA faces the same divide in its functionality.

2.3 South Africa's Pharmaceutical Pricing Systems

Access to improved healthcare with limited resources is a worldwide challenge. The goal to achieve universal health coverage (UHC) to provide one of the basic human rights (healthcare), is a global imperative. South Africa shared the same goal, culminating in the development of the National Drug Policy (NDP). In 1993, the NDP was drafted and presented to the president in 1994 (Department of Health, 1996). This policy was approved and published in 1996. Subsequently, the pricing committee was tasked to develop a pricing plan for medicines used in SA for the public and private sectors (Gray, et al., 2017). The three main domains of the focus of the NDP were; health objectives, economic objectives, and national development objectives (Department of Health, 1996). Specifications of the economic objectives were to:

- lower the cost of drugs in both the private and public sectors,
- promote the cost-effective and rational use of drugs,
- establish a complementary partnership between government bodies and private providers in the pharmaceutical sector,
- optimize the use of scarce resources through co-operation with international and regional agencies. (Department of Health, 1996)

The specific objectives for the economic domain outlined by the NDP influenced the

establishment of medicine pricing policies. With the public and private sector functioning in different pharmaceutical and medical structures, the regulations practiced in each sector exhibit a similar divide.

2.3.1 Tender Medicine Pricing System (public sector)

The public medicine supply is governed by the tender process which is a method aimed at attaining price advantages and the standardization of code lists in the public sector (Berger, et al., 2010). The medicine procured is in accordance with an essential medicine list (EML) guided by the standard treatment guidelines (STG) which is utilized in the public sector for the treatment of specific disease conditions.

Financing and funding of medicines in the public sector are covered by the government. The Department of Health's access to affordable medicines directorate, together with the National Treasury (NT), are responsible for the arrangement of national tenders for medicines (Berger, et al., 2010). Medical devices are procured through provincial tenders. The tender system is defined by the World Health Organization (WHO) as "any formal and competitive procurement procedure through which offers are requested, received and evaluated for the procurement of goods, works or services, and as a consequence of which an award is made to the tenderer whose tender/offer is the most advantageous" (World Health Organization, 1999). "Advantageous" in the case of medicines, correlates to factors such as efficacy, cost-effectiveness, and/or the availability of the medicine being procured. These factors outline the important aspects that need to be accounted for when utilizing the tender method, especially when concerning medicine choice—which is not a straightforward process.

The tender system uses a two-stage scoring process to determine who will be awarded the tender (Wouters, et al., 2018). The scoring is firstly based on the lowest price (90 points) and secondly based on broad-based black economic empowerment scores (10 points) (Wouters, et al., 2018). Other factors such as the company performance history may also influence the manner in which a tender will be awarded i.e. split tender versus single tender.

The tender system undergoes many financial difficulties including medicine stock-outs and exhaustion of medicine budgets (Berger, et al., 2010). However, some methods are adopted in the tender process to assist with these challenges. This involves bidding medicine through a split tender system whereby the tender contract is not awarded to a single supplier (Dranitsaris, et al., 2017). A split tender approach for the medicine tenders allows for multiple companies to supply medicines of the same drug class and can be issued in different pack sizes depending on

each company. Besides stock-out issues, budget compliance for medicine procurement is another challenge endured which is difficult to adhere to but is necessary since funding is limited.

The financing of medicines in SA's public tender system is conducted via two basic funding mechanisms i.e. equitable shares and conditional grants (Berger, et al., 2010). Equitable share is a platform that provides each

sphere of the government with an equitable share of revenue that is raised nationally and allocated to each province to perform basic services and functions assigned (Berger, et al., 2010). Conditional grants are "conditional allocations to provinces and municipalities from the national government's share of revenue raised nationally, which are conditional on certain services being delivered or on compliance with specified requirements. Each conditional grant has its own specific performance indicators that are reported against and monitored by Treasury and the NDOH" (Berger, et al., 2010). HIV/AIDS services are an example of medicines that are funded via a conditional grant while most other disease conditions and services (non-HIV/AIDS conditions) are funded through equitable share funding (Berger, et al., 2010).

2.3.2 SEP System (private sector)

The medicine procurement approach in the private sector differs from the methods utilized in the public sector. In the past, this system functioned using an unregulated approach. Transparent pricing regulations for medicines became necessary (due to many reasons including high medicine prices) and was introduced in the early 2000s. Several system reforms were executed concerning medicine pricing in the private sector, some of which included the banning of sampling (2002); mandatory generic substitution (2003); removal of discounts, bonuses, and rebates, and the introduction of the Single Exit Price (SEP) policy (2004) (Bodhania, 2007).

The banning of sampling was a concept dating as far back as 1978 made mention by the Snyman Commission (Republic of South Africa, 1962). This statement claimed how "bonusing" and reward systems made to healthcare providers should be banned to decrease a biased industry. This premise was implemented almost two decades later when the regulation to remove discounting, bonuses and rebates were introduced (Gray, 2009). The regulation of banning sampling allows for a transparent business arrangement to proceed by permitting no favour, discount, or reward from the pharmaceutical company to purchasers (pharmacies and doctors), for buying products in increased quantities. Patients benefit from the banning of sampling

regulation as the medicines sold to them will not be based on a bias (due to rewarding) but rather on the medicine efficacy irrespective of how it was procured.

Mandatory generic substitution, another medicine pricing regulation, was implemented and introduced in 2003 (Gray, et al., 2016). The regulation is a major cost-saving enterprise for patients as it enables them to be offered safe effective medicines at lower costs. This regulation stipulates that a pharmacist must offer a generic equivalent, which the patient could accept or refuse unless otherwise specified by the doctor or regulated by a non- substitutable list (Gray, et al., 2016). Implementation of generic substitution decreases out-of-pocket expenditures and medical aid schemes are able to adopt this system to assist patients by creating drug formularies based on lower costing generic medicines. The concept of drug formularies is to deter patients from acquiring higher costing medicines that are out of the drug formulary as opposed to the lower costing generic medicine which would prevent them from incurring co-payments. However, the success of the generic substitution regulation remains dependent and is influenced by patient education on generic medicine (Bangalee, 2015).

Further to generic substitution, the SEP system was introduced in 2004 (Moodley & Suleman, 2019). This mechanism stipulates the maximum price (ex-manufacturer price + logistics fee + VAT) at which pharmaceutical manufacturers and importers can sell their products as per The Medicines and Related Substances Control Act 101 of 1965 as amended (The Republic of South Africa, 2002) The SEP prices are regulated by an annual inflation cost that is stipulated by the Minister of Health, which is based on the following provisions (Green Gazette, 2017):

- "The average Consumer Price Index (CPI) for the preceding year
- The average Purchaser Price Index (PPI) for the preceding year
- Changes in the rates of foreign exchange and purchasing power parity
- International pricing information relating to medicines and scheduled substances
- Comments received from interested persons in terms of regulation 8(2)
- The need to ensure the availability, affordability, and quality of medicines and scheduled substances in the Republic"

(Green Gazette, 2017).

The SEP policy regulates the cost of medicines in their different branded forms (e.g. active ingredient paracetamol, includes Panado®, Painblok®, and other generic brands that are available for the same ingredient). Several brands of medicines are produced by different pharmaceutical companies that set different costs for their specific brand of medicine.

However, the specific cost that a medicine is agreed upon is not sold at this uniform price throughout the pharmaceutical market. Additional to the SEP amount, a dispensing fee can be added which makes up the final price a patient will pay for their medicine at a pharmacy. The dispensing fee is regulated by stipulating the maximum amount that can be added to the SEP as follows:

a) "where the single exit price of a medicine or scheduled substance is less than one hundred and nine rand and fifty-six cents (R109.56), the dispensing fee shall not exceed R14.50 plus 46% of the single exit price in respect of that medicine or scheduled substance;

b) where the single exit price of a medicine or scheduled substance is greater than or equal to one hundred and nine rands and fifty-seven cents (R109.57), but less than two hundred and ninety-two rand and twenty-five cents (R292.25), the dispensing fee shall not exceed R27.75 plus 33% of the single exit price in respect of that medicine or scheduled substance;

c) where the single exit price of a medicine or scheduled substance is greater than or equal to two hundred and ninety-two rand and twenty-six cents (R292.26), but less than one thousand and twenty-two rand and ninety-four cents (R1022.94), the dispensing fee shall not exceed R79.00 plus 15% of the Single Exit Price in respect of that medicine or scheduled substance;

d) where the single exit price of a medicine or scheduled substance is greater than or equal to one thousand and twenty-two rand and ninety-five cents (R1022.95), the dispensing fee shall not exceed R182.00 plus 5% of the Single Exit Price in respect of that medicine or scheduled substance."

(The Department of Health, 2019)

The dispensing fee that is added to the SEP is derived by the specific pharmacy (chain store pharmacies will stipulate a standard fee across) and is capped accordingly. This explains the variation in costs for a particular branded medicine in different pharmacies. The addition of the dispensing fee creates a competitive market in the pharmaceutical dispensing industry.

The logistics fee component, which is inclusive in the SEP, is determined and negotiated between manufacturer or importer and the logistics service provider (Green Gazette, 2020). It can be set to range from as little as no fee or the alternate, a high valued fee, provided that the total price (SEP) stays within the annual SEP percentage increase. The logistics fee process still requires further regulation and transparency as these fees have an impact on the final

purchasing price of a product.

The regulations that were implemented in the private sector market were intended to create a more transparent pricing system for SA. A transparent pricing system is foreseen to assist toward the goal of achieving UHC intended for SA. Similarly, the global pharmaceutical market has also implemented different pharmaceutical pricing approaches towards improving their healthcare systems.

2.4 Pharmaceutical Pricing Policies Across the World

Pharmaceutical pricing protocols follow different practices around the world. Each country has adopted specific approaches that work in the best interest of its citizens. The practices however differ between most countries, even among first world countries.

The United States of America (U.S.A) institutes a less regulated pharmaceutical pricing environment in comparison to other first world countries. Classified as one of the countries that exhibits the highest medicine costs, it also expands the highest research and development of newer medicines (Gross, et al., 1994). The USA utilizes an un-regulated approach for pricing medicines to promote newer medicine development. It is estimated that when there is a decrease in medicine prices due to price regulations, there will be less focus emphasized toward early-stage research and development of newer medicines. This makes the implication of pricing controls for the U.S.A questionable as new medicine development is at stake (Abott & Vernon, 2005). Increased funds are needed to sustain research and development of newer medicines; thus, such costs are usually covered within the prices of the medicine (which potentially decreases the affordability of the drug). The U.S.A believes that if medicine prices were to be regulated, focus toward new research and development would be neglected as the costs associated with funding the new developments will be unfeasible and unaffordable.

The U.S.A health system can be described as a hybrid system as healthcare coverage is not uniformly covered (Department for Professional Employees, 2016). Operating within such a unique healthcare system creates difficulty for citizens to afford medicines, which is the consequence of a market infiltrated by high medicine prices. The out-of-pocket expenditure experienced by the U.S.A citizens is increasing, and uninsured patients are a principal factor that has led to this situation (Sarnak, et al., 2017). Thus, we find that access and affordability of medicines, in a first world country, is also a challenge.

The United Kingdom (U.K.) functions using a more regulated approach in relation to medicine

pricing policies. Regulation in European countries is either guided using a direct or indirect approach. The U.K., however, utilizes a more indirect approach known as profit controls (Gross, et al., 1994). Profit controls utilize a price ceiling method such that manufacturers introducing new medicines into the market can set the selling price of the medicine to any amount that does not exceed the negotiated target—which is usually set by the National Health Service (NHS) (Gross, et al., 1994). This aids in regulating the prices of medicines when reaching the pharmaceutical dispensing market. Unlike the U.S., the U.K. citizens are funded for medical care through the NHS which is a UHC system.

Other European countries such as France, Germany, and Sweden utilize additional mechanisms to control medicine prices. This includes methods such as "product-by-product price controls" and "limits on insurer reimbursement prices" (Gross, et al., 1994). The product-by-product price control is a more direct method of controlling prices and involves manufacturers setting their medicine prices in accordance with the Government (or the responsible paying authority), while new prices and price increases are negotiated via both parties (Government and manufacturer). This was typically practiced in Sweden (until 1993) and France (Gross, et al., 1994), and such practice mandates that specific criteria be followed to establish these prices. The price control executed via limiting the insurer reimbursement prices is commonly known as reference pricing. This involves setting limits on prices of medicines either based on prices from other countries or comparable to a generic brand available in one's own country. However, the insurer will only cover the cost of the referenced medicine price. Any costs incurred exceeding the said referenced price must be covered by the consumer (out-of-pocket cost). Such practice encourages that the referenced medicine price be used which introduces an opportunity for increased generic drug utilization. Sweden calculates its reimbursement price with its target set at 10% more than the least expensive generic equivalent while Germany calculates its product medicine price based on an average of the prices of that medicine and similar products, i.e. medicine with the same active ingredients, therapeutically comparable active ingredients, and therapeutically comparable effects (Gross, et al., 1994).

High-income countries have pricing policies that are more readily available for use in study and investigations, however, this is not the case for low - and middle-income countries (LMIC). The LMICs constitute nations that are developing, and these countries usually portray less regulated pricing policies than high-income countries (de Joncheere, et al., 2003). The LMICs usually utilize private funding to afford medicine thus making out-of-pocket payments

in these countries quite high (Nguyen, et al., 2015). There are pricing policies that are practiced in some LMICs, however, due to lack of documented data, it is difficult to indicate what pricing policies work best or what conditions result in policy failures (Bangalee & Suleman, 2018). However, some of the pricing techniques and pricing policies that have been recorded in someLMICs are as follows:

- **External reference pricing:** Pakistan (for medicines in the third category: new molecules), Taiwan, Vietnam (in regulation only), Bulgaria, Hungary, Turkey

- **Internal reference pricing:** Bulgaria, Hungary, Turkey, Philippines, Thailand (for setting up the price ceiling for medicines procured by public hospitals), Taiwan
- **Pharmacoeconomic evaluation for value-based purchasing:** Brazil, Bulgaria, Hungary, Turkey, Thailand, Taiwan, Philippines
- **Cost plus pricing:** India (before 2012), Vietnam, China, Sri Lanka
- **Fixing price at retail/pharmacy level: Maximum Retail Prices (MRP):** China, India, Philippines, Sri Lanka, South Africa
- **Fixing price at wholesale level: maximum wholesale price:** Sri Lanka
- **Fixing price at the ex-manufacturer and importer level:** Bulgaria, Hungary, Turkey, Sri Lanka, Vietnam
- **Limiting price increases, price freezes:** Hungary, India (price freeze in 1963, prior approval of the government for price increase from 1966), Taiwan, Vietnam
- **Price cuts:** China, Pakistan, Philippines
- **Margin cuts:** Hungary
- **Fixed mark-ups:** Bangladesh, China (fixed mark-ups between 1980 and 2000 and currently zero mark-ups in public health facilities), Sri Lanka
- **Capped mark-ups:** India (before 2012)
- **Regressive mark-ups:** Vietnam (Public hospital pharmacies only), Bulgaria, Hungary, Turkey, South Africa
- **Fixed dispensing fees:** South Africa, Sri Lanka
- **Prohibition of discounts:** South Africa
  (Nguyen, et al., 2015)

Efforts to better healthcare systems with medicine pricing regulations are apparent in both high-income and LMICs however, there is no global standardized method that can be implemented and function for every country. Each nation has to adopt its own objective in implementing these regulations bearing in mind the feasibility of such interventions to obtain successful outcomes (Bangalee & Suleman, 2018). With medicine costs affecting countries globally, access to data and recording of data is particularly important as this assists in making decisions on which regulations may work or not. Approaches that provide information on accessibility and availability of medicine is an important tool that is used to assist policymakers when creating pharmaceutical pricing regulations and is a global initiative adopted to provide a platform where this data can be accessed.

2.5 South Africa in the Health Action International (HAI) Project

Health Action International (HAI) together with the World Health Organization (WHO) developed a project on medicine prices and availability targeting the following objectives:

- "To develop a reliable methodology for collecting and analyzing medicine price, availability, affordability, and medicine price component data across health-care sectors and regions in a country
- To publish survey data on a publicly accessible web site to improve price transparency
- To advocate for appropriate national policies and monitor their impact" (WHO & HAI, 2008).

With these goals set out for the project, the development was able to create a tool that is accessible and useful to countries around the world. Several countries participated in this project, including SA. The survey component involved gaining information to generate reliable data on the price, availability, and affordability of selected important medicines and price components in the supply chain (WHO & HAI, 2008). The selection of the medicines to be surveyed comprised up to 50 medicines including:

1. "A global core list of 14 medicines that are included in all medicine price surveys to enable international comparisons.
2. A regional core list of 16 medicines that accounts for regional differences in medicine usage but still allows for comparisons across countries within the same region (which was later removed).
3. A supplementary list of at least 20 medicines, selected at the country level for their local importance" (WHO & HAI, 2008).

SA participated in the study and executed the survey in the Gauteng region in 2004 (Xiphu & Mpanza, 2004). The medicine selection consisted of 42 medicines: 28 from the core list and 14 from the supplementary list (Xiphu & Mpanza, 2004). Of the 42 medicines selected, 39 were part of the EML (Xiphu & Mpanza, 2004). The EML is a main component that is utilized in the public sector and the survey was facilitated in both private and public sector, hence the choice of selecting medicines from the EML during the survey was vital.

Table 1: Medicine list used during the HAI survey conducted in the Gauteng region (Health Action International, 2019)

ACTIVE INGREDIENTS	DOSAGE FORM	ACTIVE INGREDIENTS	DOSAGE FORM

1. Aciclovir	200 mg cap/tab	22. Ibuprofen	400 mg cap/tab
2. Allopurinol	300 mg cap/tab	23. Indinavir	400 mg cap/tab
3. Amitriptyline	25 mg cap/tab	24. Lamivudine	150 mg cap/tab
4. Amoxicillin	250 mg cap/tab	25. Loperamide	2 mg cap/tab
5. Atenolol	50 mg cap/tab	26. Losartan	50 mg cap/tab
6. Beclometasone	50 mcg/dose inhaler	27. Metformin	500 mg cap/tab
7. Captopril	25 mg cap/tab	28. Methylphenidate	10 mg cap/tab
8. Carbamazepine	200 mg cap/tab	29. Metoclopramide	10 mg cap/tab
9. Ceftriaxone	1 g/vial injection	30. Nevirapine	200 mg cap/tab
10. Ciprofloxacin	500 mg cap/tab	31. Nifedipine	10 mg cap/tab
11. Co-amoxiclav	250+125 mg cap/tab	32. Nifedipine	20 mg tab Retard
12. Co-trimoxazole	40+200mg/5ml suspension	33. Omeprazole	20 mg cap/tab
13. Diazepam	5 mg cap/tab	34. Phenytoin	100 mg cap/tab
14. Diclofenac	25 mg cap/tab	35. Prednisone	5 mg cap/tab
15. Efavirenz	600 mg cap/tab	36. Promethazine	25 mg cap/tab
16. Fluconazole	150 mg cap/tab	37. Ranitidine	150 mg cap/tab
17. Fluconazole	200 mg cap/tab	38. Salbutamol	100 mcg/dose inhaler
18. Fluoxetine	20 mg cap/tab	39. Stavudine	30 mg cap/tab
19. Fluphenazine	25 mg/ml injection	40. Stavudine	40 mg cap/tab
20. Glibenclamide	5 mg cap/tab	41. Sulfadoxine + Pyrimethamine	500+25 mg cap/tab
21. Hydrochlorothiazide	25 mg cap/tab	42. Zidovudine	100 mg cap/tab

The HAI project facilitated in SA was able to contribute to the global objective of UHC. The availing of information on medicine prices and availability in SA was able to provide data that assisted with medicine policy development. With the initiation of the NHI program in SA, such tools are imperative for guiding future projections in SA. Similar practices used in this survey such as the EML component may be executed during the NHI program, which makes price comparisons of medicines quite significant. However, an outlook of universal health in countries around the world is also an important component that can guide decisions that will influence NHI in SA.

2.6 Universal Health Coverage (UHC) Across the Globe

UHC is established to assist in the worldwide struggle of cost containment in healthcare. The UHC system encompasses medical insurance coverage for all people in a nation which is administered via the public sector, private sector, or a combination of both.

Several first world countries have established UHC executing numerous mechanisms to achieve this. “Universal health coverage” can be classified as a broad term and can be accomplished through different methods thus having different meanings in each country depending on their approach towards this goal (Giovanella, et al., 2018). Some of the approaches include; predominantly public insurance, regulated private insurance, and mixed public-private insurance (Seervai, et al., 2017).

Predominantly public insurance is practiced in the U.K. via the single-payer model. This model is funded via the government through taxes and pays the providers directly, covering all residents for complete healthcare with no co-payments (Seervai, et al., 2017). The Netherlands practices the regulated private insurance mechanism. This method functions by citizens paying a premium towards a private insurance who subsidizes the payment to the healthcare provider. All citizens are required to join this program (exceptions are granted to some citizens who qualify) and this service covers government-defined health benefits with deductibles for some services (Seervai, et al., 2017). France practices the mixed public-private insurance system, where all residents are covered by governmental non-profit funds that pay providers. Additionally, private insurance can be bought to cover the gaps not funded by the government (Seervai, et al., 2017).

The NHI model is another mechanism aimed to achieve UHC and is practiced in Canada. This model, also known as Medicaid, uses private healthcare providers but are subsidized from a governmental insurance program (which citizens contribute towards either through premiums or tax) (Wallace, 2013). The benefits of the program provide cover to all citizens independent on their earnings, age, or province of residence (Martin, et al., 2018). Although residents are subsidized for healthcare needs, not all prescription drug coverage is met.

There is no national standard for drug coverage in Canada. Each province permits its own coverage of medicine costs. One of the greatest differences in the methods executed in each province is the medicine benefits that are available to the residents that are not on social assistance, or who are 65 years or older (Brandt, et al., 2018). Premium-based medicine coverage which is sometimes subjected to monthly premiums and co- insurance on prescriptions filled are offered in some provinces such as Alberta, New Brunswick, and Quebec (Brandt, et al., 2018). Some provinces offer private insurance which is mandatory to citizens that qualify for extended health benefits and is available in other provinces on a voluntary basis.

High out-of-pocket costs are still experienced in Canada, even in a combined private and public health coverage approach (Brandt, et al., 2018). Methodologies such as generic substitution and, generic or therapeutic reference-based compensation are practiced in some of the provinces to control the expenditure of medicines in their provinces (Canadian Health Services Research Foundation, 2005). One of the recommendations towards universal drug coverage for Canada is the compilation of a National Drug Formulary which is similar to the EML used in SA. The formulary is recommended to be funded using the single-payer public program and the recommendations were made towards forming universal pharmacare for Canada (Brandt, et al., 2018).

The aim of UHC is not an easily achievable goal as seen in countries that practice this approach. It is advantageous for SA to review the practices of other countries as strengths and weaknesses can be observed. With Canada already practicing the NHI approach, it is important for SA to note the successful components of such a system.

2.7 The Projected NHI Programme for South Africa

The progression towards NHI in SA is intended to be accomplished by 2030. The NHI program has been a work-in-progress involving several stages of execution and is nearing the stage of complete implementation.

The NHI program is intended to lower the financial burdens of healthcare experienced by South African citizens. The project aims to provide an equitable health service to all, regardless of their socioeconomic status. It will require a massive re-organization of the public and private health sectors to accommodate this change. The NHI program intends to provide a single fund that is administered and owned publicly. It stems from forming a culture of values that embraces justice, fairness, and social solidarity (Government of South Africa, 2020).

The increased expenditure experienced in SA's private sector has been difficult to reduce. There are tools currently in place to decrease the financial burden; however, high costs of healthcare still exist. This forms the foundation and purpose of introducing the NHI. The system is proposed to form coverage for hospital, pharmaceutical, laboratory, and radiology services. These services will be subsidized by the NHI which aims to pool the revenue for this fund via tax contributions by the citizens. The tax revenue that is collected will be apportioned towards funding this program and both the employed and unemployed will be covered from the public pool of funds (Government of South Africa, 2020).

The pharmaceutical sector will function utilizing a medicinal formulary (similar to the EML)

that should be adhered to. If treatment remains within the boundaries of the medicine formulary, complete subsidizing and funding will be awarded. If an individual chooses treatment outside of the formulary boundary, the treatment will be covered by the individual or their private medical aid insurance. Private medical aid insurance will still be available to those who can afford it, however, contributions towards the NHI fund will be mandatory. Although contributions will not be optional, the choice of utilizing the program will be.

According to the proposed NHI system, medicines will be accessible at both public and private healthcare facilities. These facilities will procure the specified medicines that are on the formulary and will be subsidized by the public fund for the purchases made. There is no stipulation on the procurement system that will be adopted for obtaining medicines in this program. The tender system, SEP system, or perhaps a combination of both may be the approach taken, however, with the program still in the pilot phase, decisions are still underway (Government of South Africa, 2020).

With the NHI in its pilot phase, the decisions that influence how it will function need to be decided before the program is fully enforced. Further studies that can aid the NHI program will assist policymakers during the implementation phase of the program and is necessary.

2.8 Chapter Summary

South Africa's goal towards universal health coverage is much anticipated. As noted from practices around the world, pharmaceutical pricing regulations as well as universal health coverage systems are complex yet unique. Though different systems are practiced, the objective of the systems shares the same goal — decreasing the financial burden of healthcare. The studies appraised are significant as South Africa moves towards UHC and requires that the strongest components of all policies be amalgamated in order to ensure sustainable access to quality and affordable essential medicines.

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CHAPTER 3: MANUSCRIPT FOR SUBMISSION AND PUBLICATION

3.1 Introduction

This chapter describes the general findings and discussion of the results of the study and is presented in the form of a manuscript entitled "A comparison study between public and private healthcare sector medicine prices in South Africa". The manuscript was submitted to the Journal of Pharmaceutical Health Research Services and was formatted accordingly (see Annexure 3).

A comparison study between public and private healthcare sector medicine prices in South Africa.

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Abstract

Objectives

The objectives of the study were to compare price trends, determine price differentials, and equate the average price index of a basket of medicines between the public and private healthcare sectors in South Africa.

Methods

A price list consisting of 32 essential medicines available in both the public and private healthcare systems of South Africa was chosen for this study. The price of medicines for the private sector were obtained from the Medicine Price Registry- Open Up website for the period 2014-2018. Public sector medicine prices were obtained from the Department of Health website for the corresponding period. Observations and price trends were identified and analyzed using Microsoft Excel version 2016.

Key Findings

A total of 74 medicine brands were analyzed in the study. It was found that the prices across both sectors had increased over time, however, the majority of brands (87%) displayed higher prices in the private sector in comparison to the public sector. On

average, the price differential between the private and public sector medicines were 395.47%.

Conclusion

The study found varying price differences between medicines in the public and private sectors because of the different methodologies used in each. The reasons for changes in medicine prices across the years in both sectors, could not always be clearly determined as both sectors lacked complete transparency in the processes applied to establish medicine prices. Therefore, more transparent medicine price systems need to be considered for the future of South Africa's healthcare system as the country transitions toward universal health coverage.

Keywords

- Public tender prices
- Single exit price (SEP)
- Medicine price trends
- South Africa

Introduction

The regulation of medicine prices is a complex economic process. Globally there have been several policies and regulatory interventions that have been implemented to improve medicine price (Volger, et al., 2017). In South Africa (SA), previous health system disparities, and increasing medicinal costs warranted the need for better medicine price systems (Moodley & Suleman, 2019). Efforts to achieve this included the development of the National Drug Policy (NDP), which laid the foundation for medicine price strategies in both the public and private healthcare sectors (Department of Health, 1996).

The South African healthcare system is divided into two sectors which have different funding sources i.e. the public sector (government funding) and the private sector (private medical aid insurances and out-of-pocket funding). The public and private sectors warrant different pharmaceutical price regulations as the fundamental practises in each sector are different and are therefore regulated accordingly (e.g. the different funding methods for each).Additionally medicine and healthcare resource distribution is also unbalanced across the both sectors. The accessibility and availability of healthcare in this polarised system, therefore, provides unequal health benefits to patients being treated in each sector (Burger & Christian, 2020).

Measures to regulate medicine prices in the private sector required the construction of greater transparency in the South African pharmaceutical price system. In the past, drug prices in SA had inflated artificially through bonuses, discounts, rebates, and other incentives schemes that led to the dispensing of more expensive drugs (Ngozwana, 2016). This led to the introduction of several regulatory mechanisms to improve transparency which included the banning of sampling; mandatory offering of generic substitution; removal of discounts, bonuses and rebates; and among these, the introduction of the single exit price (SEP) intervention (Bodhania, 2007).

The SEP can be defined as a mechanism that regulates the maximum price at which a medication can be charged (Open Up, 2019). All medicines in the private sector are governed by the SEP regulation with two exceptions, this being, veterinary medicines and over-the-counter schedule zero medicines (Moodley & Suleman, 2019). The SEP undergoes an annual regulated maximum increase which is set by the Minister of Health. This increase is based on several provisions which include the average consumer price index (CPI) and the average producer price index (PPI) for the preceding year (Green Gazette, 2017). The final SEP of a medicine is made up of three components i.e. the ex-manufacturer price (set by the manufacturer), logistics fee (set by the manufacturer); and value-added-tax (14%).

In the public sector, medicine prices are regulated by a tender system which is also available as an exit price. The pharmaceutical tenders are advertised on a public forum where several pharmaceutical companies bid on the tender (Wouters, et al., 2018). The medicine quantity and the type of medicine required for each tender depend on the need of each province and the overall process is monitored by the National Department of Health (NDoH) (Wouters, et al., 2018). The Government purchases the medicine at the specific price stipulated by the pharmaceutical company that was awarded the tender (Wouters, et al., 2018). This price is exclusive only to the government (for the tender) and is not available in the private sector. In some instances, the same tender can be awarded to multiple pharmaceutical companies to prevent medicine shortages (Dranitsaris, et al., 2017). This tender system has been in use in the public sector for several years with not many variations to the systems applied.

Medicines procured in the public sector are based on an Essential Medicine List (EML). The EML contains a list of the safest and most effective medicines that satisfy the priority health needs of a country (WHO, 2020). The essential medicine list contains the list of medicines in its active ingredient form. Globally, issues concerning essential medicine access led to the development of the World Health Organization (WHO)/Health Action International (HAI) methodology, which aimed to publish a country's survey data on a publicly accessible website. This project intended to improve medicine price transparency (WHO & HAI, 2008). The methodology was applied by Xiphu and Mpanza in SA and resulted in the following findings relating to medicine prices: there was a lack of transparency and uniformity of mark-ups by retailers and; most facilities did not adhere to medicine price regulations and had high medicine prices in comparison to international reference price (Xiphu & Mpanza, 2004).

The global market has also made several attempts to regulate medicine prices. In several low and middle- income countries, such as Brazil and Argentina, pricing policies were introduced to reduce medicine prices. It was found however, that despite an initial decrease in prices, these reductions were not sustainable, eventually leading to prices increasing over time (Kohler, et al., 2015) (Schargrodsky, et al., 2001). Similarly, a study conducted in Spain to anyalze the interventions implemented to control pharmaceutical expenditure revealed that 12 out of 16 interventions did not effectively decrease medicine prices in the short term and the remaining 4 interventions did not have a sustainable effect thus only resulting in moderate annual savings (Moreno-Torres, et al., 2011). Therefore, there is a need to employ transparency measures that will ensure sustainability of reduced medicine prices.

Achieving price transparency is the aim of medicine price regulations in SA, hence the progress of these interventions needs to be monitored. Since the introduction of the SEP in SA, there have been some studies that looked at the effect and outcomes of this price mechanism (Pretorius, 2011) (Moodley & Suleman, 2019). A study on the

impact of the SEP established that since the introduction of the SEP there was a 22% decrease in the average prices of medicines (Pretorius, 2011). Another recent study evaluated the impact of the SEP policy on a series of originator medicine products and determined that the SEP impacted medicine prices both short term and long term (Moodley & Suleman, 2019). Tender medicine systems were evaluated in other countries such as the Netherlands and China, where it was found to reduce medicine prices, however these findings cannot be generalized to all other countries due to the several differences in regulatory practise as well as political economies of each healthcare system (Barber, et al., 2013) (Kanavos, et al., 2009) (Wouters, et al., 2018). The studies conducted in SA focused on the progress of the SEP system however the comparison of both price systems was not extensively investigated.

As SA transitions towards universal health coverage via the National Health Insurance (NHI), medicine price mechanisms between the two healthcare sectors need to be re-evaluated and reviewed to improve systems for future use. Therefore, the objectives of this study were to compare price trends, determine price differences, and equate the average price index of medicines between the public and private healthcare sectors in SA.

Research Methods

Study design

The study was descriptive, quantitative, and retrospective in nature. It was a comparison between tender and SEP medicine prices in both the public and private health sectors of South Africa for a 5-year period i.e. between 2014-2018.

Definitions

For the purpose of the study,

Branded medicines were defined as “medicines which have a name given to them by a company for the purpose of advertising. The names of branded medicines are different from the International Non-proprietary Name (INN). Branded medicines may be the original medicine developed by a company, or several companies may make the same medicine in the generic form to which each company will give its own brand name ” (EUPATI, 2015).

Active ingredients were defined as “any component of a drug product intended to furnish pharmacological activity or other direct effects in the diagnosis, cure, mitigation, treatment, or prevention of disease, or to affect the structure or any function of the body of humans or other animals. Active ingredients include those components of the product that may undergo chemical change during the manufacture of the drug product and be present in the drug product in a modified form intended to furnish the specified activity or effect” (U.S. FDA, 2020).

Selection of medicines

The basket of medicines chosen was based on that of a study conducted by Xiphu and Mpanza which used the WHO/HAI methodology to explore medicine availability, affordability, and prices (Xiphu & Mpanza, 2004). The medicine list in the Xiphu and Mpanza study were based on a core list and supplementary list as per the standards specified in the WHO/HAI methodology (WHO & HAI, 2008). The core list was developed to facilitate international comparisons and could be adjusted to suit each countries pattern of medicine use (Xiphu & Mpanza, 2004). The supplementary list

allowed for each country to add more medicines that were relevant to it but did not appear in the core list. In SA the Pharmaceutical Economic Evaluation directorate at the National Department of Health, created a supplementary list of 14 medicines that was based on the most sold medicines by volume in the private sector and the occurrence of the medicine in the EML (Xiphu & Mpanza, 2004). The medicine list used in the Xiphu and Mpanza study therefore consisted of 42 medicines (28 from the core list and 14 from the supplementary list), however, this list was amended in line with the following inclusion criteria for this study:

1. For an active ingredient to be included in the final medicine basket, it had to appear on the tender medicine list for all five years (2014-2018) chosen for the study. The following active ingredients were therefore omitted i.e. fluconazole 150mg cap/tab, fluphenazine 25mg/ml injection, ibuprofen 400mg cap/tab, indinavir 400mg cap/tab, nifedipine 20mg tab retard, omeprazole 20mg cap/tab, ranitidine 150mg cap/tab, stavudine 40mg cap/tab, sulfadoxine+pyrimethamine 500+25mg cap/tab.
2. Single exit prices were compared to the corresponding branded medicines that appeared on the tender list. Therefore, the active ingredient fluconazole 200mg cap/tab was excluded because it did not appear on both lists.

Table 1 presents the final basket of 32 active ingredients that were investigated.

Table 1: *Basket of active ingredients (in each category)*

	Active ingredients		
	Anti-infective medicines (i.e., antibiotic, antifungal, antiprotozoal, and antiviral agents)		fluoxetine 20mg cap/tab
	acyclovir 200mg cap/tab		glibenclamide 5mg cap/tab
	amoxicillin 250mg cap/tab		hydrochlorothiazide 25mg cap/tab
	ceftriaxone 1g/vial injection		loperamide 2mg cap/tab
	ciprofloxacin 500mg cap/tab		losartan 50mg cap/tab
	co-amoxiclav 250+125mg cap/tab		metformin 500mg cap/tab
	co-trimoxazole 40+200mg/5ml suspension		methylphenidate 10mg cap/tab
	Drops, aerosols, inhalers, and inhalants		metoclopramide 10mg cap/tab
	beclomethasone 50mcg/dose inhaler		nifedipine 10mg cap/tab
	salbutamol 100mcg/dose inhaler		phenytoin 100mg cap/tab
	Solid-dose medicines and transdermal patches		prednisone 5mg cap/tab
	allopurinol 300mg cap/tab		promethazine 25mg cap/tab
	amitriptyline 25mg cap/tab		**Antiretroviral medicines**
	atenolol 50mg cap/tab		efavirenz 600mg cap/tab
	captopril 25mg cap/tab		lamivudine 150mg cap/tab
	carbamazepine 200mg cap/tab		nevirapine 200mg cap/tab
	diazepam 5mg cap/tab		stavudine 30mg cap/tab
	diclofenac 25mg cap/tab		zidovudine 100mg cap/tab

[The table contains 32 active ingredients divided into four categories according to type and/or to the dosage form of the medicine. The first category (numbers 1-6) represent

antiinfectives. The second category (numbers 7-8) represents drops, aerosols, inhalers, and inhalants. The third category (numbers 9-27) represent solid-dose medicines and transdermal patches. The fourth category represents antiretrovirals (28-32).]

Medicine price data analysis

The tender medicine prices were sourced from the Department of Health website (Department of Health, 2019), whereas the SEPs for the private sector were obtained from the "Medicine Price Registry- Open Up website" (Open Up, 2019). All medicine prices used in the study were in South African Rands (ZAR). Due to the differences in pack sizes between the tender price system and the SEP system, the price per standard unit (i.e. per tablet or capsule) was computed.

All data were analyzed using Microsoft Excel version 2016. The tender medicine prices and SEPs were compared to identify the trends that exist between each price system. Comparisons were made using the following calculations:

1. The average price difference between the branded medicine prices of the tender and SEP systems was determined over the five-year period. The calculation was based on the following criteria:

- Medicine prices compared were calculated and represented as per standard unit pack size.
- The price difference was calculated by expressing the difference between the SEP and tender price as a percentage of the tender price for each year in the five-year period:

$$\varepsilon_{i,b} = \frac{SEP_{i,b} - TP_{i,b}}{TP_{i,b}} \times 100\% \qquad (1)$$

$where$: $\varepsilon\ is\ the\ price\ difference$
$SEP\ is\ the\ single\ exit\ price$
$TP\ is\ the\ tender\ price$
$i\ is\ the\ year\ in\ which\ the\ price\ was\ in\ effect$
$b\ represents\ the\ \ branded\ medicine\ at\ a\ specific\ pack\ size$

- The price difference calculation was applied for each medicine for the corresponding year in the five-year period. The calculated percentage per year ($\varepsilon_{i,b}$) was used to calculate the average price difference:

$$\bar{\varepsilon}_b = \frac{\sum_{i=2014}^{2018} \varepsilon_{i,b}}{n} \qquad (2)$$

$where$: $\bar{\varepsilon}\ is\ the\ average\ price\ difference$
$n\ represents\ the\ number\ of\ years\ with\ available\ price\ data$

2. The average price index was calculated using the following criteria:

- The average annual price increase was calculated for each branded medicine within its pack size over the five-year period. Only branded medicines that had a price value for two or more years could be used. The difference between the earliest and the latest annual price available for a medicine was used to determine the average price index:

$$API = \frac{P_{y_l} - P_{y_e}}{y_l - y_e} \times 100\%$$

$where: API\ is\ the\ Average\ Price\ Index$
$P\ represents\ the\ price\ of$ a $medicine\ in\ a\ specific\ year$
$y_l\ represents\ the\ latest\ year$
$y_e\ represents\ the\ earliest\ year$

Ethical Considerations

Ethical approval for this study was obtained from the relevant University Institution (HSS/0421/019M) under the exempt approval as the nature of the study involved data/materials available to the public domain.

Results

The findings relate to the prices of the final basket of 32 active ingredients that yielded a total of 74 branded medicines.

The tender medicine price and SEP's for each medicine brand were tabulated (see ***Error! Reference source not found.***, ***Error! Reference source not found.***, and *REF _Ref42443940 \h * MERGEFORMAT* ***Error! Reference source not found.***) and then graphed for comparisons.

Table 2: *Tender medicine prices (per dosage form e.g. Tablet/capsule/suspension) from 2014 to 2018 for the basket of 32 medicine active ingredients.*

Branded Medicine Name	Active Ingredient	2014 Price	2015 Price	2016 Price	2017 Price	2018 Price
Acitab_200_DT 200mg Tablets 25	Aciclovir	-	R 0.40	R 0.48	-	-
Lovire 200mg Tablets 25		R 0.40	-	-	R 0.41	R 0.41
Adco-Allopurinol 300mg Tablets 28	Allopurinol	R 0.39	-	-	-	-
Adco-Allopurinol 300mg Tablets 30		-	R 0.40	R 0.47	R 0.44	R 0.42
Puricos 300mg Tablets 28		R 0.43	R 0.44	-	-	-
Gulf_Amitriptyline 25mg Tablets 100	Amitriptyline	-	-	R 0.15	R 0.14	R 0.13
Gulf_Amitriptyline 25mg Tablets 168		-	R 0.12	R 0.13	R 0.13	R 0.12
Gulf_Amitriptyline 25mg Tablets 500		-	-	R 0.10	R 0.09	R 0.09
Sandoz_Amitriptyline_HCL 25mg Tablets 28		R 0.09	R 0.09	-	-	-
Trepiline 25mg Tablets 100		R 0.13	R 0.13	-	-	-
Trepiline 25mg Tablets 28		-	-	R 0.16	R 0.15	R 0.15
Trepiline 25mg Tablets 56		R 0.13	R 0.13	R 0.13	R 0.13	R 0.13
Trepiline 25mg Tablets 84		R 0.10	R 0.10	R 0.13	R 0.13	R 0.13
Allmox 250mg Capsules 100	Amoxicillin	-	-	-	R 0.29	R 0.29
Allmox 250mg Capsules 15		-	-	-	R 0.32	-
Amoxicap 250mg Capsules 15		-	R 0.31	R 0.39	-	-
Amyn 250mg Capsules 100		R 0.22	-	-	-	-
Amyn 250mg Capsules 15		R 0.23	-	-	-	-
Austell_Amoxicillin 250mg Capsules 15		-	-	-	R 0.37	R 0.37
Indo_Amoxycillin 250mg Capsules 15		-	-	-	R 0.32	-
Moxymax 250mg Capsules 15		R 0.23	R 0.28	R 0.35	-	-
Austell_Atenolol 50mg Tablets 28	Atenolol	R 0.08	-	-	-	-
Austell_Tenopress 50mg Tablets 28		-	R 0.09	-	-	-
Bio-Atenolol 50mg Tablets 28		R 0.07	R 0.07	-	-	-
Bio-Atenolol 50mg Tablets 30		-	-	R 0.09	R 0.08	R 0.08

Zetenol 50mg Tablets 28		-	-	R 0.10	R 0.10	R 0.09
Beceze 50mcg Inhaler 200	Beclometasone	R 0.13	R 0.13	-	-	-
Beclate 50mcg Inhaler 200		-	-	R 0.16	R 0.13	R 0.13
Bio-Captopril 25mg Tablets 60	Captopril	R 0.11	R 0.11	R 0.17	R 0.16	R 0.15
Degranol 200mg Tablets 100	Carbamazepine	-	-	R 0.36	R 0.35	R 0.34
Degranol 200mg Tablets 28		R 0.26	R 0.27	R 0.46	R 0.45	R 0.45
Degranol 200mg Tablets 56		R 0.22	R 0.23	R 0.34	R 0.33	R 0.32
Degranol 200mg Tablets 84		R 0.21	R 0.23	R 0.32	R 0.31	R 0.30
Gulf_Carbamazepine 200mg Tablets 100		R 0.24	R 0.26	-	-	-
Gulf_Carbamazepine 200mg Tablets 28		R 0.24	R 0.26	-	-	-
Gulf_Carbamazepine 200mg Tablets 84		-	-	-	R 0.28	R 0.26
Austell_Ceftriaxone 1g Vial 1	Ceftriaxone	-	R 5.69	R 7.18	-	-
Fraxone 1g Vial 1		-	-	-	R 5.86	R 5.86
Kocef-1000 1g Vial 1		R 4.50	R 5.21	R 6.50	R 6.01	R 6.01
Rociject 1g Vial 1		R 4.57	-	-	-	-
Rociject 1g Vial 10		-	-	-	R 0.61	R 0.61
Biotech_Ciprofloxacin 500mg Tablets 10	Ciprofloxacin	R 0.48	R 0.56	R 0.68	-	-
Cifran 500mg Tablets 10		-	-	-	R 0.48	R 0.48
Profloxin 500mg Tablets 10		R 0.61	R 0.56	R 0.69	R 0.61	R 0.61
Auro_Amoxiclav 375mg Capsules 100	Co-amoxiclav	R 1.05	-	-	-	-
Auro_Amoxiclav 375mg Capsules 15		R 1.12	-	-	-	-
Austell_Co-Amoxiclav 375mg Tablets 15		-	-	-	R 1.90	R 1.90
Sandoz_Co-amoxyclav 375mg Tablets 15		R 1.00	R 1.39	R 1.68	R 1.58	R 1.58
Doctrim 240mg/5ml Suspension 100	Co-trimoxazole	R 0.04	R 0.05	R 0.06	-	-
Doctrim 240mg/5ml Suspension 50		-	R 0.06	R 0.07	R 0.07	R 0.07
Ilvitrim_Suspension 240mg/5ml Suspension 100		R 0.04	R 0.04	R 0.05	R 0.06	R 0.06
Ilvitrim_Suspension 240mg/5ml Suspension 50		R 0.05	R 0.06	R 0.07	-	-
Resmed_Cotrimoxazole 240mg/5ml Suspension 100		R 0.04	-	-	-	-
Resmed_Cotrimoxazole 240mg/5ml Suspension 50		R 0.05	-	-	-	-
Betapam 5mg Tablets 100	Diazepam	R 0.09	R 0.09	-	-	-
Valium 5mg Tablets 100		-	-	R 0.57	R 0.57	R 0.58
Biotech_Diclofenac 25mg Tablets 15	Diclofenac	R 0.12	R 0.12	-	-	-
Mylan_Diclofenac 25mg Tablets 500		-	-	R 0.08	-	R 0.07
Mylan_Diclofenac 25mg Tablets 56		-	-	-	R 0.71	-
Adco-Efavirenz 600mg Tablets 128	Efavirenz	R 0.26	-	-	-	-
Adco-Efavirenz 600mg Tablets 28		-	R 1.56	R 1.75	R 1.63	R 1.69
Cipla_Efavirenz 600mg Tablets 28		R 1.30	R 1.23	R 1.52	R 1.52	R 1.53
Cipla_Efavirenz 600mg Tablets 30		-	-	-	-	-
Efavirenz_Winthrop 600mg Tablets 28		R 1.30	-	-	-	-
Efrin 600mg Tablets 28		R 1.22	R 1.49	R 1.77	R 1.69	R 1.60
Sonke_Efavirenz 600mg Tablets 28		-	R 1.62	R 1.81	R 1.69	R 1.76
Auro_Fluconazole 200mg Capsules 28	Fluconazole	-	-	-	R 0.86	-
Gulf_Fluconazole 200mg Capsules 28		-	R 0.86	R 0.94	-	-
Flucoric 200mg Capsules 28		R 0.82	-	-	-	-
Nuzak 20mg Capsules 100	Fluoxetine	R 0.11	R 0.12	R 0.22	-	-
Nuzak 20mg Capsules 28		-	R 0.14	R 0.21	-	-
Nuzak 20mg Capsules 30		R 0.12	-	-	-	-
Prolax 20mg Capsules 100		-	-	-	R 0.20	R 0.20
Prolax 20mg Capsules 28		-	-	-	R 0.20	R 0.20
Bio-Glibenclamide 5mg Tablets 100	Glibenclamide	R 0.07	R 0.07	R 0.11	R 0.10	R 0.09
Bio-Glibenclamide 5mg Tablets 28		R 0.07	R 0.07	R 0.14	R 0.14	R 0.13
Bio-Glibenclamide 5mg Tablets 56		R 0.07	R 0.04	R 0.11	R 0.10	R 0.09
Bio-Glibenclamide 5mg Tablets 84		R 0.05	R 0.05	R 0.09	R 0.09	R 0.08
Glycomin 5mg Tablets 28		R 0.08	R 0.07	R 0.14	R 0.14	R 0.14
Glycomin 5mg Tablets 56		R 0.07	R 0.07	R 0.10	R 0.10	R 0.10
Ridaq 25mg Tablets 28	Hydrochlorothiazide	R 0.09	R 0.09	R 0.14	R 0.14	R 0.14
Ridaq 25mg Tablets 500		-	-	R 0.13	R 0.13	R 0.13
Adco-Lamivudine 150mg Tablets 56	Lamivudine	R 0.29	R 0.44	R 0.49	R 0.46	R 0.47
Aspen_Lamivudine 150mg Tablets 56		R 0.35	R 0.29	R 0.32	R 0.30	R 0.29

Cipla_Lamivudine 150mg Tablets 56		R 0.34	R 0.32	R 0.40	R 0.40	R 0.40
Sonke_Lamivudine 150mg Tablets 56		R 0.35	R 0.39	R 0.44	R 0.41	R 0.43
Adco-Loperamide 2mg Tablets 300	Loperamide	-	-	R 0.07	R 0.07	R 0.07
Adco-Loperamide 2mg Tablets 6		-	-	R 0.21	R 0.20	R 0.19
Cipla_Loperamide 2mg Tablets 8		R 0.11	R 0.13	-	-	-
Austell-Losartan 50mg Tablets 28	Losartan	-	-	R 0.27	R 0.26	R 0.24
Ciplazar 50mg Tablets 30		R 0.21	R 0.21	-	-	-
Austell_Metformin 500mg Tablets 56	Metformin	-	-	R 0.15	R 0.16	R 0.13
Austell_Metformin 500mg Tablets 84		-	-	R 0.15	R 0.14	R 0.13
Forminal 500mg Tablets 56		R 0.12	R 0.13	-	-	-
Forminal 500mg Tablets 84		R 0.12	R 0.13	-	-	-
Indo_Metformin 500mg Tablets 56		R 0.12	R 0.13	R 0.16	R 0.15	R 0.15
Indo_Metformin 500mg Tablets 84		R 0.11	R 0.09	-	-	-
Mylan_Metformin 500mg Tablets 500		-	-	R 0.13	R 0.12	R 0.12
Mylan_Metformin 500mg Tablets 84		-	-	R 0.15	R 0.14	R 0.14
Ritalin 10mg Tablets 30	Methylphenidate	R 0.82	R 0.82	R 0.82	R 0.82	R 0.83
Adco-Contromet 10mg Tablets 10	Metoclopramide	R 0.16	R 0.17	R 0.19	R 0.18	R 0.17
Adco-Contromet 10mg Tablets 100		-	-	R 0.08	R 0.08	R 0.07
Bio_Metoclopramide 10mg Tablets 10		R 0.16	R 0.16	-	-	-
Clomax 10mg Tablets 100		R 0.05	R 0.05	-	-	-
Clomax 10mg Tablets 500		-	-	R 0.07	R 0.07	R 0.07
ACRIPTAZ 200mg Tablets 56	Nevirapine	R 0.38	R 0.57	R 0.68	R 0.65	R 0.61
Adco-Nevirapine 200mg Tablets 56		R 0.38	R 0.53	R 0.58	R 0.55	R 0.57
Aspen_Nevirapine 200mg Tablets 56		R 0.39	R 0.54	R 0.59	R 0.56	R 0.54
Bio-Nifedipine 10mg Capsules 100	Nifedipine	R 0.49	R 0.49	R 0.56	R 0.53	R 0.50
Epanutin 100mg Capsules 100	Phenytoin	R 0.44	R 0.44	R 0.86	R 0.86	R 0.86
Phenytoin 100mg Capsules 84		-	-	R 0.73	R 0.72	R 0.59
Phenytoin_Sodium 100mg Tablets 84		R 0.59	R 0.58	-	-	-
Be-Tabs_Prednisone 5mg Tablets 100	Prednisone	R 0.12	R 0.12	R 0.15	R 0.15	R 0.15
Be-Tabs_Prednisone 5mg Tablets 1000		-	-	-	R 0.16	R 0.15
Be-Tabs_Prednisone 5mg Tablets 28		R 0.12	R 0.12	R 0.15	R 0.15	R 0.15
Be-Tabs_Prednisone 5mg Tablets 500		-	-	-	R 0.16	R 0.15
Be-Tabs_Prednisone 5mg Tablets 56		R 0.11	R 0.11	R 0.14	R 0.15	R 0.14
Phenergan 25mg Tablets 100	Promethazine	R 0.15	R 0.15	R 0.22	R 0.22	R 0.22
Asthavent_Ecohaler 100mcg Inhaler 200	Salbutamol	R 0.06	R 0.07	R 0.09	R 0.07	R 0.08
Ventimax 100mcg Inhaler 200		R 0.08	R 0.08	R 0.10	R 0.08	R 0.08
Aspen_Stavudine 30mg Capsules 56	Stavudine	-	R 0.31	R 0.34	R 0.32	R 0.31
Sonke_Stavudine 30mg Capsules 56		R 0.27	-	-	-	-
Cipla-Zidovudine 100mg Capsules 100	Zidovudine	R 0.43	-	-	-	-
Zidomat 100mg Tablets 100		-	R 0.56	R 0.67	R 0.64	R 0.61

[Table 2 contains medicine prices from the tender pricing system. There are prices for each branded medicine name for the corresponding year in the five-year period i.e. 2014–2018. The letter R represents the South African currency in Rands]

Table 3: *Single Exit Price (SEP) (per dosage form e.g. tablet/capsule/suspension) from 2014 to 2018 for the List of Medicines*

Manufacturer Product Name	Active Ingredient	2014 Price	2015 Price	2016 Price	2017 Price	2018 Price
Acitab_200_DT 200mg Tablets 25	Aciclovir	-	R 2.56	R 2.76	-	-
Lovire 200mg Tablets 25		R 2.22	-	-	R 2.77	R 2.82
Adco-Allopurinol 300mg Tablets 28	Allopurinol	-	-	-	-	-
Adco-Allopurinol 300mg Tablets 30		R 1.80	R 1.80	R 1.94	R 2.09	R 2.11
Puricos 300mg Tablets 250		R 1.80	-	-	-	-
Puricos 300mg Tablets 28		-	R 1.94	-	-	-
Puricos 300mg Tablets 30		R 1.80	-	-	-	-
Gulf_Amitriptyline 25mg Tablets 500	Amitriptyline	-	R 0.54	R 0.58	R 0.63	R 0.64
Sandoz_Amitriptyline_HCL 25mg Tablets 100		R 0.60	R 0.64	-	-	-
Sandoz_Amitriptyline_HCL 25mg Tablets 500		R 0.54	R 0.58	-	-	-
Trepiline 25mg Tablets 100		R 0.87	R 0.94	R 1.01	R 1.08	R 1.11
Trepiline 25mg Tablets 500		R 0.87	-	R 1.01	R 1.08	R 1.11
Allmox 250mg Capsules 1000	Amoxicillin	-	-	-	R 0.37	R 0.37
Allmox 250mg Capsules 500		-	-	-	R 0.37	R 0.37
Amoxicap 250mg Capsules 500		-	R 0.32	R 0.34	-	-
Amyn 250mg Capsules 500		R 0.33	-	-	-	-
Austell_Amoxicillin 250mg Capsules 15		-	-	-	-	R 0.00
Austell_Amoxicillin 250mg Capsules 500		-	-	-	R 0.59	-
Moxymax 250mg Capsules 500		R 0.33	R 0.35	R 0.37	-	-
Austell_Atenolol 50mg Tablets 28	Atenolol	R 0.66	-	-	-	-
Austell_Atenolol 50mg Tablets 30		R 0.66	-	-	-	-
Austell_Tenopress 50mg Tablets 28		-	R 0.41	-	-	-
Bio-Atenolol 50mg Tablets 30		R 0.55	R 0.59	R 0.64	R 0.69	R 0.70
Zetenol 50mg Tablets 28		-	-	-	R 0.65	-
Zetenol 50mg Tablets 30		-	-	R 0.61	-	R 0.67
Beceze 50mcg Inhaler 200	Beclometasone	R 0.31	R 0.33	-	-	-
Beclate 50mcg Inhaler 200		-	-	R 0.39	R 0.42	R 0.43
Bio-Captopril 25mg Tablets 60	Captopril	R 0.29	R 0.32	R 0.34	R 0.37	R 0.37
Degranol 200mg Tablets 100	Carbamazepine	R 1.89	R 2.04	R 2.20	R 2.36	R 2.41
Gulf_Carbamazepine 200mg Tablets 84		-	-	-	-	R 0.00
Austell_Ceftriaxone 1g Vial 10	Ceftriaxone	-	R 2.40	R 2.59	-	-
Kocef-1000 1g Vial 3.5		R 16.30	R 17.52	R 18.89	R 20.31	R 20.75
Rociject 1g Vial 3.5		R 3.89	-	-	R 4.12	R 4.00
Biotech_Ciprofloxacin 500mg Tablets 10	Ciprofloxacin	R 1.72	R 1.85	R 1.99	-	-
Cifran 500mg Tablets 10		-	-	-	R 1.50	R 1.54
Profloxin 500mg Tablets 10		R 2.11	R 2.27	R 2.37	R 2.55	R 2.61
Auro_Amoxiclav 375mg Capsules 15	Co-amoxiclav	R 2.25	-	-	-	-
Austell_Co-Amoxiclav 375mg Tablets 15		-	-	-	R 2.75	R 2.81
Sandoz_Co-amoxyclav 375mg Tablets 100		R 2.53	R 2.71	R 2.93	R 3.15	R 3.22
Sandoz_Co-amoxyclav 375mg Tablets 15		R 2.58	R 2.76	R 2.98	R 3.21	R 3.27
Doctrim 240mg/5ml Suspension 100	Co-trimoxazole	R 0.08	R 0.08	R 0.09	R 0.10	R 0.10
Doctrim 240mg/5ml Suspension 50		R 0.08	R 0.08	R 0.09	R 0.10	R 0.10
Ilvitrim_Suspension 240mg/5ml Suspension 100		R 0.08	R 0.09	R 0.09	R 0.10	R 0.10
Ilvitrim_Suspension 240mg/5ml Suspension 50		R 0.08	R 0.09	R 0.09	R 0.10	R 0.10
Ilvitrim_Suspension 240mg/5ml Suspension 500		R 0.08	R 0.09	R 0.09	R 0.10	R 0.10
Betapam 5mg Tablets 1000	Diazepam	R 0.09	R 0.09	-	-	-
Valium 5mg Tablets 100		-	-	R 3.68	R 3.96	R 4.05
Biotech_Diclofenac 25mg Tablets 500		R 0.13	R 0.14	-	-	-

Mylan_Diclofenac 25mg Tablets 500	Diclofenac	-	-	R 0.15	R 0.15	R 0.15
Adco-Efavirenz 600mg Tablets 30	Efavirenz	R 3.55	R 3.55	R 3.55	R 3.55	R 3.59
Cipla_Efavirenz 600mg Tablets 28		-	-	-	R 5.54	-
Cipla_Efavirenz 600mg Tablets 30		R 4.45	R 4.78	R 5.15	-	R 5.66
Efavirenz_Winthrop 600mg Tablets 28		R 5.94	-	-	-	-
Efrin 600mg Tablets 28		-	-	-	R 7.41	-
Efrin 600mg Tablets 30		R 5.95	R 6.39	R 6.89	-	R 7.57
Sonke_Efavirenz 600mg Tablets		-	-	-	R 5.01	-
28 Sonke_Efavirenz 600mg Tablets 30		-	R 4.32	R 4.66	-	R 3.26
Nuzak 20mg Capsules 30	Fluoxetine	R 1.36	R 1.46	R 1.58	-	-
Prolax 20mg Capsules 28		-	-	-	R 0.94	R 0.96
Bio-Glibenclamide 5mg Tablets 100	Glibenclamide	R 0.23	R 0.25	R 0.27	R 0.29	R 0.29
Bio-Glibenclamide 5mg Tablets 500		R 0.23	R 0.25	R 0.27	-	R 0.29
Glycomin 5mg Tablets 100		R 0.24	R 0.25	R 0.27	R 0.29	R 0.30
Glycomin 5mg Tablets 30		R 0.24	R 0.25	R 0.27	R 0.29	R 0.30
Glycomin 5mg Tablets 500		R 0.24	R 0.25	R 0.27	R 0.29	R 0.30
Ridaq 25mg Tablets 500	Hydrochlorothiazide	R 0.82	R 0.88	R 0.95	R 1.03	R 1.05
Adco-Lamivudine 150mg Tablets 60	Lamivudine	R 0.70	R 0.70	R 0.70	R 0.70	R 0.71
Aspen_Lamivudine 150mg Tablets 56		R 1.84	-	-	-	-
Aspen_Lamivudine 150mg Tablets 60		-	R 1.98	R 2.13	R 2.29	R 2.34
Cipla_Lamivudine 150mg Tablets 60		R 1.22	R 1.31	R 1.41	R 1.52	R 1.55
Adco-Loperamide 2mg Tablets 300	Loperamide	-	-	R 1.37	R 1.47	R 1.51
Adco-Loperamide 2mg Tablets 6		-	-	R 1.37	R 1.47	R 1.51
Cipla_Loperamide 2mg Tablets 8		R 1.15	R 1.24	-	-	-
Austell-Losartan 50mg Tablets 28	Losartan	-	-	-	-	R 3.20
Austell-Losartan 50mg Tablets 30		-	-	R 2.92	R 3.14	-
Ciplazar 50mg Tablets 30		R 2.93	R 3.15	-	-	-
Austell_Metformin 500mg Tablets 100	Metformin	-	-	R 0.46	R 0.46	R 0.42
Austell_Metformin 500mg Tablets 500		-	-	R 0.46	R 0.46	R 0.42
Forminal 500mg Tablets 100		R 0.38	R 0.41	-	-	-
Forminal 500mg Tablets 500		R 0.38	R 0.41	-	-	-
Forminal 500mg Tablets 60		R 0.38	R 0.41	-	-	-
Indo_Metformin 500mg Tablets 100		R 0.36	R 0.38	R 0.40	R 0.43	R 0.44
Indo_Metformin 500mg Tablets 500		R 0.36	R 0.38	-	-	-
Mylan_Metformin 500mg Tablets 500		-	-	R 0.40	R 0.43	R 0.44
Mylan_Metformin 500mg Tablets 90		-	-	R 0.40	R 0.43	R 0.44
Ritalin 10mg Tablets 30	Methylphenidate	R 6.23	R 6.70	R 7.22	R 7.76	R 7.93
Adco-Contromet 10mg Tablets 500	Metoclopramide	R 0.11	R 0.12	R 0.13	R 0.14	R 0.14
Bio_Metoclopramide 10mg Tablets 500		R 0.09	R 0.10	-	-	-
Clomax 10mg Tablets 500		R 0.10	R 0.11	R 0.12	R 0.13	R 0.13
ACRIPTAZ 200mg Tablets 56	Nevirapine	-	-	-	R 4.50	-
ACRIPTAZ 200mg Tablets 60		R 3.61	R 3.88	R 4.18	-	R 4.60
Adco-Nevirapine 200mg Tablets 60		R 2.38	R 2.38	R 2.38	R 2.38	R 2.40
Aspen_Nevirapine 200mg Tablets 56		-	-	-	R 4.40	-
Aspen_Nevirapine 200mg Tablets 60		R 3.61	R 3.88	R 4.19	-	R 4.49
Bio-Nifedipine 10mg Capsules 250	Nifedipine	R 0.26	R 0.26	R 0.26	R 0.26	R 0.26
Epanutin 100mg Capsules 100	Phenytoin	R 2.26	R 2.43	R 2.50	R 2.68	R 2.74
Phenytoin 100mg Capsules 100		-	-	R 0.56	-	-
Phenytoin 100mg Capsules 90		-	-	-	R 0.60	R 0.62
Phenytoin_Sodium 100mg Tablets 100		-	R 0.52	-	-	-
Phenytoin_Sodium 100mg Tablets 1000		R 0.48	-	-	-	-
Be-Tabs_Prednisone 5mg Tablets 1000	Prednisone	R 0.12	R 0.16	R 0.17	R 0.20	R 0.21
Phenergan 25mg Tablets 100	Promethazine	R 1.13	R 1.21	R 1.31	R 1.40	R 1.43
Asthavent_Ecohaler 100mcg Inhaler 200		R 0.12	R 0.13	R 0.13	R 0.14	R 0.15

Ventimax 100mcg Inhaler 200	Salbutamol	R 0.13	R 0.13	R 0.14	R 0.16	R 0.16
Aspen_Stavudine 30mg Capsules 56	Stavudine	-	-	R 0.91	-	-
Aspen_Stavudine 30mg Capsules 60		-	R 0.85	-	R 0.98	R 1.00
Sonke_Stavudine 30mg Capsules 60		R 0.54	-	-	-	-
Cipla-Zidovudine 100mg Capsules 100	Zidovudine	R 1.94	-	-	-	-
Zidomat 100mg Tablets 100		-	R 1.84	R 1.99	R 2.14	R 2.18

[Table 2 contains medicine prices per dosage form (e.g. tablet/capsule/suspension) from the SEP system. There are prices for each branded medicine name for the corresponding year in the five-year period i.e. 2014–2018. The letter R represents the South African currency in Rands]

The first trend visually observed that medicine prices increased with time for both tender medicine prices and the SEP's (found in 36 out of 74 branded medicine graphs). Trend lines were added to each branded medicine graph to assess the level of the price increase which was represented by the gradients of the slope (see *Figure 1- Epanutin® 100mg tender gradient 0.126 and SEP gradient 0.121*).

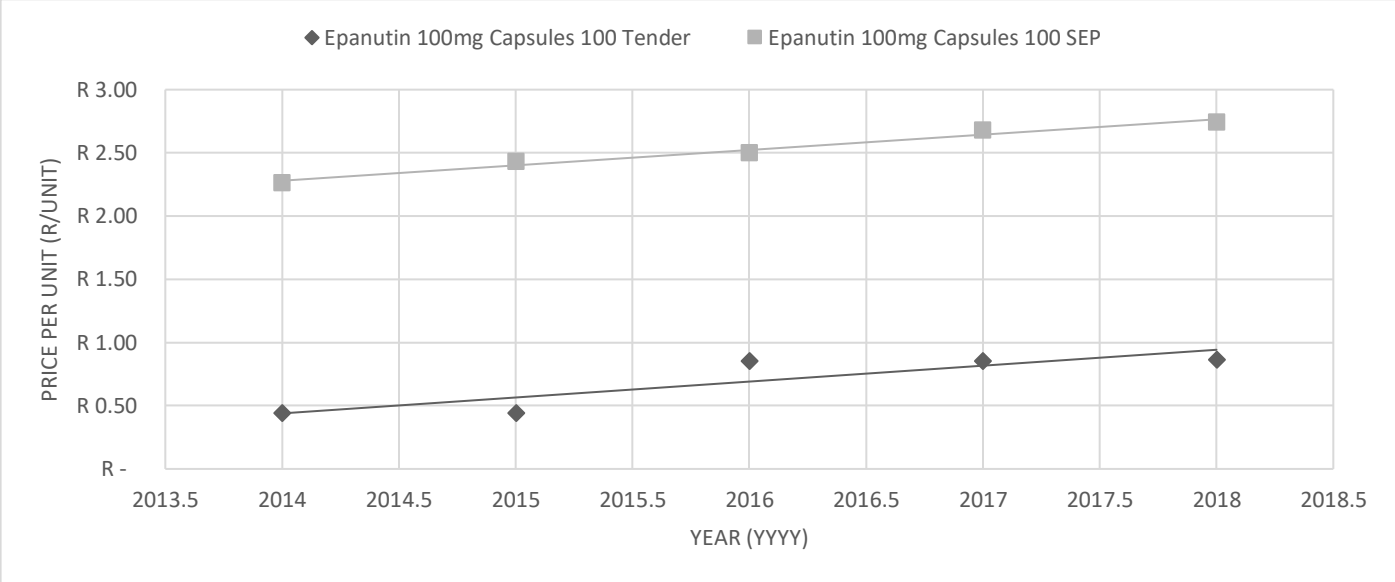

Figure 1: *Medicine prices of Epanutin® 100mg versus time*

[Figure 1 represents the price increases over the five-year period (2014–2018) for both tender (gradient 0.126) medicine prices and SEPs (gradient 0.121)

The next trend visually displayed that the tender medicine prices for some branded medicine items remained the same or decreased in price for the five-year period, while the SEP's for the same branded medicine increased. This was shown for 31 of the total branded medicine graphs (see *Figure 2- graph of Ritalin®10mg: gradient for tender 0.001 and gradient for SEP 0.447*).

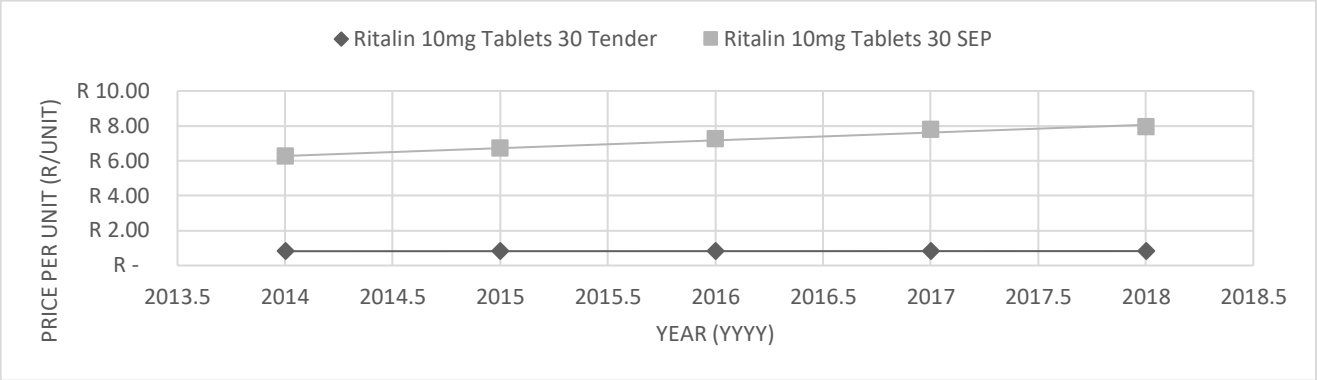

Figure 2: *Medicine Prices of Ritalin®10mg versus time*

[Figure 2tender prices remained the same with time (2014–2018) while the SEP increased and is represented by medicine Ritalin®10mg- gradient for tender 0.001 and gradient for SEP 0.447]

The most prominent observation was that SEP's were consistently higher than the tender medicine prices throughout the study period. The majority, 87.84% (65 out of 74), of the branded medicine items exhibited this behaviour (see *Figure 3*- graph of Bio-captopril® *25mg: gradient for tender* 0.123 and gradient for SEP 0.002). This was further substantiated by the price difference calculation that was computed. For the calculation between the two price systems to be completed, only 36 medicine brands could be used based on the calculation criteria (see method section). All 36 items consistently showed higher SEP's than tender prices during this observation. The lowest price difference was 33% (Be-tabs prednisone® 5mg) and the highest price difference was 1964.70% (Adco-loperamide® 2mg 300's) shown in **Error! R eference source not found.**. The median was 252.30% with quartile one at 94.75% and quartile two at 585.1%. The interquartile range was 490.35%. The dataset distribution was skewed to the right yielding a positive skewness.

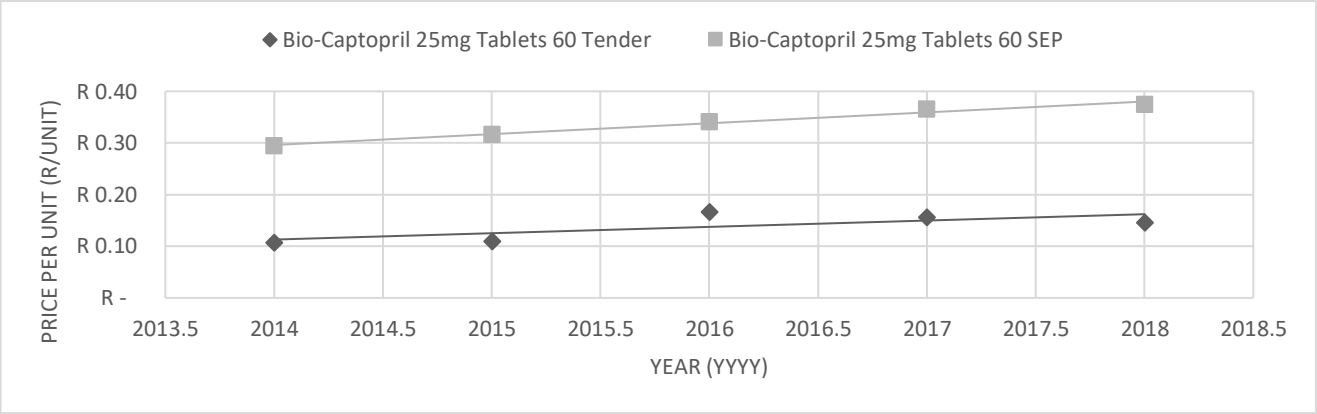

Figure 3: *Medicine prices (per tablet) of Bio-captopril®25mg versus time*

[Figure 3 represents the SEPs being more than tender price by the example of the medicine Bio-captopril®25mg- gradient of tender 0.123 and gradient of SEP 0.002]

Table 4: *The Price Difference between Tender Price and SEP from 2014 to 2018*

Branded Medicine Name	Price Difference
Be-Tabs_Prednisone 5mg Tablets 1000	33.00%
Doctrim 240mg/5ml Suspension 50	35.50%
Austell_Co-Amoxiclav 375mg Tablets 15	46.00%
Ilvitrim_Suspension 240mg/5ml Suspension 50	56.50%
Doctrim 240mg/5ml Suspension 100	64.20%
Ventimax 100mcg Inhaler 200	77.20%
Asthavent_Ecohaler 100mcg Inhaler 200	79.70%
Clomax 10mg Tablets 500	81.00%
Mylan_Diclofenac 25mg Tablets 500	92.70%
Ilvitrim_Suspension 240mg/5ml Suspension 100	96.80%
Sandoz_Co-amoxyclav 375mg Tablets 15	108.90%
Bio-Captopril 25mg Tablets 60	150.60%
Beceze 50mcg Inhaler 200	153.20%
Beclate 50mcg Inhaler 200	196.40%
Bio-Glibenclamide 5mg Tablets 100	201.00%
Cifran 500mg Tablets 10	213.80%
Biotech_Ciprofloxacin 500mg Tablets 10	226.70%
Zidomat 100mg Tablets 100	230.20%
Mylan_Metformin 500mg Tablets 500	252.30%
Profloxin 500mg Tablets 10	288.00%
Epanutin 100mg Capsules 100	297.60%
Adco-Allopurinol 300mg Tablets 30	361.90%
Prolax 20mg Capsules 28	379.40%
Acitab_200_DT 200mg Tablets 25	507.50%
Lovire 200mg Tablets 25	540.90%
Degranol 200mg Tablets 100	558.80%
Gulf_Amitriptyline 25mg Tablets 500	576.00%
Valium 5mg Tablets 100	581.60%
Phenergan 25mg Tablets 100	588.60%
Trepiline 25mg Tablets 100	604.60%
Adco-Loperamide 2mg Tablets 6	630.90%
Ridaq 25mg Tablets 500	666.10%
Bio-Atenolol 50mg Tablets 30	702.30%
Ritalin 10mg Tablets 30	771.80%
Cipla_Loperamide 2mg Tablets 8	896.50%
Ciplazar 50mg Tablets 30	1319.50%
Adco-Loperamide 2mg Tablets 300	1964.70%

[Table 4 is the percentage price difference between the SEP and tender medicine prices for the period 2014–2018. The medicines are represented in their branded medicine name and the price difference is represented as a percentage.]

The average price index (API) calculation was the final observation. From the basket of 32 active ingredients (with some brands having multiple pack sizes) only those items fitting the required criteria (see method section) were used in the calculation. The calculation was to establish the average price increase (in %) displayed by the specific medicine brand (in each pack size) within each price system. The purpose of displaying the data as such was to establish the price change patterns that could be observed in each respective price system. By virtue of differing data sets in each price system, annual price changes could not be compared directly between SEP and tender systems. The graph shows a more consistent price increase in the SEP system while the tender system showed a more sporadic price change pattern. In the tender system, 15 branded medicines (out of 47 brands) showed a price decrease while 32 showed an increase in price (see *Figure 4)*. Out of 81 branded medicines (overlapping brands for some medicines with multiple pack sizes) for the SEP system, 78 branded items demonstrated an increase in price while 3 branded items demonstrated a decrease.

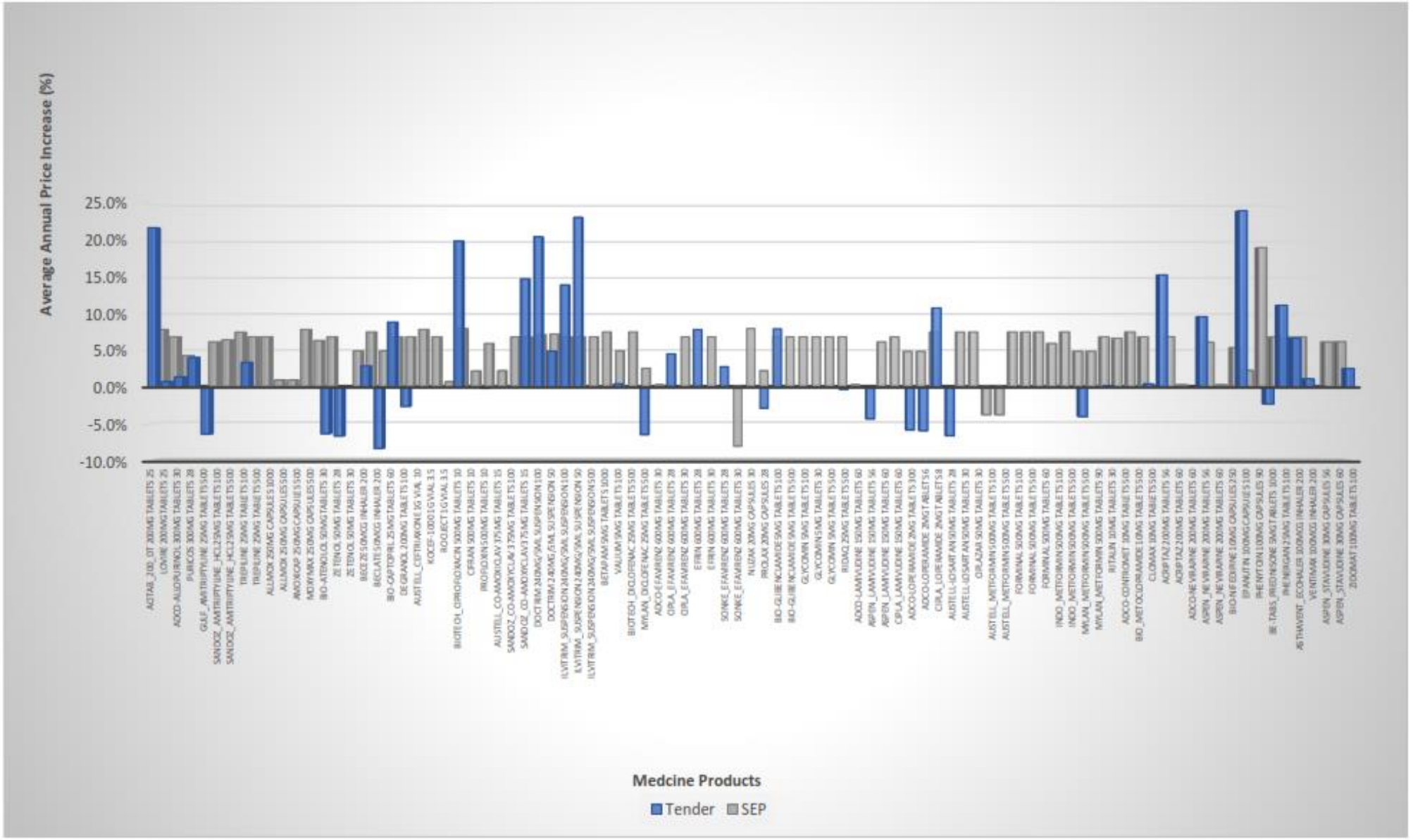

Figure 4: *Average Annual Price Increase from 2014 to 2018 for the List of Medicines*

Discussion

Globally, medicine price regulations are implemented with the intent of containing medicine costs. In SA, the medicine price systems implemented differ across the private and public sectors. Despite both having the same intention of lowering medicine costs, the degree to which this is achieved requires further investigation. The article was thus written with the intent of identifying the price trends between the two systems by calculation of the price difference and price increases.

At the outset, the study revealed that prices between the two healthcare sectors for the same medicine were glaringly different. Medicine prices in the private sectors were consistently higher than tender prices. This was similar to findings in other studies that proved tender medicine prices showed an overall decrease in medicine price [(Baldi & Vannoni, 2015); (Bartels, 2016); (Bergman, et al., 2017); (Curto, et al., 2014); (Danzon, et al., 2015); (Kanavos, et al., 2009); (Petrou & Talias, 2014); (Raventos & Zolezzi, 2015) and (Wouters, et al., 2018)]. The most probable reason for this difference is the methodology adopted for the tendering process in the public sector. This was elaborated upon in a study by Wouters et al., which observed the impact of the tender medicine system in SA over a 14-year period: 2003–2016 (Wouters, et al., 2018). According to Wouters et al. pharmaceutical tenders are bought after a confidential bidding process in bulk, usually from a central buyer which accounts for the fixed prices that are awarded (Wouters, et al., 2018). This indicates that the volumes procured largely influence the prices at which it will be available on the tender system. In the private sector, medicine prices are prohibited from being influenced by volume purchases by the price regulations applied. These regulations were permitted to improve price transparency in the private sector, especially where price negotiations (rebates and bonuses) promoted previous discounts from manufacturers to retailers and not awarded to patients.

The selection criteria adopted in the tendering process could also attribute to the price differences seen in this study. The WHO defines the tendering process as a form of strategic purchasing based on several input factors (World Health Organization, 2020). Every country, therefore, establishes what factors strategically form their tender criteria. Competitive bidding (Dranitsaris, et al., 2017); (Kockaya & Wertheimer, 2016), price negotiations (The Department of Health ;, 2010), medicine efficacy, safety, quality and cost (Modisakeng, et al., 2020),are some of the factors used in the South African selection process. While these factors could be contributing to the low costs exhibited in the tender system as compared to the SEP system, there is no certainty that the tendering process has indeed led to the lowest possible prices. In SA, the Government occasionally uses an ad hoc based criterion to promote local economic growth by favoring local manufactures for the tender (Wouters, et al., 2018). This indicates that the medicines supplied by the local manufacturers may not always be the most cost-effective, as seen in the Xiphu and Mpanza study where prices even in the public domain did not compare well with international reference prices or with prices in other African public sectors (Xiphu & Mpanza, 2004). Furthermore, the criteria for medicine selection for the EML was also identified as not being a completely transparent process (Perumal-Pillay &

Suleman, 2017). The tender process also has little coordination with regards to tender issuance and the registration of products, which leads to some items being excluded from tenders, further weakening competition (Wouters, et al., 2018). Therefore to maintain better competition among the drug companies, a better tender process needs to be developed to make it simpler for drug companies to participate in tenders (Wouters, et al., 2018).

The tender process follows several selection criteria steps before concluding with a contract that is negotiated and agreed upon. Each contract contains all the details about the tender including the price, the duration of the contract, and even a section on price review rules (Department of Health, 2019). The price review section stipulates the conditions that will mandate a price change, which is mostly related to foreign exchange fluctuations (Department of Health, 2019). Foreign exchange rates affect the tender price especially when the medicine active ingredient is sourced internationally. This could be the reason for the sporadic price increases seen for the tender system in this study (see *Figure 4*). The graph showed irregular price increases for the tender system while the SEP system showed a steadier average price growth. The SEP system can account for the regular price increases as it is regulated by an annual price increase which is based on the CPI. Therefore, the private sector can account for the price increases seen because it is regulated tightly as compared to the public sector, which is not.

The medicine price increases in the private system are capped thus providing an advantage. Before the SEP system was implemented, the price increases were much higher. In the Moodley and Suleman study, it was identified that there was an immediate decline in medicine prices after the implementation of the SEP system (Moodley & Suleman, 2019). The yearly increases continued after the SEP regulation, however, the value by which it increased was regulated thus providing an overall decrease in medicine price in the private sector. This provided an advantage to the patients in the private sector as they were paying less in comparison to before the implementation of the SEP. However, in comparison to the prices available in the public sector, the private sector prices are vastly more The current study contained a basket of “lower-priced medicines” (mostly generic brands) of which the price difference calculation yielded a median value of 252.30%between SEP and tender prices with a positive skewness distribution There was a large distribution in price differences however the entire sample used for the calculation yielded positive values, which indicated that all the SEPs were higher than the tender prices for the sample used in the calculation. However a larger dataset is recommended to make inferential analysis., The price difference explored in the Wouters et al. study showed a 511% price difference for atorvastatin in 2009 (Wouters, et al., 2018). This indicates that the yearly price increases have improved in the private sector but the price differences between the public and private sectors have not seen a significant change.

While the tender system shows lower prices than the SEP system, it does face some limitations. These include an over or undersupply of medicines due to poor annual demand forecast estimations (Wouters, et al., 2018). Oversupply of medicines could lead to budget exhaustions (J, et al., 2010), while the undersupply of medicines lead

to medicine shortages (J, et al., 2010) (Wouters, et al., 2018). While budget exhaustions have serious implications, medicine shortages are a more common problem experienced in SA and other countries such as Netherlands (Kanavos, et al., 2009) and New Zealand (PHARMAC, 2016). A study conducted by Modisakeng et al. reviewed the medicine shortage problems in SA and concluded that the main challenges were in the procurement process (Modisakeng, et al., 2020). There are several adjustments to the tender structural approach (Management Sciences for Health, 2012) that can improve medicine shortages such as a split tender system. In SA, the split tender approach is utilized thus limiting the occurrence and impact of medicine shortages (Wouters, et al., 2018). This approach is adopted to assist with volume issues especially when the needed product is of high importance such as first-line ARV drugs (Wouters, et al., 2018). This was the reason for several branded names being listed for one medicine active ingredient in this study (see **Error! Reference source not found.**, ***Error! Reference source not found.***, and *REF _Ref42443940 \h * MERGEFORMAT* ***Error! Reference source not found.***).

It is noted that both tender and SEP systems have advantages and disadvantages. One downside of the SEP system is that there are additional costs applied to the SEP of a medicine in the form a dispensing fee (which a pharmacy may or may not apply) (Ondo, 2019). The price differences observed in the current study excluded the dispensing fees, which are governed by procedures that are weak and complex (Ondo, 2019), thus requiring further transparency and policy review. Ultimately the patient is paying more than the values identified in this study.

The current study focused on establishing the differences between the price system in the private and public sectors. However, during the study, an underlying commonality was identified. Both the private and the public sectors underwent regulation changes to improve transparency, but complete transparency in these systems has not yet been achieved and should be improved. It is also recommended that as medicine procurement volume is a contributing factor in relation to price, and was not explored in this study, it should be further investigated.

Limitations

The medicines selected in the study were based on the WHO/HAI survey list (Xiphu & Mpanza, 2004) and did not include all medicines that are on the tender. Generalizations for all medicines on the tender system therefore could not be made. The medicine list used in the study included mostly generic branded medicines (according to the tender awards) which show “lower-priced medicines” when compared to originator brands (higher medicine prices). Medicine prices were “low” in the study however it does not indicate that prices are generally low in SA but rather that the chosen list contained more “lower costing” medicines, which could bias the cost representations in the study. In the private sector the logistics fee is included as part of the SEP however, the logistics fee for medicines in the public sector were not reviewed in this study and should therefore be considered in future studies. The use of a larger dataset and inferential statistics would have strengthened the findings of this study.

Conclusion

The trends depicted in the study showed that each price system does show some advantages and disadvantages. Varying price differences across both sectors is associated with a lack of transparency in establishing medicine prices. Therefore, to move towards a better-unified healthcare system (NHI), the underlying shortcomings in the current systems must be corrected. Policymakers need to ensure that a transparent system adheres throughout the medicine price processes in order to improve medicine price systems and healthcare in SA.

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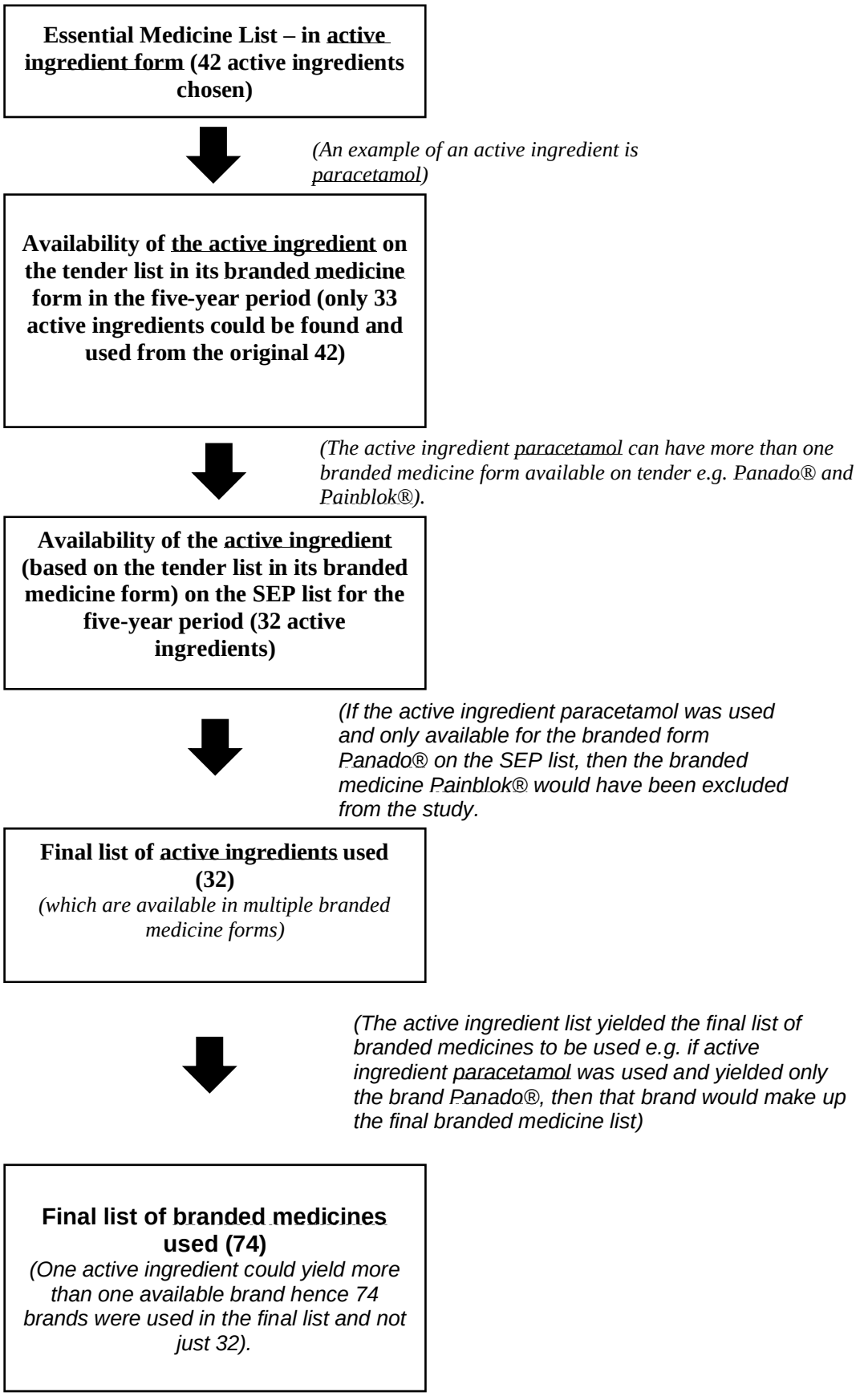
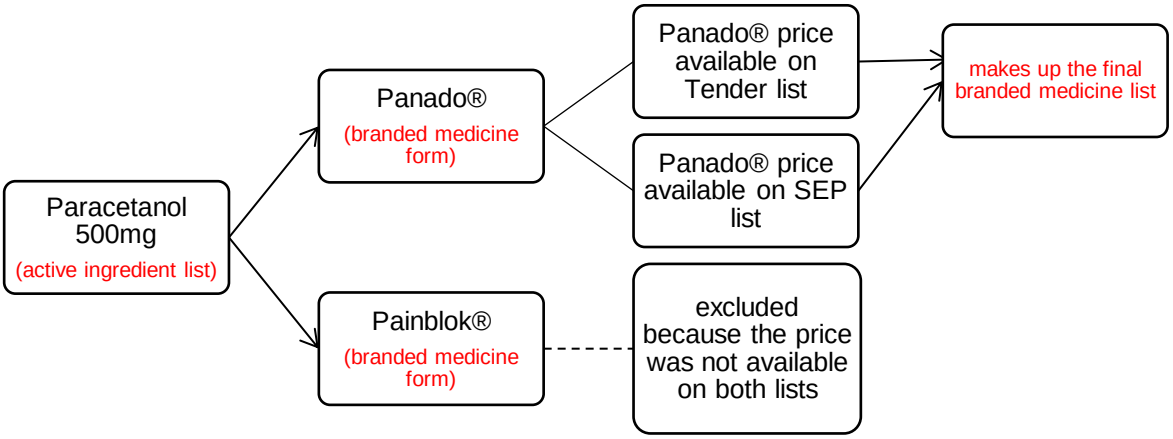
Supplementary Material

Medicine basket selection flow chart



Example of medicine basket selection process



CHAPTER4: CONCLUSION

4.1 Introduction

This study was carried out to establish the differences between medicine prices in the public and private healthcare sectors of South Africa (SA). The trend in medicine prices, as well as calculations of the price differentials and average price increases, were explored to determine the differences in each sector. The rationale for the study was to identify how current medicine pricing systems function in SA to make recommendations for future healthcare prospects in SA i.e. the NHI. From the medicine price differences explored during the study, it can be deduced that the pricing regulations largely influence the prices found in each sector. This study found that the medicine prices in the private sector were much higher relative to the public sector and requires elements of better system transparency to improve the current practices.

4.1.1 Strengths of the Study Methodology and Design

The gathering of the data was simple as each website forum allowed easy access to obtain the data. The data for five years were further categorised according to the research methodologies adopted with the relevant exclusion and inclusion criteria. Data were relatively easy to further analyse to deduce the trends and price differences for the two pricing systems investigated.

4.1.2 Limitations of the Study

- Prices were explored for selected medicines; therefore, the results of the study cannot be generalised.
- The study contained a basket of "lower-priced medicines" (mostly generic brands used) and does not represent that all medicines in SA have low prices.

4.2 Conclusions Drawn from the Study Findings

This study aimed to compare the differences in medicine prices between the public and private healthcare sectors in SA i.e. the tender and SEP systems, respectively. The objectives of the study were to:

1. identify the medicine pricing trends that exist
2. determine the medicine price differential
3. equate the average price index between each pricing system.

Conclusions drawn from the study findings based on the aforementioned objectives

- Medicine prices in each system showed a general increase in medicine prices over the five-year period.
- The most prominent observation was that medicine prices were higher in the SEP system as compared to the tender system as displayed in other studies (Wouters, et al., 2018). There were few exceptions for medicines in the tender system having higher prices than SEP however the majority displaying higher prices were found in the SEP system (87.84 %).
- The price differential calculation determined a median value of 252.30% with distribution skewed to the right yielding a positive skewness.

  . There were no negative differential values found, indicating that all the medicine brands used in the average price differential calculation were always higher for the SEP than in the tender system.

- Tender medicine prices decreased or remained the same for 41.89 % of the medicine brands explored, while the SEP for these same medicine brands increased.
- The average price index (API) was calculated and extrapolated that medicine price increases for the tender system were changing in a more sporadic pattern. The price increases for the SEP system showed a steadier price change over the five-year period. The calculation showed that the tender system experienced more medicine price decreases in comparison to the SEP system that showed a majority of medicine prices increases. Thus, the patterns explored for the API are influenced by the regulations in place which affects the medicine price changes; in the case of the tender system the lack of such regulation whereas the SEP system that has a stricter price increase regulation.

4.3 Significance of the Study

- The results of the study indicate the medicine price differences that are experienced between the two medicine pricing systems in South Africa especially with a global goal of decreasing medicine costs (Volger, et al., 2017).
- The two systems practice different pricing methodologies. Having explored the medicine prices for each system, a better understanding of the impact of the practices of each system has been gained. With the regulations in each system showing its influence on medicine prices, lack of transparency was a common trait identified in both systems. This finding can assist policymakers for future healthcare changes for SA, particularly

when the NHI is fully implemented.

4.4 Recommendations

- While each pricing system needs to update the methods used, a large part of improving the current systems, involves creating better transparency in all steps undertaken. The underlying problems faced in both systems included information gaps in several of the steps which impacted the prices of medicines in each sector. The tender system needs to focus on the approach for implementing price changes as well as the process for awarding tenders.
- Policymakers need to re-evaluate the regulations implemented in the private sector. Regular amendments to the policies need to be considered at shorter intervals rather than longer, so that problem areas can be rectified, to avoid long-term impact.
- Further studies are encouraged for a larger medicine basket selection to be able to generalise the study findings.
- A thorough investigation of medicine price systems for the NHI needs to be conducted to be able to implement improved mechanisms for the new system.

4.5 Chapter Summary

This final chapter highlighted the conclusions drawn from the findings of the study and described the significance, strengths, and limitations of the study. It also provided recommendations for the problem areas identified in the study that need to be improved to enhance medicine pricing systems in SA.

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ANNEXURE 1

UNIVERSITY OF KWAZULU-NATAL
INYUVESI YAKWAZULU-NATALI

20 June 2019

Mrs Tarryn Thaver (210509623)
School of Health Sciences
Westville Campus

Dear Mrs Thaver,

Protocol reference number: HSS/0421/019M
Project Title: A comparison study between public tender medicine prices and single exit medicine prices

Full Approval – No Risk / Exempt Application

In response to your application received 25 May 2019, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol has been granted **FULL APPROVAL.**

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment /modification prior to its implementation. In case you have further queries, please quote the above reference number.

PLEASE NOTE: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully

.....
Dr Rosemary Sibanda (Chair)

/ms

cc Supervisor: Dr Varsha Bangalee
cc. Academic Leader Research: Professor Pragashnie Govender
cc. School Administrator: Ms Phindile Nene

Humanities & Social Sciences Research Ethics Committee
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Website: www.ukzn.ac.za

ANNEXURE 2

Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Tarryn Thaver** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 07/18/2017.

Certification Number: 2436299.

ANNEXURE 3

Journal of Pharmaceutical Health Services Research - Manuscript ID JPHS-20-0071 [email ref: SE-6-a]

1 message

Aditya Shivcharan <onbehalfof@manuscriptcentral.com> Wed, Jun 10, 2020 at 7:12 PM
Reply-To: JPHSReditorialoffice@wiley.com
To: tarryngovender72@gmail.com
Cc: tarryngovender72@gmail.com, Neelaveni.Padayachee@wits.ac.za, Bangalee@ukzn.ac.za

10-Jun-2020

Dear Mrs. Thaver:

Your manuscript entitled "A comparison study between public and private healthcare sector medicine prices in South Africa." by Thaver, Tarryn; Padayachee, Neelaveni; Bangalee, Varsha, has been successfully submitted online and is presently being given full consideration for publication in Journal of Pharmaceutical Health Services Research.

Co-authors: Please contact the Editorial Office as soon as possible if you disagree with being listed as a co-author for this manuscript.

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Sincerely,
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