

Chapter 5

Conclusions and Recommendations

Chapter 1	Introduction	The background, motivation and reasoning for the study as well as the goals and outline of the study are given.
Chapter 2	Literature Study	Literature review of health care systems, chronic medication, cost, compliance, prevalence and patient profiles provide the background for the quantitative analyses
Chapter 3	Research Methodology	The research methodology followed in the study is discussed.
Chapter 4	Results and Discussion	A number of analyses are performed on the available data to establish prescribing trends, including demographic profiles, geographic distribution, utilisation, costs, providers of medication and medication compliance. The results of the empirical investigation are also reported in this chapter.
Chapter 5	Conclusions and recommendations	This chapter contains final conclusions and recommendations on chronic medication management in the private sector in South Africa.

The goal of this chapter is to match the initial objectives to the final findings and to draw conclusions from these findings. The chapter commences with a short summary of the thesis content followed by the main conclusions drawn from both the literature and empirical investigation. The research objectives are linked to the findings in order to complete and conclude this study. Lastly, the strengths and weaknesses of the study are discussed followed by suggestions for possible future research.

5.1. Thesis content summary

The five chapters of this thesis were divided as follows:

- Chapter 1: the background, goals, motivations and reasoning for the study were highlighted. Research objectives, specific research questions and proposed study outline to meet these objectives were given

- Chapter 2: a literature review of health care delivery, reimbursement, types of health care and medication usage trends was completed. Pharmaceutical care and the supply of medication were of special interest and this formed the background for the empirical investigation on medication usage in Chapter 4.
- Chapter 3: the nature of the empirical investigation was clarified. Descriptions of the study design, research methods, data source and study population selection were given. The statistical and other measurements were reported and defined. Reliability and validity, ethical considerations as well as study limitations were presented.
- Chapter 4: the details of the datasets and the results from their interpretation were given. The chapter included reports on the characteristics of the total dataset as well as chronic medication only. Chronic medication was analysed in more depth and medication possession ratios, medication oversupply and the costs associated with this oversupply were reported.

5.2. Study conclusions

The study consisted of two phases, as described in Chapter 1 paragraph 1.6.2.1 and 1.6.2.2. Phase one (the literature review) was documented in Chapter 2 and focused on health care and specifically its pharmaceutical care component. This was further analysed to discuss chronic medication and the distribution thereof. Phase two of the study consisted of an empirical investigation – in particular, a quantitative, retrospective, cross-sectional drug utilisation review. The general research objective was a comparative investigation into the management of chronic medication and trends between mail order/courier and retail pharmacies in the South African private health care sector. These trends include geographic distribution, demographic profiles, utilisation, costs and medication possession trends.

5.2.1. Conclusions from the literature review

The specific research objectives can be paired with a summary of the findings from the literature. The specific research objectives of the literature study as set out in Chapter 1, were as follows:

- ❖ **Objective 1: To research and compare different health care systems and models globally, and then focus on the SA health care environment (including public and private sector)**

The World Health Organization, in its 2000 World Health report, defines a health care system as follows: “Health systems consist of all the people and actions whose primary purpose is to improve health” (WHO, 2000:2). Countries across the world have different health care systems in place to meet the health related needs of their citizens. The different classifications of health care systems are given in paragraph 2.3.1 and include single-payer and multi-payer systems such as employment-based or managed-competition systems. The South African health care system is a multi-payer system where private and public health care needs are met with great disparities (refer to paragraph 2.3.2.1). The current system is viewed as ineffective and many supporting statistics such as high infant mortality rates and percentage of gross domestic product spent on health care versus outcomes are discussed in paragraph 2.3.2.1. The National Health Insurance Plan is also discussed in this paragraph. The private health care system is reviewed in paragraph 2.3.2.2 and it is seen that only 16% of the population is covered by private medical schemes, with an approximate expenditure of R11 300 per person per annum, while 68% of the population uses public health care facilities with an expenditure of less than R1 900 per person per annum while the rest are out-of-pocket payers (Health Economics Unit, 2009:2). This leads to the conclusion that, when compared to other countries, South Africa does not have a successful health care system and that the planned NHI will have the task of improving health care access, especially for the poor population.

❖ **Objective 2: To investigate and discuss health care and medication reimbursement strategies in various countries, including South Africa**

Reimbursement strategies are reported on in paragraph 2.4.1, and comparisons between the strategies of various countries are given in Tables 2.8 – 2.10. The re-imbursement of health care services in the South African private sector is described, including prescribed minimum benefit (PMB) legislation, which compels medical schemes to pay for a range of medical conditions and associated costs (refer to paragraphs 2.4.2 and 2.4.5).

It is concluded that there are primarily three types of reimbursement systems worldwide:

- A national system, where universal coverage is publicly financed through taxation, and health care delivery is performed by publicly owned systems and professionals paid by the public sector
- An entrepreneurial health care model where people voluntarily purchase medical cover (employment-based or individual), and the providers and health care facilities are largely in the private sector

- A compulsory mandated insurance model, where universal coverage is publicly financed and health care is delivered by both public and private entities

South Africa seems to have a two-tiered health care reimbursement system, whereby a portion of the population is part of the entrepreneurial model (private sector) and the majority is dependent on a national insurance model (public sector). This system causes inequality between the levels of care and the resources available in the private and public sector. The South African government aims to change the reimbursement structure to a compulsory mandated model with services provided from both the private and public health care facilities (refer to paragraph 2.3.2.1).

The current South African private sector model, where a patient contributes a premium towards a medical aid scheme and this scheme reimburses health care claims at a private health care facility, forms the basis of this investigation. More specifically, medication claims at private sector providers have been the focus of the analysis as described in the empirical investigation (Chapter 4).

❖ **Objective 3: To distinguish between the different components of health care, namely primary, ambulatory, hospital and pharmaceutical care**

Health care is seen to consist of various components: primary care, ambulatory care, hospital care, and pharmaceutical care (refer to paragraphs 2.5.1 to 2.5.4). Pharmaceutical care has been investigated further and is found to have two roles. Firstly, pharmaceutical care in the community is defined as the direct, responsible provision of medication-related care to patients, and secondly, the provision and distribution of prescription medication (refer to paragraphs 2.4.5.1. and 2.4.5.2).

The WHO (2001) describes timely access to safe and efficacious medicines at affordable costs for consumers as an essential part of health care.

In a study on accessibility of medication across low-income and middle-income countries, Cameron *et al.* (2011:1) found that both acute and chronic medication availability were limited across countries, specifically in the public sector. Upon closely investigating the provision of medication, it was found that geographic area, patient age and even gender may influence the accessibility to and requirements for medication (refer to section 2.5.4.2).

It is concluded that medication provision is a key element in a sustainable health care system, and the review of the provision of medication (specifically chronic medication) is therefore the main directive in the empirical investigation of this study.

❖ **Objective 4: To investigate and describe health care cost, both internationally and nationally, with specific reference to pharmaceutical (medication) costs and chronic medication**

Paragraph 2.6 explores medication usage trends and the associated costs in South Africa (private sector) as well as in other countries. It seems that the pharmaceutical market may be declining in value over the next few years in South Africa. This may be due to lower medication prices due to patent losses and more generic launches in this period. Hypertension and diabetes are the most prevalent diseases, and antihypertensive and antidiabetic medications are included in the top medication groups (CMS, 2011:167; Bester & Badenhorst, 2011:11). Chronic medication costs are discussed in more detail in paragraph 2.6.2.1, where it is found that medication was responsible for 17% of the annual spending on private health care (CMS 2010:165; CMS 2011:161). Bester and Badenhorst (2011:6) found that the combined cost contribution of PMB and non-CDL chronic medications was 39.5% of total medication costs. Chronic medication therefore represents a large portion of medication costs and this supports the empirical analysis of costs, medication possession and oversupply of chronic medication in Chapter 4.

❖ **Objective 5: To elucidate generic medication usage and its impact internationally and nationally**

Generic medication is defined and discussed in detail in paragraph 2.6.1. Factors that lead to generic use are found to include the number of generics available for the nature of a patient's treatment, the number of medications taken by the patient and the cost implication in relation to his/her economic position. Prescribing doctors also have an influential role in the prescribing of generic medication. In South Africa, managed care strategies such as reference pricing and formularies promoting generics, as well as mandatory generic substitution at pharmacy level, contributes to increased utilisation of generic medication. Internationally and locally the increased use of generic medication has led to a decrease in the cost of medication to both patient and third-party payers (refer to paragraph 2.6.1).

❖ **Objective 6: To describe medication provision systems internationally and nationally**

Paragraph 2.5.4.2.1 highlights the various providers of medication as retail/community pharmacies, courier/mail order pharmacies or dispensing medical practitioners. Of these distribution channels, pharmacies are utilised most frequently. South African retail pharmacies can further be classified as “independent” or “chain” pharmacies, indicating whether the pharmacy is individually owned and operated or forms part of a group of pharmacies. The volumes and costs associated with medication dispensed by the various providers have been analysed in Chapter 4.

❖ **Objective 7: To explore the definition of chronic medication and the medical scheme legislation around the management of chronic diseases and the dispensing of chronic medication in South Africa, which includes prescribed minimum benefit (PMB) / chronic disease list (CDL) and non-CDL list medications**

The term “chronic” and the follow-on term “chronic medication” is discussed in detail in paragraph 2.6.2. The large role of chronic disease as a cause of death internationally and nationally is also established. It is found that chronic disease is regarded as a major health care burden worldwide, and three of the top four causes of death worldwide are attributed to chronic disease. These conditions are coronary heart disease, stroke and cerebrovascular diseases, and chronic obstructive pulmonary disease (WHO, 2008b).

Chronic medication used to treat chronic diseases has been analysed in South Africa and other countries. Due to chronic diseases’ high burden on health care costs and medical aids’ legal commitment to paying for all treatment costs associated with the chronic PMB list of 26 diseases, it has been concluded that chronic medication is an important factor in health care costs for both patients and third party payers. This gives further motivation to investigate chronic medication at a deeper and empirical level, as executed in this study.

❖ **Objective 8: To provide the background for the comparison of utilisation, cost and geographic distribution patterns of chronic medication between various providers**

As the supply of medication to different geographical areas, patients of different ages and genders are quantitatively analysed in Chapter 4, some background on geographic distribution, age and gender distribution is provided in paragraph 2.5.4.2. The literature study has revealed that medication distribution as well as medical scheme membership could vary per province. Membership to private medical schemes may be related to economic status, and provinces with

a low household income also have a low medical scheme membership (Statistics SA, 2011; CMS, 2011). Membership per province is also linked to the number of residents per province, as is substantiated by data from Statistics SA (2011) and CMS (2011) which indicates that the highest concentration of medical scheme members and population density is found in Gauteng and the lowest in membership and population count is found in the Northern Cape.

Limpopo, Eastern Cape, Mpumalanga, and Northern Cape (considered rural provinces) have the least number of medical practitioners per 100 000 people and the least number of hospital beds (refer to table 2.6 and figure 2.7). The more urbanised provinces (Gauteng, Western Cape and KwaZulu-Natal) have a higher ratio of medical practitioners serving the population and more hospital beds available.

It has been found that older age could lead to a higher number of medications used (Morgan, 2005:997, Roe *et al.*, 2002:302). Medication utilisation could also differ between males and females (Franconi *et al.*, 2007:81-91), and the beneficiary profile as reported by the Council for Medical Schemes (CMS, 2011:160), indicated that the number of females represented 52.3% and males 47.7% of the total memberships population in 2010. This is also in line with the national demographic statistics (Statistics SA, 2011:2), indicating that 52% of the South African population is female and 48% male.

❖ **Objective 9: To review the current mechanisms of chronic medication dispensing in South Africa's two different health care sectors, public and private, and to focus specifically on the South African private sector**

According to the WHO (2001), a key element in any health system is to ensure timely access to safe and efficacious medicines at affordable costs for consumers. In South Africa, most patients receiving medication do so via a pharmacy. Bester and Badenhorst (2011:6) found that 89.5% of all medication claims were made by pharmacies. In the public sector, patients also receive their medication from the primary health care clinics, community health centres or hospital pharmacies, and there have even been private-public partnership initiatives to assist in the dispensing of chronic medication to public sector patients. In paragraph 2.5.4.2.1, pharmacies are established as the main source of distribution of medication in the South African private sector.

❖ **Objective 10: To identify the drivers or deterrents of chronic medication compliance from the literature**

Section 2.6 includes a comprehensive discussion on medication compliance and suggests that reasons for patient non-compliance may include:

- Perceived side effects
- Uninformed patients
- Older age (less cognitive ability and more medication items)
- Cost of medication

It is concluded from the literature that medication compliance is not satisfactory in many cases, based on international studies (McHorney *et al.*, 2009:2584; Hugtenburg *et al.*, 2005:352; Vanelli *et al.*, 2009:2628-2652; Theodorou & Slezak, 2010:58; Goldman *et al.*, 2004: 2349).

It seems that patients' adherence to chronic medication, especially after initiation of therapy, is not ideal. In South Africa, adherence to chronic medication is possibly also inadequate, and this assumption is addressed in the empirical investigation. The conclusions drawn for the South African private sector are discussed in section 5.2.2, objective number 4.

5.2.2. Conclusions from the empirical investigation

The specific objectives of the empirical investigation are listed in paragraph 1.6.2.2 in Chapter 1 and again in Chapter 3 (paragraph 3.2.1). In this section the specific research objectives are given and the findings and conclusions relating to these objectives are discussed.

❖ **Objective 1: To investigate the prescribing patterns of medication in the private health care sector, stratified according to the demographic profiles of patients as well as geographical distribution**

Medication Utilisation

The data employed in this study are claims data sourced from a privately owned pharmaceutical benefit management company. This PBM company manages the electronic medication claims of some 1.5 million medical scheme beneficiaries and all claims data for 2009 and 2010 were extracted for us in this study. Exclusion criteria such as the exclusion of non-paid claims and non-medication items ensured that only actual medicine items claimed and processed were reflected in the data (refer to Table 3.6 and section 1.7.3).

The total number of patients (N) to whom medication was dispensed over the period January 2009 to December 2010 is 3 111 675. Of this number of patients, 1 708 548 or 54.01% are females and the remaining 1 403 127 or 45.09% are males. This is similar to the beneficiary profile as reported by the Council for Medical schemes (CMS, 2011:160), where the number of females represented 52.3% and males 47.7% of the total membership population in 2010. The number of patient medication claims declined by 5% from 2009 to 2010. This decline may be due a decreased number of medical scheme beneficiaries. According to the CMS report of 2010 (CMS, 2011:159), unrestricted schemes had a decrease of 0.3% in scheme membership from 2009 to 2010 (refer to paragraph 4.3.1). The largest claims decrease (8.04%) was found in acute prescriptions (refer to Table 4.11). This could be due to various reasons, such as less frequent antibiotic use where a winter season is less severe, patients paying cash and therefore not claiming their acute medication, or even out-of-stock situations or recalls of popular acute medication. This avenue will not be explored further as the focus of this investigation remains on chronic medication.

Most prescriptions were claimed for patients in age group 3 (40-59 years). This age group accounted for 6 286 069 prescriptions (refer to section 4.3.1 and Table 4.4). This may be due to the fact that medication utilisation is more prevalent in older age groups (Bester & Badenhorst, 2011:9). The least number of prescriptions were claimed in age group 5 (80+ years) at 1 161 634 prescriptions. This age group also generally represents a smaller portion of the study population. When comparing the average number of prescriptions per patient claimed during 2009 to 2010 per age group with the general South African population per age group (Statistics SA, 2011), it is interesting to note that although more than 20 million South Africans are aged less than 19 years, this group does not claim many prescriptions in the private health care system. Reasons could be that the proportion of younger children not belonging to private medical schemes are higher and also that younger children in general did not have as many claims per patient. This is supported when taking into consideration that around 22% of all members covered by private medical schemes are in the age group 0-19 years (Bester & Badenhorst, 2011:9). It would indicate that this age group is proportionately covered within the private sector. In the public sector, however, almost 40% of the population fall into age group 1. This may indicate that the public (non-medical scheme) population have more children (0-19 years) per household than the private health care population.

The province where the most prescriptions were claimed for both study years is Gauteng (41% of all prescriptions) while the least prescriptions were claimed in the Northern Cape (average of

1.5% of all prescriptions over the two study years). This correlates with population demographics (Statistics SA, 2011), indicating that the largest part of the population resides in Gauteng (22.39%), with the smallest part of the population residing in the Northern Cape (2.17%). Also refer to Tables 4.4 and 4.5.

Of all medication claimed over the study period, most were labelled as acute medication (55%), followed by chronic medication (31% of the total) and over-the-counter (OTC) medication (10% of all prescriptions). HIV/AIDS and oncology medication represented only 1% of all prescriptions dispensed (refer to Table 4.10 in section 4.3.1).

The average number of items per prescription remained constant from 2009 to 2010. For most medication groups there were no significant difference in number of items per prescription from 2009 to 2010. Only HIV/AIDS medication reflected a *d*-value of 0.1 and it can therefore be deduced that there was a non-significant increase in the number of HIV/AIDS items per prescription dispensed from 2009 to 2010 (refer to Table 4.12 in section 4.3.1).

Medication costs

The total cost of all prescriptions claimed was R2 509 210 769.00 in 2009 and R2 460 225 811.00 in 2010 (a decrease of 2%). Age group 3 (40 to 59 years) utilised the most medication (refer to section 4.3.2). The amount spent on medication for this group represents 36% of the total costs while this group also received the majority of prescriptions (36% of all prescriptions). Age group 4, however, represented only 26% of the prescriptions dispensed but 34% of the medication cost. This indicates that this older age group uses more costly medication.

Gauteng spent 46% of the total medication cost pool, followed by KwaZulu-Natal at 15% (refer to Table 4.13). When comparing the amount spent on medication to the population estimates (Statistics SA, 2011; Table 4.5), a big variance is seen in the amount spent per province. While 22% of the South African population reside in Gauteng, 46% of the private sector medication costs studies in this research project lies within Gauteng. KwaZulu-Natal is home to 21% of the population but only contributes 15% to the private sector medication costs (refer to Tables 4.5 and 4.13). This may indicate that less people in KwaZulu-Natal have access to private medical care. This is confirmed when acknowledging that Gauteng represents 36% of the total medical scheme membership pool in SA and KwaZulu-Natal only 15% (CMS, 2011:162).

Acute medication represented 39% and chronic medication and 43% of the total medication costs. Although oncology medication represented only 1% of the number of prescriptions

dispensed, 11% of the total medication costs is attributed to this group. When the cost prevalence index (CPI) was calculated (refer to Table 4.16), it was found that oncology (CPI of 11), HIV/AIDS (CPI of 3) and chronic medication (CPI of 1.39) were medication classified as relatively expensive. Oncology medication also had the highest average cost per item (R1748.65 ± R4940.61 in 2009 and R1742.10 ± R5000.90 in 2010), followed by HIV/AIDS and then chronic medication. This concurs with the findings of Bester and Badenhorst (2011:5-6) that the item costs of oncology medication is the highest, followed by HIV/AIDS and then prescribed minimum benefit chronic medication.

Provider types – utilisation

The average number of prescriptions per patient per year was 5.7 ± 2.69 for 2009 and 5.68 ± 6.79 for 2010. This includes chronic, acute, HIV/AIDS, OTC and oncology medication dispensed. The provider with the highest average number of prescriptions per patient was courier pharmacies at 9.75 ± 6.45 (2009) and 9.06 ± 6.00 (2010). This is followed by retail pharmacies at 6.46 ± 7.39 (2009) and 6.45 ± 7.39 (2010) respectively (refer to section 4.4.1). This supports the fact that pharmacies are the primary dispensers of medication in South Africa. Courier pharmacies tend to dispense more chronic medication (Bester & Badenhorst, 2011:7) and this may lead to their prescription average per patient being the highest.

In age group 1, most prescriptions were obtained from retail pharmacies (1 806 475 out of the 2 251 602 prescriptions, or 80%, for the study period). For age group 2, 81% of all prescriptions in the study period were also obtained from retail pharmacies. This trend is seen for all age groups, as retail pharmacies provided 78% of prescriptions for age group 3, 82% for age group 4 and 87% for age group 5. It would seem that, regardless of age group, retail pharmacies provide around 80% of all general prescriptions claimed in the private sector data analysed (also refer to Table 4.21).

Provider types – cost

Total prescription cost comprises of two components:

- Medical scheme contribution, which is the portion of total prescription cost paid for by the medical aid scheme. It is calculated electronically and real-time.
- Patient levy, which is an out-of-pocket payment that a patient may have should he/she be out of scheme rules (e.g. purchasing an originator medication instead of a generic, or using medication for a condition that falls out of the scheme's therapeutic guidelines). A

patient levy can also be incurred when the dispenser charges more than standard scheme rates for the medication (also refer to section 1.8.2).

The total cost for prescription medication over the two-year study period was R4 969 436 580.88 (refer to table 4.25). Of this, 81% (R4 018 239 627.00) was paid by the medical aid schemes and 19% (R951 196 953.70) by the patients. The average cost per prescription was R275.56 ± R921.03 in 2009 and R286.05 ± R983.84 in 2010. The average cost per prescription at courier pharmacies was higher than the average prescription cost, at R708.90 ± R2670.78 in 2009 (*d*-value of 0.16) and R793.80 ± R2987.69 (*d*-value of 0.17) in 2010. This trend was also found in the annual Mediscor Medicines Review (Bester & Badenhorst, 2011:7), which states that 72% of medication claimed by courier pharmacies are for chronic medicines, 13.6% for HIV/AIDS medication and 4.6% for oncology. These are more costly medication groups and the average cost per prescription is therefore expected to be higher. After calculating the CPI (refer to Table 4.26) not one specific provider was relatively “expensive” compared to another.

In section 4.4.2 it was found that, although courier pharmacies have the highest average cost per prescription dispensed, the portion that the patient pays as co-payment is the lowest at 7%. This could indicate that courier pharmacies go to greater length to ensure that medication claimed are authorized as per scheme rules, ensuring lower patient co-payments. The highest co-payments (30% of total prescription cost) were paid at “other” providers (OP) while 23% of total prescription costs in retail pharmacies (RP) were paid out of pocket by the patient. The medical schemes paid the balance between patient levy and total cost. It can therefore be assumed that schemes paid a 93% portion of all courier pharmacy prescription claims, 92% of specialist claims and 77% of all retail pharmacy claims.

Dispensing specialists had the highest average item cost for the study period followed by courier pharmacies (refer to Table 4.30). Dispensing GPs had the lowest average cost per item at R36.65 ± R100.71 in 2009 and R38.24 ± R96.61 in 2010. Dispensing doctors do not usually stock a wide range of medications and the low cost per item may indicate a limited variety of items dispensed that is also prescribed by the GP in question. Examples may be acute medication that the GP has prescribed him/herself. (In this study, the lowest average item cost per year was for acute medication, at R83.32 ± R178.89 in 2009 and R83.34 ± R178.89 in 2010).

❖ **Objective 2: To determine the number of chronic medication prescriptions prescribed by the various providers and analyse demographic profiles, geographic distribution, utilisation and costs of these prescriptions**

For the purpose of this study, chronic medication included prescribed minimum benefit (PMB) and non-chronic disease list (non-CDL) medication (also refer to section 3.6). The total number of chronic prescriptions dispensed were 3 126 266 in 2009 and 3 064 881 in 2010, totalling 6 191 147 for the total study period. Females claimed 59% and males 41% of these chronic prescriptions in each study year. Age group 4 (60-79 years) claimed 43% of these prescriptions and most chronic medication prescriptions were dispensed in Gauteng (42% in 2009 and 41% in 2010).

The cost of chronic medication was R1 053 216 784 in 2009 and R1073 299 370 in 2010. When calculating the CPI to determine the cost-volume effect of each population subsection, no value of 1 or higher was found for any age group or gender. This means that no age group or gender had relatively “expensive” chronic medication dispensed in the study period, according to the definition of CPI (Serfontein, 1989:180). The CPIs of the province subsections again indicate that all chronic prescriptions are relatively inexpensive. The highest CPI was found in Gauteng (0.18). It was interesting to note that Gauteng had a CPI 6-fold that of the closest province, Western Cape (with a CPI of 0.3). This means that Gauteng is a very important province when considering chronic medication distribution. Reasons for Gauteng having by far the highest chronic medication CPI could include the high population in Gauteng as well as urban lifestyle, leading to more chronic conditions. Burger (2012:39) supports this statement by noting that more resourceful areas have changes in nutritional and lifestyle stress that may influence the metabolism and in turn cause chronic diseases like metabolic syndrome.

❖ **Objective 3: To review the cost associated with chronic medicine claimed from the different providers (including retail and courier pharmacies) for 2009 and 2010 and to compare originator and generic medication prescribing patterns for these pharmacy types**

The provider that most often dispensed chronic medication prescriptions was retail pharmacies (79.15% of all prescriptions) followed by courier pharmacies (18.54%). Dispensing GPs dispensed only 2.31% of all chronic prescriptions, while dispensing specialists and other providers did not contribute towards chronic medication prescriptions in the study population. (Although there were some prescriptions, the percentage contribution to the total was 0.00% for each – also refer to paragraph 4.7.1).

Courier pharmacies had the highest number of chronic prescriptions per patient at 9.74 ± 5.91 prescriptions per patient in 2009 and 8.94 ± 5.61 in 2010. Retail pharmacies dispensed an average of 8.65 ± 6.45 (2009) and 8.77 ± 6.42 (2010) prescriptions per patient per year. This is interesting to note. One would expect the average number of chronic prescriptions per patient to be much higher in a courier pharmacy because this type of pharmacy couriers/mailed medication to the patient every month, whereas patients need to walk into retail pharmacies on a monthly basis to collect their chronic medication, leaving more room for compliance errors. The type of medication may, however, influence the regularity of usage and this was investigated in section 4.8 of Chapter 4. Courier pharmacies also had the highest average number of items per prescription for both 2009 and 2010. The *d*-values for the difference in the average number of items per prescription between courier and retail pharmacies were 0.27 in 2009 and 0.31 in 2010. This indicates that there was a small statistical significance in the difference between average number of items for retail and courier pharmacies. Also refer to section 4.7.1.

It can therefore be concluded that courier pharmacies have more chronic items per prescription than retail pharmacies. This is in line with the core business of courier pharmacies. As medication needs to be delivered after receipt of the prescription, courier pharmacies do not specialise in acute medication, which may be for immediate and urgent use, e.g. antibiotics or pain medication. Courier/mail order pharmacies specialise in chronic medication, where a repeat prescription (usually for six months) is captured and dispensed by an (often automated) system every month. It would therefore make sense that such a pharmacy, specialising in chronic medication only, will dispense more chronic medication items per prescription than a retail pharmacy.

Although the majority of patients were serviced in the retail pharmacy sector, the average number of chronic prescriptions per patient was the highest in courier pharmacy for females. Males received the highest average number of prescriptions per patient at retail pharmacies. For females, 16% opted to use a courier pharmacy in 2009 and 2010, while 79% (2009) and 80% (2010) preferred to obtain their chronic medication from a retail pharmacy. A higher portion of males (18% for both study years) preferred chronic prescriptions from courier pharmacies while 76% (2009) and 77% (2010) utilised retail pharmacies for their chronic medication. It would therefore seem that although more males use courier pharmacies proportionally, males also claim fewer prescriptions per person from courier pharmacies than from retail pharmacies (also refer to Tables 4.47 and 4.48).

The highest number of chronic prescriptions was dispensed in the Gauteng province (49% of all patients for both study years). Although the greatest number of patients receiving chronic medication was from Gauteng, patients with the largest average number of prescriptions per patient was from the Eastern Cape (9.29 ± 6.92 prescriptions per patient in 2009 and 9.13 ± 6.86 in 2010), as well as KwaZulu-Natal (8.88 ± 6.92 prescriptions per patient in 2009 ± 6.86 and 9.22 ± 6.19 in 2010). According to Statistics South Africa (Statistics SA, 2011), Gauteng was also the province with the largest number of households, at 3 684 000 or 26% of the total population. Although 26% of all household reside in Gauteng, 49% of all chronic medication was prescribed to these patients. This suggests that people living in more urbanised areas may suffer from more chronic diseases per resident than other parts of the country. It may also mean that because people in Gauteng are more economically active (the highest income per household is found in Gauteng according to Statistics SA (2011), these residents have the financial means to join private medical schemes.

The North West province had the largest margin of chronic prescriptions dispensed by retail pharmacy over courier pharmacy (80% to 20% in 2009 and 84% to 16% in 2010). The province where most chronic prescriptions were dispensed via courier pharmacy was the Northern Cape. When comparing retail to courier prescriptions, it was found that retail prescriptions comprised 54% in 2009 and 48% in 2010, with courier pharmacy dispensing comprised 44% of all chronic prescriptions in 2009 and 52% in 2010. As mentioned in paragraph 4.3.1, the Northern Cape is the province with the smallest population in South Africa. This may mean that there is a lack of retail pharmacies for patients to go to and that they therefore utilise courier pharmacies. According to the SA Pharmacy Council (SAPC, 2011), the Northern Cape does indeed have the fewest pharmacies of all the provinces (also refer to Table 2.16).

Concerning chronic medication cost at the various providers, the CPI for each provider reflected the “relative expensiveness” of chronic medication per provider. It would seem that chronic medication is relatively expensive at courier pharmacies (CPI of 1.16). Retail pharmacies and dispensing GPs offered more affordable chronic medication at CPIs of 0.96 and 0.5 respectively (also refer to Table 4.49). This could be due to the fact that the type of chronic medication dispensed at courier pharmacies may include specialised medication such as inteferons (indicated for the chronic condition multiple sclerosis). The costs of such specialised medication may increase the average cost of chronic medication at courier pharmacies. Courier pharmacies had average chronic prescription costs of $R436.57 \pm R1199.46$ (2009) and $R398.56 \pm R937.61$ (2010), with co-payments of $R38.04 \pm R171.87$ (2009) and $R37.78 \pm R106.71$

(2010). Retail pharmacies had lower average prescription costs for both years, but higher patient levies than courier pharmacies. The average prescription cost variance between courier and retail pharmacies had a *d*-value of only 0.13 in 2009 and 0.16 in 2010. This highlights that there is no meaningful saving in prescription cost between these two providers. Dispensing GPs, however, had a statistically significantly lower average prescription cost than courier pharmacies with the *d*-value of this difference being greater than 0.3 for both study years (0.36 in 2009 and 0.63 in 2010). When comparing the levies paid by patients between courier and retail pharmacies, the difference in average levy per prescription has a *d*-value of only 0.15 (in both 2009 and 2010), indicating that there is no practically significant differences in the cost of patient levies between courier and retail pharmacies.

The average chronic prescription costs for males were similar to that of females (refer to Table 4.57). When analysing chronic medication costs in the different age group cohorts, the age groups with the largest difference in the average chronic prescription costs were found to be age groups 1 and 4. The difference in average prescription costs between age groups 1 and 4 was observed most clearly in 2009 (*d*-value 0.27), which was still considered practically insignificant. Age group 4 (60-79 years) may suffer from general and age-related chronic diseases, whereas young patients (0-19 years) using chronic medication may have rare or costly conditions. This could lead to a higher average prescription cost for the younger age group.

When analysing the trends (difference in average cost between courier and retail pharmacy for 2009 and 2010), it can be seen that although the average cost for courier pharmacies was higher than for retail pharmacies in all provinces, the highest *d*-value for all the provinces was 0.16 for North West in 2009 and 0.18 in 2010, which is considered a non-significant difference (0.2 is a small statistical significance). It can therefore be proposed that the total average chronic medication prescription costs for courier and retail pharmacies were similar for all provinces in terms of practical significance.

The difference in average item costs between retail and courier pharmacies were also statistically non-significant for chronic medication in both study years (refer to Table 4.66). There was also no statistical or practical significance between the male and female chronic item costs between retail and courier pharmacies for either of the study years (refer to Table 4.69).

In 2009, patient levies were lower at courier pharmacies than at retail pharmacies for all age groups. For age groups 1 (*d*-value of 0.25) and 5 (*d*-value of 0.27), it was more expensive to receive a chronic medication item from a retail pharmacy than a courier pharmacy in terms of

levy paid by the patient. The d -values however are below 0.3 and not regarded as practically significant. When comparing the various age groups receiving medication from a courier pharmacy with a GLM procedure, it is found that although there is a statistical significance between the levy costs between all age groups, no practical significance was determined. In 2010, no statistically significant difference in levies per age groups was identified

Generic and originator medication usage

In 2009, dispensing GPs dispensed the most generics (63%) of all chronic medication dispensed by them. Of all chronic medication dispensed by courier pharmacies, 62% were generics, while it was 51% at retail pharmacies. Dispensing specialists mostly dispensed originator products with no generic equivalent (52%). In 2010, the average item costs for generics were once again lower than the originator products for all providers. Dispensing GPs again dispensed most generics (64%) of all chronic medication dispensed by them. Of all chronic medication dispensed by courier pharmacies, 64% were generics, while it was 53% at retail pharmacies. Dispensing specialists again mostly dispensed originator products with no generic equivalent (58%). At retail and courier pharmacies specifically, wherever generics are dispensed the associated medication costs are also less (refer to Tables 4.82 and 4.83). Courier pharmacies, for example, dispensed only 19% of originators with no generic equivalent, but this contributed to 53% of the total item cost. Similarly, retail pharmacies dispensed 23% originator chronic medication with no substitute available, and this represented 45% of the total item cost. It seems that the same trend is visible for 2009 and 2010: where more generics are dispensed, the total item costs are lower

For courier and retail pharmacies, the average item costs and also the lowest patient levy was achieved when a generic was dispensed. Innovator medicine items with valid patents and available generic substitutes were the most costly for both providers but didn't necessarily contract the highest co-payments, as these may have been authorized and therefore reimbursed by the medical scheme. Courier pharmacies had a slightly higher average item cost (R152.21±R545.86) than retail pharmacies (R150.74±R226.15), but had a much lower patient levy at R14.41±R58.07 versus R24.66± R54.32. The d -value for this difference in patient levy is 0.18, which does not indicate a statistically significant difference.

The following conclusions can therefore be drawn:

- Regardless of the type of pharmacy (retail or courier), the average chronic medication cost variances are low between generic medications and older innovator products (of patent originators with available generics).
- The cost differences are the highest between originators still on patent (with no available generics) and generic medications (refer to Tables 4.84 to 4.88).

It seems that variances are smaller within courier pharmacies than retail pharmacies. This may indicate that the chances of receiving medication with low cost variance are higher at a courier pharmacy. This supports the rationale that courier pharmacies dispense the same type of medication on a (usually automated system) each month. Retail pharmacies dispensed 51% (2009) and 53% (2010) generic medication out of all chronic medication, and courier pharmacies dispensed 62% (2009) and 64% (2010) generics (refer to section 4.7).

❖ **Objective 4: To determine the medication possession rates (MPRs) of the top-five chronic conditions as a proxy of patient compliance and to calculate the possible oversupply and undersupply of medication**

Chronic medication claimed during the study period was filtered to include only chronic medication that was claimed for four or more consecutive months. This ensures that patients on therapy initiation (where medication types and dosages are often altered) are excluded, as well as patients who only claimed chronic medication for a short period (e.g. antidepressants for a traumatic experience). The five chronic medication groups most frequently dispensed by courier pharmacies included ACE inhibitors (11.89% of all chronic medication dispensed), statins (10.06%), diuretics (7.9%), oral antidiabetics (7.81%) and thyroid medication (5.17%) (refer to Table 4.89). These same medication groups also represented the top five chronic medication groups dispensed by retail pharmacies in the following order: ACE inhibitors (11.52%), statins (10.55%), diuretics (6.66%), thyroid medication (6.13%) and oral antidiabetics (5.97%) (refer to Table 4.90). These five medication groups were therefore selected to calculate MPRs, differentiating between the MPR of patients at retail and courier pharmacy respectively.

Table 5.1 illustrates the conclusions drawn from the MPR calculations as found in sections 4.8.1 to 4.8.5.

Table 5.1: MPR for retail and courier pharmacy – top medication categories

	ACE inhibitors	Statins	Diuretics	Thyroid Medication	Oral antidiabetics
% received from RP	76.62%	79.91%	74.98%	82.75%	76.47%
% received from CP	20.50%	17.37%	20.00%	15.49%	20.28%
MPR RP	3.96% of retail pharmacies oversupplied ACE inhibitors to their patients. Retail pharmacies, however, also undersupplied most frequently (25.85%).	Only 3.88% of retail-dispensed statins were oversupplied (4104 out of 105755). Conversely, 38.93% of all statins were undersupplied by retail pharmacies (41173 out of 105755).	3.02% of retail-dispensed diuretics were oversupplied (2034 out of 67342) and 47.22% of all diuretics were undersupplied by retail pharmacies.	Only 3.29% of the thyroid medication group was oversupplied in retail pharmacies and 39.17% was undersupplied.	3.99% of oral antidiabetics were oversupplied in retail pharmacies and 42.37% of oral antidiabetic medication was undersupplied.
MPR CP	32.81% of ACE inhibitors supplied by courier pharmacies fell within the oversupply range. Only 2.42% of patients were undersupplied with ACE inhibitors by courier pharmacies.	Of all courier-dispensed statins, 32.47% fell within the oversupply range (7225 out of 22252), and 13.28% of undersupply occurred in courier pharmacies.	33.38% of all courier-dispensed diuretics fell within the oversupply range (6023 out of 18045), and 16.41% of diuretics were undersupplied by courier pharmacies.	35.68% of courier-dispensed thyroid medication was oversupplied and 9.17% undersupplied.	In courier pharmacy, 31.64% of antidiabetic medication was oversupplied and 19.03% undersupplied.

Average MPR	Both retail and courier pharmacies' average MPRs are within the 80-110 bands, with courier pharmacies at an average MPR of 103.08 ± 25.89 and retail pharmacies at 82.40 ± 25.43 .	The average MPRs for statins was 103.43 ± 30.03 for courier and 78.54 ± 28.44 for retail pharmacies. It would seem that, on average, retail pharmacies undersupply statins to their patients.	47.65% of all diuretics analysed fell within the 80%-110% adherence cohort. 43.37% of diuretics were undersupplied and 8.98% oversupplied.	The average MPR for thyroid medications are 106.44 ± 25.32 for courier and 78.86 ± 26.51 for retail pharmacies. As the lowest parameter for sufficient supply is 80%, it can be concluded that, on average, retail pharmacies undersupply thyroid medication.	Of all courier- dispensed antidiabetics, 49.32% fell within the acceptable possession rates, and 53.64 % of the antidiabetics dispensed in retail also fell within this cohort. The average compliance rate for oral antidiabetics is 99.58 ± 29.55 for courier and 77.70 ± 27.56 for retail pharmacies. As the lowest parameter for sufficient supply is 80%, it can be concluded that, on average, retail pharmacies undersupply antidiabetic medication to their patients (also refer to Tables 4.129 and 4.130).
Effect sizes: variance between CP	There is a practically significant difference in the MPR between courier and retail pharmacies	There is a practically significant difference in the MPRs of the statins. The <i>d</i> -value is 0.87	A practically significant difference in the MPRs of the diuretics was found when comparing	Thyroid medication possession was significantly higher in courier pharmacies than	There is a practically significant difference of a medium scale for oral antidiabetics. The <i>d</i> -

and RP MPR	within the ACE inhibitor class. The <i>d</i> -value is 0.81 which can be considered a high and meaningful significance, indicating that the MPRs for courier pharmacies are significantly higher than that of retail pharmacies.	which can be considered a high and meaningful significance. It is therefore deduced that medication possession is significantly higher in courier pharmacies than in retail pharmacies for the statin group.	the MPR of retail pharmacies versus that of courier pharmacies. The <i>d</i> -value was 0.96 which can be considered a high and meaningful significance. It is therefore deduced that medication possession is significantly higher in courier pharmacies than in retail pharmacies	in retail pharmacies (<i>d</i> -value of 1.05).	value is 0.79 which can be considered a medium and meaningful significance. It is therefore deduced that oral antidiabetic medication possession is significantly higher in courier pharmacies than in retail pharmacies.
Effect sizes: Male and Female MPR	There was no difference in the MPRs of ACE inhibitors between males and females within retail or courier pharmacies.	For statins, no practically significant differences were found between male and female MPRs within courier or retail pharmacy.	No practical significance was found between the MPRs of diuretics for males or females within the retail or courier provider groups.	No practically significant differences were noted within gender MPRs for thyroid medication.	For oral antidiabetics, no practically significant differences were noted within gender MPRs for either courier or retail pharmacies.

❖ **Objective 5: To determine the cost of oversupply of chronic medication based on the MPR calculations**

Using MPR data, the cost of over- and undersupply of medication could be calculated. The calculation was based on three components:

- Number of days oversupply = total days' supply (i.e. actual days of medication received) - days between first and last refill (i.e. number of days patient was supposed to have received medication)
- Average cost per day = final cost / total days' supply
- Cost oversupply = number of days oversupply x average cost per day

Or, simplified to a single formula

Cost oversupply = average cost per day x (total days' supply – number of days patient was supposed to have received medication)

For example, say:

- the average cost of an ACE inhibitor over the period of the study was R100,
- the number of days the patient was supposed to receive the ACE inhibitors were 100 days, and
- the patient received 120 days' worth of medication,

then the cost of oversupply for a patient would be calculated as follows:

$$\begin{aligned}\text{Cost oversupply} &= \text{R100 (120-100)} \\ &= \text{R2000}\end{aligned}$$

(Also refer to section 3.8.4.1).

The cost of oversupply for the different top-five medication groups is captured in Table 5.2. Refer to sections 4.8.1 to 4.8.5 in Chapter 4 for the data analysis.

Table 5.2: Cost of oversupply for retail and courier pharmacy – top medication categories

	ACE inhibitors	Statins	Diuretics	Thyroid Medication	Oral antidiabetics
Cost of oversupply for study period – RP	R1 927 590.00	R2 177 834.80.	R423 972.96.	R301 608.35	R628 918.73
Cost of oversupply for study period – CP	R2 844 266.00	R3 523 133.20	R946 525.26	R647 121.67	R1 122 413.17
Oversupply RP as a % of total RP costs	1%	1%	1%	1%	1%
Oversupply CP as a % of total CP costs	9 %	10%	11%	10%	10%
Comments – undersupply	Retail pharmacies are at risk of undersupplying ACE inhibitors (25.85% of all retail patients received less than 80% of the required dosages). The potential cost of	The average MPR for patients receiving statins at retail pharmacies was 78.54 $\pm$ 28.44, indicating that the average patient claiming statins from retail pharmacies	The average patient claiming diuretics at retail pharmacies received less than 80% of intended supply (average MPR of 73.68 $\pm$ 29.43).	Thyroid medication was, on average, undersupplied by retail pharmacies.	The average MPR for oral antidiabetics at retail pharmacies was under 0.8, or 80%, indicating that patients receiving this medication from retail pharmacies are

	undersupply (e.g. treatment failure, hospitalisation, additional diagnostics) is not investigated in this study. It would be worthwhile to balance the cost of oversupply with the possible cost of undersupply in further studies.	receives less than 80% of the intended medication supply. This could be due to patients not visiting the retail pharmacy on a frequent basis or due to patients who do not renew their 6-monthly prescriptions regularly. At courier pharmacies, medication is sent out on a monthly basis and support and reminder systems are in place to assist the patient in obtaining his/her follow-up repeat prescriptions.			generally undersupplied.
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5.2.3. Strengths, limitations and recommendations

This study was performed using a medicine claims database. Advantages of using such a database include a large study population (in this case 9 105 893 prescriptions in 2009 and 8 600 631 prescriptions in 2010). The database utilised is also validated on a regular basis (refer to paragraph 3.5.2.), and it was cleaned to exclude non-medical items as well as unpaid claims. This type of database can be used to study actual claims over a certain timespan and is not limited to a selected patient base as would be the case in randomised controlled trials.

The data obtained from the pharmaceutical benefit management company database were considered to be accurate and correct, which could be seen as a study limitation. Furthermore, data on medical aid claims, although indicative of compliance, cannot prove or disprove whether the patient is actually taking the medication. External validity is limited, implying that the results can only be generalised to the specific database and study population. (In this case only private sector data were analysed.) Demographic data were limited to patient age, gender, province of dispensing and the provider of medication.

This study found that retail pharmacies are the main provider of both general and chronic medication in the South African private sector. Retail pharmacies provided 81% and courier pharmacies 8% of all prescriptions during the study period (refer to paragraph 4.4.1). Courier pharmacies had the highest average number of items per prescription. Courier pharmacies dispensed 18.54% of all chronic medication and retail pharmacies 79.15% (paragraph 4.7.1).

There was no significant difference in the average medical scheme or patient contribution when claiming chronic medication from either retail or courier pharmacies (paragraph 4.7.2.), although the CPI indicated that chronic medication is relatively more expensive at courier pharmacies.

Analysis of the MPR for the top-five chronic medication groups revealed that retail pharmacies on average undersupplied four out of the top five medication groups (statins, diuretics, thyroid medication and oral anti-diabetics). Studies have suggested that therapeutic response to long-term treatment is preserved when patients take at least 80% of their prescribed drug, but long-term treatment and its beneficial effects are not maintained in the case of undersupply (Duru *et al.*, 2010:34, Ho *et al.*, 2008:773, Sikka *et al.*, 2005:449 and Stroupe *et al.*, 2006:782). It is therefore suggested that the patients of retail pharmacies do not have sufficient compliance to the top five medication groups and this may result in longer term complications such as hospitalisation or medication and/or dosage adjustments.

Courier pharmacies, on the other hand, oversupplied more frequently: 9% of the cost of ACE inhibitors, 10% of statins, 11% of diuretics, 10% of thyroid medication and 10% of oral antidiabetics dispensed by courier pharmacies were due to the oversupply of medication. This indicates that patients have enough (and extra) medication in their possession, but this comes at a cost, mostly to the medical scheme.

Recommendations for future research include:

- ❖ To determine the cost of oversupply to the medical scheme specifically as well as the potential cost of undersupply, which may influence the effectiveness of medicine therapy (e.g. hospitalisations)
- ❖ To initiate patient surveys to establish the perception of patients regarding the over-and undersupply at retail and courier pharmacies, including possible reasons for it. These surveys can be initiated on-line by the medical schemes and patients can be incentivised with, for example, loyalty points. Patient claims can then be monitored by the scheme in order to determine the improvements/changes in patient claiming patterns
- ❖ To investigate over- and undersupply of chronic medication in the public health sector. Treatment for HIV/AIDS can be included in such an investigation
- ❖ To do in-depth research about the business models of courier compared to retail pharmacies. Variables such as number of prescriptions processed per day, average number of pharmacists employed, customer service, automation of dispensing systems and medical scheme authorisation procedures can be compared. The costs of operating a courier pharmacy could be compared to that of a retail pharmacy and this could provide insight into the most suitable pharmacy models to be developed for the National Health Insurance scheme.

5.2.4. Chapter summary

This chapter concluded the study by proving that the study objectives as set out in Chapter 1 have been met. Strengths, limitations and recommendations for future research were also discussed.