Chapter 1

Introduction, background and problem statement

1.1. Introduction

The title of this study is “A Comparison of chronic medication prescribing patterns between mail order and community pharmacies in South Africa”.

In this chapter, the elements contained in the title are described, as well as the background, research questions and methodologies used to reach the study goals. The outcome to be achieved during the course of this investigation is the better understanding of chronic medication usage in South Africa, with special focus on the private health care sector. The providers of medication are investigated and detailed comparisons made between mail order (also referred to as courier) and community (also referred to as retail) pharmacies.

Figure 1.1 indicates the structural layout of Chapter 1:

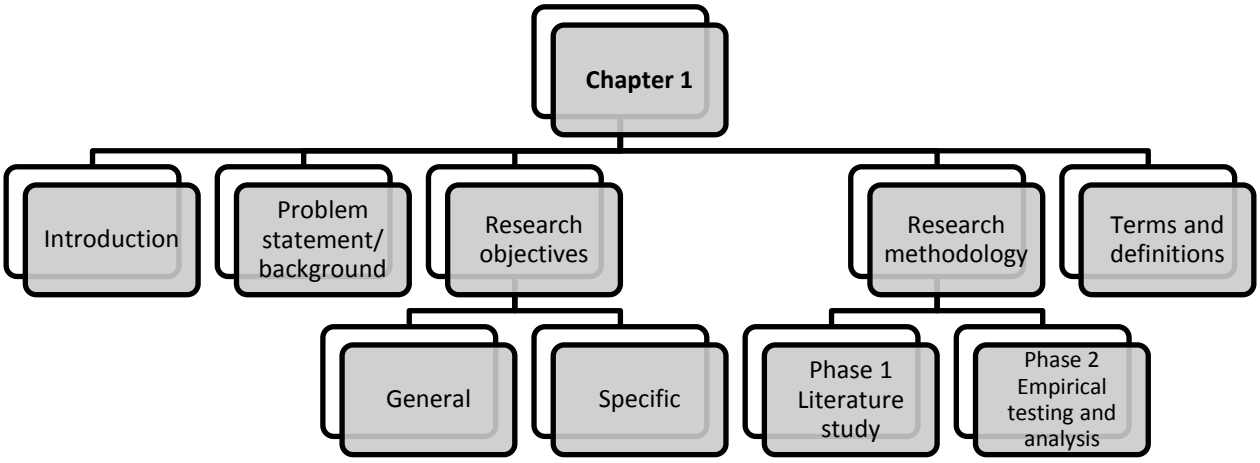

Figure 1.1: Chapter layout

1.2. Background and problem statement

In this section, the rationale for the focus of this study is explained, capturing the background details that led to the selection of the research topic.

1.2.1. Background: South Africa

In order to understand the various elements to be investigated in this thesis as well as the reasoning behind the research focus, some background on South African health care and its history is provided.

Before 1994, South Africa was governed by a political system that included the separation of different cultural groups based on the colour of their skin. This system was called apartheid. According to Coovadia *et al*. (2009:817) the history of South Africa has had a definite effect on the health of its people, including the health policy and services of the present day. Before 1994, political, economic and land restriction policies structured society according to race, gender, and age-based hierarchies, which impacted on social life organisation, access to basic resources for health and health services (Coovadia *et al*., 2009:817).

Baker (2010:79) is of the opinion that after the African National Congress government came into power in 1994, it inherited a health service that was marked with the inequities of the apartheid era. Health care was much privatized and designed to meet the hospital needs of urban whites. Baker holds the opinion that the inequitable distribution of expenditure and provision of care in the apartheid health care service followed three major patterns.

- Public resources were distributed unequally among provinces, tending to benefit the richer, healthier areas.
- There was systemic bias toward the high-tech hospital level of care used by urban whites.
- The public-private mix was unequal. McIntyre *et al.* (1995:101) confirm this by proving that the public sector spent only 38.7% of the health care resources but treated around 73% of the population in 1992 and 1993.

Furthermore, even in the post-apartheid era, the gap between rich and poor increased as the Gini coefficient in South Africa rose from 0.64 in 1995 to 0.72 in 2005. (Bhorat & van der Westhuizen, 2008:7). Bhorat & van der Westhuizen (2008:1-35) suggest that South Africa is the most consistently unequal economy in the world.

In South Africa, 57% of health care spending came from private health insurance contributions (44%) and out-of-pocket spending by patients (13%). If the poor did not have to spend this 13% on out-of-pocket expenditure, they would either save it or spend it on other goods and services. These goods or services include investing in household assets and other activities that create

jobs in South Africa, according to the 2010 Health Systems Trust Report (Van den Heever, 2010:159).

Disparity in access to quality service was based mostly on race (Hofman & Tollman, 2010:799). It can therefore be stated that medical services were provided in different ways to different ethnicities. In 1994, the first democratic election was held, and the focus shifted towards provision of all basic services to all citizens.

However, in 2013 there is still no national health care plan in place, and the system remains split into a private health care system, where those who can afford health care cover belong to medical aid schemes, and a public sector where free service is provided by state hospitals and clinics to those who cannot afford medical aid cover. This is regardless of the fact that South Africa has a relatively high Gross Domestic Profit (GDP) spent on health care. McIntyre and Thiede (2007:19) state that South Africa's health care expenditure is relatively high by international standards; it is higher than the majority of countries of a similar level of economic development and it is similar to that of many high-income countries (e.g. the UK). In 2010, the health care expenditure in SA stood at 3.4% of the GDP, but it is estimated to reach 8% in 2025 if the SA National Health Insurance (NHI) comes into effect (Van den Heever, 2010:165). This 8% is higher than all industrialised countries except Germany and France. At the current spending of 3.4%, South African health care expenditure is comparable with countries like Thailand (3%), South Korea (3.6%), Chile (4.1%) and Mexico (2.8%) according to Van den Heever (2010:163).

Although the investment in health care is relatively high, the outcomes are below average. McIntyre and Thiede (2007:19) state that health status indicators such as infant and maternal mortality in South Africa are far worse than that in other upper-middle income countries. One may therefore argue that the problem facing the South African health sector is not one of a lack of resources but rather not using the existing resources efficiently and equitably (McIntyre & Thiede, 2007:19).

It would therefore seem that the inequalities in the quality of health care, although inherited by the country's democratic government, has not been corrected. Another very pertinent inequality is that of money spent on health care. In the private sector, members of medical aid schemes pay their own contributions as well as out-of-pocket expenses with little or no subsidy from the state. The largest portion of the population relies on government to take care of their health care needs. The number of public patients is estimated at 42 million and the number of those on medical aid schemes at 7 million (IMS, 2011b:20).

In 2005, the approximate average annual cost to belong to a medical scheme (excluding out-of-pocket spending) was R8 000 per annum, i.e. R666.67 per month (McIntyre & Thiede, 2007:30). In contrast, the mean income per household in South Africa at the same time was R4 314 per annum, i.e. R359.50 per month, in the poorest decile, and R405 646 per annum, i.e. R33 803.83 per month, in the richest decile (Statistics SA, 2008). Furthermore, expenditure per patient for government primary care and hospital services in 2005 was an estimated R1 200 per annum (equating to R100 per month) (McIntyre and Thiede, 2007:30-31).

Revised figures in 2008 (Health Economics Unit, 2009:1) did not show a very different picture:

- R11 300 per beneficiary per annum for those belonging to medical schemes (includes both medical scheme spending of R9 600 and estimated out-of-pocket payments of R1 700)
- R2 500 per beneficiary per annum for the middle group (includes out-of-pocket payments to private primary care providers and government spending on hospital care)
- R1 900 per beneficiary per annum for those using government primary care and hospital services

Harrison (2010:25) states that private health care costs spiralled upwards between 1989 and 2004. This was driven largely by escalating private hospital and pharmaceutical costs and was given further impetus by higher administrative costs as schemes switched from lower cost closed schemes to higher cost open schemes. National health care expenditure in South Africa is projected to rise by an average of 7.1% per year between the fiscal years 2009/2010 and 2012/2013, with costs close to R100 billion for 2009/2010 (National Treasury, 2010).

Table 1.1 summarises this vast difference in private and public health care expenditure:

Table 1.1: Summary of health care spending per patient: private and public sector in South Africa, 2005 and 2008

Average Per Annum	**2005**	**2008**	**Average**	**Ratio as %**
Medical scheme contribution per beneficiary*	R 8 000	R 9 600	R 8 800	100%
Cost per government primary care beneficiary	R 1 200	R 1 900	R 1 550	17.61%

**Note that the medical scheme contribution is paid by the member. The member also pays income/business tax with which to support the government beneficiary.*

As Table 1.1 indicates, cost of care (amount spent) for a government beneficiary is only 17.61% of that of a private sector beneficiary.

It can therefore be seen how distorted medical expenditure in South Africa is. The monthly household income of the low income group of the population easily equates the amount spent on private health care alone by the high income population group.

In addition to the argument of *inequality,* the *poor quality* of the current public health care service cannot be overlooked. In studies done by the Econex economics group in South Africa (Econex, 2010a:3), it was found that a substantial portion of households in all income groups, but especially the poor, still live more than an hour's travel away from the nearest hospital or clinic. Fifteen per cent of the poorest quintile lives more than an hour from the closest clinic and 20% of this quintile lives more than an hour from the closest hospital.

Furthermore, the proportion of public sector patients that were dissatisfied has grown from 11.7% in 1998 to 23.3% by 2003. Over the same period, the dissatisfaction with private clinics and hospitals also rose from 7.0% in 1998 to 11.6% by 2003 (Econex, 2010a:3). The Econex research also refers to studies conducted by the Monitor Group in 2008 which found that South Africa's public health care system ranked 8th from the bottom amongst 48 developed and developing countries, whilst the private health care system ranked 6th from the top (Econex, 2010a:3).

The conclusion to be drawn from the facts presented thus far is twofold: firstly, it seems that although private health care in South Africa is of high standard, it is becoming increasingly limited to an elite group who can afford the premiums as well as the co-payments. Secondly, public health care is relied on by 42 million South Africans, and although the national expenditure is adequately budgeted for, it seems that it does not filter through to patient care, resulting in a poor performing health care system with limited resources. Table 1.2 provides a summary of these conclusions.

Table 1.2: Condition of South African health care – Summary based on literature discussed in Section 1.2

	Public Health Care	**Private Health Care**
Number of patients	42 million	7 million
Cost per beneficiary	Relatively low (17% of cost of private care)	High and growing
Quality (waiting times, patient satisfaction)	Poor	Very good

When viewed in table format, it becomes clear that there is a need for better public health care in general in South Africa.

The Minister of Health in 2009, Minister Motsoaledi, announced a ten point plan in order to replace the present model of health care (IMS, 2011b:23). The priorities of the Programme of Action (POA) for 2009-2014 are:

• Provision of strategic leadership and creation of a social contract for better health

• Implementation of National Health Insurance

• Improvement of the quality of health services

• Overhauling the health system to improve its management

• Improved human resources planning, development and management

• Revitalisation of infrastructure

• Acceleration of the implementation of the National Strategic Plan 2007-2011 for HIV/AIDS and sexually transmitted infections, with increased focus on TB and other communicable diseases

• Mass mobilisation for better health for the population

• Review of drug policy

• Strengthening of research and development

Of interest in this study is one of these goals, namely the creation of a National Health Insurance (NHI) cover system. This system will result in health care across all health care fields, but the focus of this study will be the pharmaceutical (medication) sector of health care provision and specifically the provision of chronic medication. Data on chronic medication cost, usage and trends are not readily available in South Africa as many public health care facilities are not yet computerised. Those facilities having access to computerise dispensing systems are not linked to a central database and no collective drug information can therefore be gathered from the public sector via this route.

A picture of chronic medication usage in the private sector is not only useful for private health care funders in South Africa and for comparisons to international trends, but can also assist in providing background for policymakers when implementing the envisaged NHI in South Africa. This study will aim to create such a picture through such elements as a demographic and geographic analysis of medication users, cost analyses, medication compliance levels between different types of private sector pharmacies, as well as costs associated with possible oversupply of chronic medication.

1.2.2. Chronic medication

The word “chronic” in terms of medication usage is defined as “[o]f long duration [;] [u]sed of a disease of slow progress and long continuance” by the American Heritage Medical Dictionary (2007).

According to the Oxford Dictionary (2010), chronic illness means “illness persisting for a long time or constantly recurring”.

“Chronic” can also be defined as “[o]f long duration and slow progression. Illnesses that are chronic develop slowly over time, and do not end. Symptoms may be continual or intermittent, but the patient usually has the condition for life” (Gale Encyclopaedia of Medicine, 2008).

In a retrospective literature study done by O’Halloran *et al*. (2004:383) in Australia, the characteristics found in the literature to be indicative of chronic conditions were aetiology duration, onset, recurrence/pattern, prognosis, sequelae, diagnosis, severity and prevalence.

For the duration of this study, chronic medication will therefore be viewed as medication used to treat conditions that are probably life-long or medication used for continuous periods of time at best.

1.2.3. Chronic medication in the private sector

In the South African private sector, the top five therapeutic groups represent 31.1% of total expenditure and include antihypertensives, cytostatics, hypolipidaemic agents, antidepressants and gastric acid reducers (Bester & Badenhorst, 2010:i). Oncology medicine is increasing in cost and was responsible for 8.7% of expenditure in 2009, with the volume only contributing 0.6% of all items claimed. The amount spent on oncology medicine per beneficiary per annum increased by 95.5% from 2007 to 2009 (Bester & Badenhorst, 2010:i)

These findings are supported by an analysis from the Council of Medical Schemes in South Africa which indicates that the most prevalent chronic condition in medical schemes is hypertension (10.79%), hyperlipidaemia (4.85%), Diabetes Mellitus type 2 (2.89%) and asthma (2.66%) (CMS, 2010a:172).

Morgan (2005:996) similarly notes that in North America population-wide expenditures per capita on prescription medication have grown at double-digit rates since the 1990s.

Harrison (2010:25) also names pharmaceutical cost as one of the drivers of private health care cost in South Africa, and this study aims to closely investigate this pharmaceutical section of health care.

According to the South African Medical Schemes Act (131/1998), medical schemes have to cover the costs related to the diagnosis, treatment and care of:

• any emergency medical condition;

• a limited set of approximately 270 medical conditions; and

• 26 chronic conditions.

This requirement is known as Prescribed Minimum Benefits (PMBs) and members are entitled to these benefits regardless of the medical scheme option selected. Prescribed Minimum Benefits, where indicated, can therefore include medicine (CMS, 2009a:1).Prescribed Minimum Benefits have therefore increased pressure on medical schemes to save costs. One of these cost-saving initiatives could be focused on medication in the form of appointing one or more designated service providers (DSPs). The named DSP then provides medication at a negotiated dispensing fee to members of medical schemes on a contract basis. The contract, also referred to as a service level agreement (SLA), includes various standards and levels of service that has to be met by the DSP.

The member guide of the Council of Medial Schemes (CMS, 2009c) describes a DSP as a health care provider (doctor, pharmacist, hospital, etc.) that is the medical scheme's first choice when PMB conditions need attention. State facilities can be designated as a DSP only where services are reasonably available and accessible. When a member chooses not to use the DSP, he/she may have to pay a portion of the claim (a co-payment). The medical scheme has to ensure that it is easy for the member to get to the DSP. If there is no DSP reasonably close to the member's work or home, the member can visit any provider and the medical scheme has to pay (CMS, 2009c).

The sector of health care provision analysed in this study will specifically be the pharmaceutical section. This leads to further investigation of the providers of medication in South Africa - pharmacies. The types of pharmacies to be overviewed are mail order/courier pharmacies and community/retail pharmacies. Both of these types of pharmacies could be DSPs for medication provision. Serfontein *et al*. (2006:18) mention that the total number of registered pharmacies in 2005 were 3 270. In December 2008, 4 286 pharmacies were registered according to the South African Pharmacy Council's annual report (SAPC, 2008).

1.3. Mail order/courier pharmacies

Because mail order pharmacies have national reach (deliveries to patient homes or to Post Office parcel counters), the DSP can always be reasonably close to the member's work or home. This enables the medical schemes to appoint a DSP within CMS regulations whilst negotiating preferential dispensing fee rates with the said DSP. These rates usually include delivery fees as well as the dispensing fees.

Johnsrud (2006:2) declares that mail order pharmacies are an attractive segment of the pharmacy industry in the US as well, and the fastest growing pharmacy segment. Employers or unions have benefit plans which are contracted to these mail order pharmacies.

In a recent Northern California study regarding mail order pharmacies (Duru *et al.*, 2010:37), key findings from UCLA and Kaiser Permanente's division of research show the following:

- Of the patients who received their medication by mail at least two-thirds of the time, 84.7% complied with their physician-prescribed medication regimen, versus 76.9% of those who collected their medication at "brick and mortar" (retail) Kaiser Permanente pharmacies.
- Mail-order pharmacy users were more likely than local pharmacy users to have a financial incentive (lower costs) to fill their prescriptions by mail (49.6% vs. 23.0%). Mail-order pharmacy users also tended to live a greater distance away from a local pharmacy (8.0 miles vs. 6.7 miles).

According to Cox and Mager (2008:3), who did a compliance study on chronic medication usage classes through the Express Scripts mail order pharmacy group in the United States, members receiving their maintenance medication via home delivery had significantly higher compliance rates compared to their retail counterparts after controlling for patient demographics and utilisation. This finding was consistent across all three chronic therapy classes evaluated, namely antihyperlipidemics, antidiabetics and antihypertensives.

In the words of Cox and Mager (2008:3):

> "While it is recognized that lower co-payments is a contributing factor to the more favourable compliance rates in home delivery, other factors inherent within this channel also favour greater compliance. These factors include convenient reordering processes, refill reminders and the need for less frequent reordering, which could reduce gaps in therapy. Taken together, these findings suggest that the value of home delivery lies not only in the cost savings of this channel but also, equally important, potentially improved quality of care through increased adherence. "

In Chapters 4 and 5 of this study, adherence of mail order versus community/retail pharmacy will also be discussed based on five chronic medication therapy classes.

In South Africa, mail order/courier pharmacies also exist, and they have been growing in capacity over the past few years. These pharmacies send medication to patients (whether it be to their Post Offices or home addresses) instead of patients visiting the pharmacy to collect it. Examples of mail order/courier pharmacies in South Africa include:

- Medipost Pharmacy
- Pharmacy Direct
- Direct Medicines (incorporated into the Clicks Pharmacy group)
- Chronic Medicines Dispensary (CMD)
- Optipharm

A patient's choice to utilise such a pharmacy could include limited availability of other pharmacies in the patient's living area. Several positive and negative aspects (e.g. cost of dispensing fees, counselling to the patient and compliance) of this industry have been debated over the years.

The words "mail order" and "courier" are used interchangeably during the course of this study. In Chapter 4 where the data is empirically analysed, the most convenient terms and abbreviations have been used in the data tables.

1.4. Community/Retail pharmacies

In the US, pharmacies situated in the community have been referred to as "brick-and mortar" pharmacies (Duru *et al.*, 2010:37). In this study, a pharmacy situated in the patient community, where a patient can walk in and have a face to face consultation with a pharmacist, is referred to as retail or community pharmacy. A patient can therefore collect his medication directly from the pharmacist. Many of these retail pharmacies also provide a service where medication can be delivered at home, or the retail chain can even own its own mail order pharmacy as an extension of its normal dispensing practice. Clicks pharmacy group, for example, owns Direct Medicines, a mail order pharmacy.

In this study, some of the analyses for example medication possession ratios and generic substitution will be performed comparatively on retail/community pharmacies and courier/mail order pharmacies in order to observe possible differences and trends.

1.5. Research questions

The following research questions have been formulated in order to meet the research objectives of this investigation:

1.5.1. What is the demographic and geographical profile of medication users in the private health care sector in South Africa?

1.5.2. How are prescriptions distributed between mail order pharmacies, retail pharmacies, dispensing doctors and dispensing specialists?

1.5.3. How does chronic medication prescribed and subsequently dispensed differ between mail order and retail pharmacies with regard to frequency, cost and generic medication utilisation?

1.5.4. What are the top chronic conditions in terms of volume of prescriptions dispensed? What are the chronic medication possession ratios for the top five identified chronic conditions, and how do these rates differ for mail order and retail pharmacies?

1.5.5. What is the cost of possible oversupply of chronic medication by either retail or mail order pharmacies?

1.6. Research objectives

The research objectives can be divided into general research objectives and specific research objectives.

1.6.1. General research objectives

The general research objective is a comparison of chronic medication prescribing patterns between mail order/courier and community/retail pharmacies in the South African private health care sector.

1.6.2. Specific research objectives

The specific research objectives of the study are based on two phases, a literature review and an empirical investigation, from which the following goals need to be achieved:

1.6.2.1. Literature study

The specific research objectives of the literature study are:

- To research and compare different health care systems and models globally, and then focus on the South Africa health care environment (including public and private sector).
- To investigate and discuss health care and medication reimbursement strategies in various countries, including South Africa.
- To distinguish between the different components of health care namely primary, ambulatory, hospital and pharmaceutical care
- To investigate and describe health care cost, both internationally and nationally, with specific reference to pharmaceutical (medication) costs and chronic medication.
- To elucidate generic medication usage and its impact internationally and nationally
- To describe medication provision systems internationally and nationallyTo explore the definition of chronic medication and the medial scheme legislation around the management of chronic diseases and the dispensing of chronic medication in South Africa. This will include Prescribed Minimum Benefit (PMB) / Chronic Disease List (CDL) and Non-CDL lists conditions
- To provide the background for the comparison of utilisation, cost and geographic distribution patterns of chronic medication between various providers
- To review the current mechanisms of chronic medication dispensing in South Africa's two different health care sectors: Public and Private sector, and to focus specifically on the South African private sector.
- To identify the drivers or deterrents of chronic medication compliance from the literature.

1.6.2.2. Empirical study

The specific research objectives of the empirical study are:

- 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.
- To determine the number of chronic medication prescriptions prescribed by the various providers and further analyse demographic profiles, geographic distribution, utilisation and costs of these prescriptions.

- To review the cost associated with chronic medicine for 2009 and 2010 claimed from the different providers (including retail and mail order pharmacies) and to compare originator and generic medication prescribing patterns for these pharmacy types.
- To determine the Medication Possession Ratios (MPR) of the top five chronic conditions as a proxy of patient compliance and to calculate the possible oversupply and undersupply of medication.
- To determine the cost of oversupply of chronic medication, based on the MPR calculations

1.7. Research methodology

The research methodology best suited to meet the objectives of this study, is discussed in section 1.7.

1.7.1. Research design

A non-experimental, quantitative, cross-sectional, retrospective drug utilisation method will be used in order to obtain the essential outcomes and achieve the specific objectives of this research project. The study design is descriptive in nature and includes at least two years of chronic medication claims data.

1.7.2. Data source

The data source in this study was claims data from a South African Pharmaceutical Benefit Management Company who manages the claims of approximately 1.5 million patients (also refer to Chapter 3 section 3.5). The data was obtained for the two years 1 January 2009 to 31 December 2010. Data properties include membership details and claims data.

- Each of the records in the database contain the following fields:
  - anonymised patient identifier
  - patient date of birth (to calculate age) and gender
  - postal code of prescriber – used for geographical distribution
  - dispensing date
  - drug product identifier (national product identifier or Nappi code)
  - drug quantity claimed

- drug cost (amounts paid by scheme and member, as well as total cost)
- drug product identifiers, unique to products, identified by ingredient(s), strength, dosage form and manufacturer
- anonymous provider type identifiers
- benefit type

1.7.3. Study Population

The study population selected for this study were patients who successfully claimed medication over a two-year period (2009 to 2010). These claims were processed by the PBM as mentioned in section 1.7.2. No unpaid claims or cash patients were included. Patient variables contained in the data and extracted for the purpose of this study include patient age, gender, geographical area and provider type. Medication was also classified according to benefit type, (refer to section 1.7.4.5). The study population include all medication claims. However, many of the analyses performed in this study were executed using chronic medication data only.

1.7.4. Study variables

Certain study variables have been used to investigate the study population. These are discussed in this section.

1.7.4. 1. Age

According to the Business Dictionary (2011), age of a person is measured in years, months, and days from the date the person was born. The online encyclopaedia Encyclo (2011) define age as measured by the time (years and months) that something or someone has existed. In this research project, age will refer to the number of completed live days/years/months of a patient on the last day of the study period year.

1.7.4.2. Gender

According to the World Bank (2010), the term "gender" refers to the socially-constructed differences between men and women. This differs from "sex", which refers to their biological differences. In all societies, men and women play different roles, have different needs, and may face different constraints. For the purpose of this research project, gender and sex may be seen as synonyms and are used to indicate whether a prescription was prescribed for a male or female patient.

Only patients whose gender (i.e., male or female) are known have been included in the data analysis. In the total database there is a third gender group (unknown) which includes all patients whose gender was unknown to the dataset utilised. This category can be the result of the pharmacist not capturing the gender of the patient or the medical scheme not providing the information to the pharmacy

1.7.4.3. Geographical area

The Statistical Analysis System®, SAS 9.3® (SAS Institute Inc., 2003) programme has been used to group all prescriber practice addresses according to province. Geographical areas in this study therefore refer to the nine provinces in SA, namely Gauteng, Western Cape, KwaZulu Natal, North West, Free State, Mpumalanga, Eastern Cape, Northern Cape and Limpopo.

1.7.4.4. Provider type

The various provider types that have been classified for the purpose of this study are dispensing doctors – GPs (DD GP), dispensing doctors – specialists (DD SP), courier pharmacies (CP), retail pharmacies (RP) and other providers (OP). Other providers may include providers that have not been named such as dentists or nursing sisters. The providers mainly focused on in this study, as stated in the title, are retail/community and mail order/courier pharmacies. Although initial analyses include all the listed providers, the providers are narrowed down to compare only mail order with retail pharmacy for selected analyses.

1.7.4.5. Medication

Medication is classified by three classification methods during the course of this study, namely

- Medication classification per benefit category (e.g. OTC or acute medication, chronic)
- Pharmacological classification
- Type of medication (e.g. originator or generic medication).

For a detailed description of these classification methods, refer to section 3.7.5.

1.8. Descriptive measurements

Various descriptive measures, such as frequency, cost and medicine possession ratio are used to achieve specific objectives from the individual analyses within the project. These measurements will be discussed in the following subsections.

1.8.1. Medication frequency/volume

According to Waning and Montagne (2001:20), prevalence is the number of existing cases in a defined population at a specific time. In this research project, prevalence and frequency will be used as synonyms. It is an indication of the number of medicine items/prescriptions or specific medicine items (according to trade name, active ingredient or pharmacological group) claimed for a specific time period or for a specific group of patients (e.g. specific age group or gender).

1.8.2. Medication cost

According to the World Health Organization (WHO, 2003b:3), the cost of medication includes more than acquisition price from a supplier. There are three types of cost associated with drug use in a health care system as listed:

- **Direct costs**
  - acquisition cost of the drug or drug price
  - supplies to administer the medicine
  - equipment for administration, syringes, gauze, IV sets, filters, pumps, etc.
  - supply management costs (salaries of supply staff, transport costs and storage facilities)
  - professional services costs (pharmacist salary, preparation and dispensing of medications, clinical pharmacy activities, nursing salaries, physician fees
  - other direct costs (treating adverse drug reactions, emergency room use, laboratory services)
- **Indirect costs**
  - cost of illness to the patient
  - lost time from work
- **Intangible costs**
  - quality of life.

In this research project, only direct medication cost is measured. This cost is expressed as a rand-value. The total costs and the average costs will be used. The total cost of each

prescription can also be divided into the total prescription amount (a+b), total scheme amount (a) and total patient levy (b).

- Another type of analysis has been performed when comparing the cost in one group of medication to that of another. Cost-prevalence indices were developed by Serfontein (1989:180) and are indicators of the relationship between the number of medicine items prescribed or claimed and the total cost associated with these items. If cost-prevalence index < 1 the medicine item is considered relatively inexpensive.
- If cost-prevalence index = 1 there is equilibrium between the cost and prevalence of the medicine item.
- If cost-prevalence index > 1 the medicine item is considered relatively expensive.

1.8.3. Compliance/adherence

According to Hess *et al.* (2006), compliance or adherence can be defined as the degree to which a person's behaviour coincides with medical or health counselling. The adherence ratio can be calculated from pharmacy administrative data if the days between refills and the supply for the total days are known.

Medication compliance (synonym: adherence), as defined by ISPOR, is "the extent to which a patient acts in accordance with the prescribed interval, dose, and dosing regimen. It is typically expressed as a percentage of total number of doses taken (if prospectively measured) or therapy-days available (if retrospectively measured), in relation to the time period of observation during which compliance is measured" (Cramer *et al.,* 2008:45).

According to Andrade *et al.*, (2006:567), there are several types of measures with which to calculate medication adherence. A commonly used measure of adherence is a proportion-of-days-covered model, which calculates the proportion of days within a fixed interval that the patient has an available supply of medication. This is reported as a Medication Possession Ratio (MPR). In this study, MPR has been chosen as an estimate of refill timeliness during the study period (2009 to 2010). The MPR was only calculated for the top five identified chronic medication groups, and comparisons are drawn between the MPRs of retail and courier pharmacies specifically.

MPR is calculated as the total days' supply *excluding* the last fill divided by the total calendar days between the index date and the final refill dispensing date. This ratio is then expressed as a percentage (Zedler *et al.,* 2011).

1.9. Statistical analysis and descriptive statistics

Various descriptive statistics such as the frequency (n), arithmetic mean (average), standard deviation (SD), confidence interval (CI) and standard error (SE) were used to describe the characteristics of the study population. These statistics are discussed in the following subsections:

1.9.1. Frequency

Frequency is the number of occurrences of a determinable entity per unit of time or population (Dorland's Medical Dictionary for Health Consumers, 2007). The online dictionary Hyperdictionary (2013) defines frequency (n) as the number of observations in a given statistical category.

1.9.2. Arithmetic mean (average)

The arithmetic mean is also known as the average. It is computed by adding all the values in the data set divided by the number of observations in it (Manikandan, 2011:140). The arithmetic mean, also known as arithmetic average, is the sum of all the values in a list of numerical values divided by the number of items in the list. For example, if one has the two values, eight and six, then their arithmetic average is: 8 + 6 / 2 = 7 (Eurostat, 2012).

1.9.3.Standard deviation

The standard deviation σ or s is the measure of variability most commonly used in statistical practices (Leedy & Ormrod, 2010:270). It is a numerical value used to indicate how widely individuals in a group vary. If individual observations vary greatly from the group mean, the standard deviation is big; and vice versa (Stat Trek, 2012).

1.9.4. Standard error

According to McDonald (2009), confidence intervals and standard error of the mean serve the same purpose, namely to express the reliability of an estimate of the mean. Stedman's Medical Dictionary (2013) defines the standard error of the mean as a statistical index of the probability that a given sample mean is representative of the mean of the population from which the sample was drawn.

1.9.5. Confidence intervals

According to the Engineering Statistics Handbook Confidence intervals are constructed at a *confidence level*, such as 95%, selected by the user. This means that if the same population is

sampled on numerous occasions and interval estimates are made on each occasion, the resulting intervals would bracket the true population parameter in approximately 95% of the cases (NIST/SEMATECH, 2012). Also refer to paragraph 3.9.1.5.

1.10. Inferential statistics

Inferential statistics allow the researcher to make inferences about large populations by collecting data on relatively small samples (Leedy & Ormrod, 2010:260). An inferential statistic such as Cohen's effect sizes (*d*-values) can be used to describe the practical significance of results obtained in this study. Different types of inferential statistics used during the course of the study are discussed.

1.10.1. Statistical and practical significance

Statistical significance is an indicator that the results of an analysis are unlikely to be due to chance factors (Leedy & Ormrod, 2010:285; Neuman, 1997:320). For this study, a result was deemed statistically significant if the p-value is smaller than 0.001.Practical significance is determined by the *d*-value.

1.10.2. Effect sizes (*d*-values)

Leedy and Ormrod (2010:283,285) define effect sizes as a calculation made after an experimental intervention has been studied. The effect size determines how much of a difference the intervention makes in the study. The effect size therefore indicates practical significance. In general, ≤ 0.20 is a small effect size, 0.50 is a moderate
effect size and ≥ 0.80 is a large effect size (Cohen, 1988:25). Effect size is a measure of the separation between two populations (Sarafino, 2005).There are various statistics used to estimate effect size and all are based on correlation. Examples of effect size correlations include Cohen's *d* and Cramer's *V* (Sarafino, 2005). Nandy (2012) states that a *d*-value standardizes effect sizes of the difference between two means, while Cramer's Phi (Cramer's V) can be used with categorical variables with more than 2 categories measures the inter-correlation of the variable

1.10.3. Analysis of variance (ANOVA)

According to Leedy and Ormrod (2010:282), the purpose of an ANOVA is to look for differences among three or more means by comparing the variances both within and across groups. The ANOVA test determines whether there are any differences between the means of more than two different groups (Schlotzhauer & Littell, 1997:244).

1.10.4. Chi-square test (x^2)

Diamantopoulos and Schlegelmilch (2000:200) state that the Chi-square statistic can establish whether two nominal variables are independent or not. It does not indicate the strength of the association between variables. Cramer's V is seen as a Chi-square based adjustment and as the value is always between 0 and 1, the values reflect relationships of different magnitudes. A value of 0.1 indicates a small statistical significance, 0.3 a medium statistical significance and 0.5 a practical significance.

1.10.5. Student's t- test (t)

The student's t-test is used to determine whether the difference between two means is significantly different (Leedy & Ormrod, 2010:29).

1.11. Reliability and validity of research instruments

Reliability:

Joppe (2000:1) defines this term as follows:

> The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable.

The research instrument for this study is the prescription claims database of one of South Africa's largest pharmaceutical benefit management companies. This dataset includes prescribed and subsequently dispensed medication data and include variables as mentioned in section 1.7.2. and 1.7.4.

Validity:

Joppe (2000:2) explains validity in quantitative research as follows:

> Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. Researchers generally determine validity by asking a series of questions, and will often look for the answers in the research of others.

The validity of this study will be tested by comparing the results found in Chapter 5 to the research questions posed initially in Chapter 1.

1.12. Ethical aspects

- The data utilised in this dissertation is owned by and used with the permission of the pharmaceutical benefit management company. No individual patient is identified

(protection of patient confidentiality). No medical scheme from which claims data were extracted has been identified, and all data have been used as a pool in order to identify trends and project possible patterns based on these trends. No individual medical practitioner has been identified, only the speciality of the prescriber in order to identify possible prescribing trends.

- Permission from the North West University Research Committee has been obtained
- The author declares that she is employed by a generics manufacturing company. As no generic products were named in this study, this is not regarded as a conflict of interest

1.13. Chapter division

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.

1.14. Conclusion

Many elements of the usage of chronic medication could be valuable in establishing a workable solution to medication provision in South Africa. It may, for instance, be that some provinces have higher costs for certain medication, that population age may directly influence the expenditure on chronic medication, that utilisation of medication is inadequate or that utilisation differs within different pharmacy types – perhaps indicating the need for more patient education in this area. The research objectives of this study aim to answer these questions and the final conclusions are discussed in Chapter 5.

1.15. Terms and abbreviations

Abbreviations referred to in this document include but is not limited to the following list.

Table 1.3: Definitions for abbreviations

AIDS	Acquired Immune Deficiency Syndrome
ANC	African National Congress
ART	Antiretroviral Therapy
ARV	Antiretroviral
ATC	Anatomical Therapeutic Code
BBBEE	Broad-Based Black Economic Empowerment
BEE	Black Economic Empowerment
BHF	Board of Healthcare Funders of Southern Africa
BMI	Body Mass Index
CDL	Chronic Disease List
CMS	Council for Medical Schemes
COAD	Chronic Obstructive Airways Disease
COPD	Chronic Obstructive Pulmonary Disease
CPI	Consumer Price Index
DALY	Disability Adjusted Life Year
DMP	Disease Management Programme
DoH	Department of Health
EC	Eastern Cape
EDL	Essential Drug List
FS	Free State
GDP	Gross Domestic Product
GEMS	Government Employees Medical Scheme
GP	General Practitioner
HIV	Human Immunodeficiency Virus
HMO	Health Maintenance Organisation
HPCSA	Health Professions Council of South Africa
HST	Heath Systems Trust
ICD	International Classification of Diseases
IHD	Ischaemic Heart Disease
INN	International Nonpropriety Name
KZN	KwaZulu-Natal
LP	Limpopo
MCC	Medicines Control Council
MIMS	Monthly Index of Medical Specialists
MMR	Maternal Mortality Rate / Maternal Mortality Ratio
MP	Mpumalanga
MPR	Medication Possession Ratio

NAPPI	National Pharmaceutical Product Index
NC	Northern Cape
NHI	National Health Insurance
NW	North West
OTC	Over the Counter
PHC	Primary Health Care
PHI	Private Health Insurance
PMB	Prescribed Minimum Benefit
PPI	Public-Private Interaction
PPP	Public-Private Partnership
QALYs	Quality Adjusted Life Years
R&D	Research and Development
RAMS	Representative Association of Medical Schemes (now BHF)
SA	South Africa
SAHR	South African Health Review
SAMA	South African Medical Association
SAPC	South African Pharmacy Council
SARS	South African Revenue Service
SEP	Single Exit Price
StatsSA	Statistics South Africa
USA	United States of America
WC	Western Cape
WHO	World Health Organization