

Chapter 4

Results and Discussion

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.

4.1 Introduction

In this chapter, the results of the empirical analysis of the dispensing patterns of different medicine providers in South Africa from 2009 to 2010 are reported and discussed. This analysis is in the form of a quantitative cross-sectional drug utilisation review, as described in Chapter 3 paragraph 3.3.

The costs, utilisation, generic substitution rate, demographical and geographic patterns in the dispensing of medication in the private sector were investigated by analysis of data from a medicine claims database. These factors were compared over a two-year study period.

The outline for this study is shown in Figure 3.1 which presents the pathway used to analyse medicine usage patterns.

4.1.1 Abbreviations and definitions

For the purpose of this study and interpretation of Chapter 4, the terminology and abbreviations used are defined and listed in Table 4.1.

Table 4.1: Terminology and abbreviations – Chapter 4

Study population	All prescriptions and medicine items claimed for patients from various medical schemes which were managed by the PBM from 2009 to 2010
Acute	Medicine items that were claimed through the medicine claims database using the acute benefit option
Chronic	Medicine items that were claimed through the medicine claims database using the chronic benefit option, which includes chronic medication related to the prescribed minimum conditions as well as chronic medication that cannot be claimed from the PMB benefit
OTC	Over-the-counter medication (medication schedule 0 to schedule 2). These medications can be accessed without a prescription.
PMB	Prescribed minimum benefit, which refers to the medicines used to treat the diseases on the Chronic Disease List published by the government
Generic	A product that contains the same pharmaceutical formulation as the original patented or innovator product that is not protected by a patent. It contains the same active ingredients which are identical in strength or concentration and it has the same dosage form and route of administration. It is also referred to as an interchangeable multi-source medicine (MCC, 2008).
Originator	A product which is usually the first of a specific formulation to be authorised for marketing based on the fulfilment of the necessary efficacy, safety and quality requirement. It is normally protected by a patent and is also referred to as the original product (WHO, 1998).
Prescription	A list of medication prescribed by an authorised prescriber
Item	A medicine item that forms part of a prescription. Also a medicine and therefore a substance containing at least one active pharmacological ingredient for the management of a specified condition, according to the Medicines and Related Substances Act (101 of 1965).
Patient levy	The portion of the total claimed prescription cost that is paid by the patient (out-of-pocket payment)
Medical scheme contribution	The portion of the total claimed prescription cost that is paid by the medical scheme
Total prescription cost	The total cost of the claimed prescription due to the dispenser of the medication

Geographical area	Geographical areas in this study are defined as the nine South African provinces
Provider	A provider in the context of this study is defined as a dispenser of medication, including GPs, specialists and pharmacies
Dispensing doctor	A medical practitioner (MBChB degree) who, in addition to practicing medicine, also dispenses medicine to his or his partner's patients (as defined by Act 56 of 1974, as amended)
Retail pharmacy	A pharmacy where the patient can "walk in" and have a face-to-face consultation with the pharmacist. Acute and chronic medications are dispensed to patients.
Courier pharmacy	A pharmacy dispensing medication to its clients via courier or postal or other delivery services
Specialist	Medical specialist is defined as a medical practitioner who has been registered as a specialist in a speciality or subspeciality in medicine in terms of the Regulations relating to the Specialities and Subspecialities in Medicine and Dentistry, published under Government Notice No. R. 590 of 29 June 2001
Other providers	Unclassified dispensers of medication, for example nurses with a dispensing licence.
Patient	A person / patient for whom a prescription / medicine item was claimed through his / her medical scheme for treatment of a specific condition.
Av	Average
DD GP	Dispensing doctor
DDS	Dispensing doctor specialist
RP	Retail pharmacy
CP	Courier pharmacy
OP	Other health care providers
Rx	Prescription
Rm	Rands in millions
SD	Standard deviation
SE	Standard error
SEP	Single Exit Price
M	Innovator medicine items with valid patents and available generic substitutes
N	Innovator medicine items with no available generic products
O	Innovator medicine items with available generic products
Y	Generic products

4.1.2. Annotations concerning the data analysis and results

- The claims data at hand excludes claims by the Government Employees Medical Scheme (GEMS), as the PBM from which the data were obtained is not the designated service provider for GEMS. This can be seen as a positive attribute of the dataset, as GEMS data has been found to skew datasets because of its big, younger, growing membership base

since inception in 2007. The Council for Medical Schemes frequently excludes GEMS data from analysis and comparisons in its annual reports due to this fact (CMS, 2011:159).

- Tables illustrating the trends observed over the two study years follow in many of the analyses below. A decrease from one study year to the next is presented with a minus sign in front of the number.
- The age group classification is as follows:
 - Age group 1 (>0- ≤19 years)
 - Age group 2 (>20- ≤39 years)
 - Age group 3 (>40- ≤59 years)
 - Age group 4 (>60- ≤79 years)
 - Age group 5 (≥80 years)
- Total costs and average costs presented are inclusive of VAT.
- The values of the data that were presented in the tables were rounded off to two decimals (except for n-values). This has been done to ensure uniformity for comparisons and due to spatial constraints.
- The results are presented mainly in table form, followed by brief discussions and various graphs or figures where needed to illustrate certain patterns.

4.2. Outline for the presentation of results

Figure 4.1 illustrates the flow of dataset presentation and the accompanying analysis and interpretations.

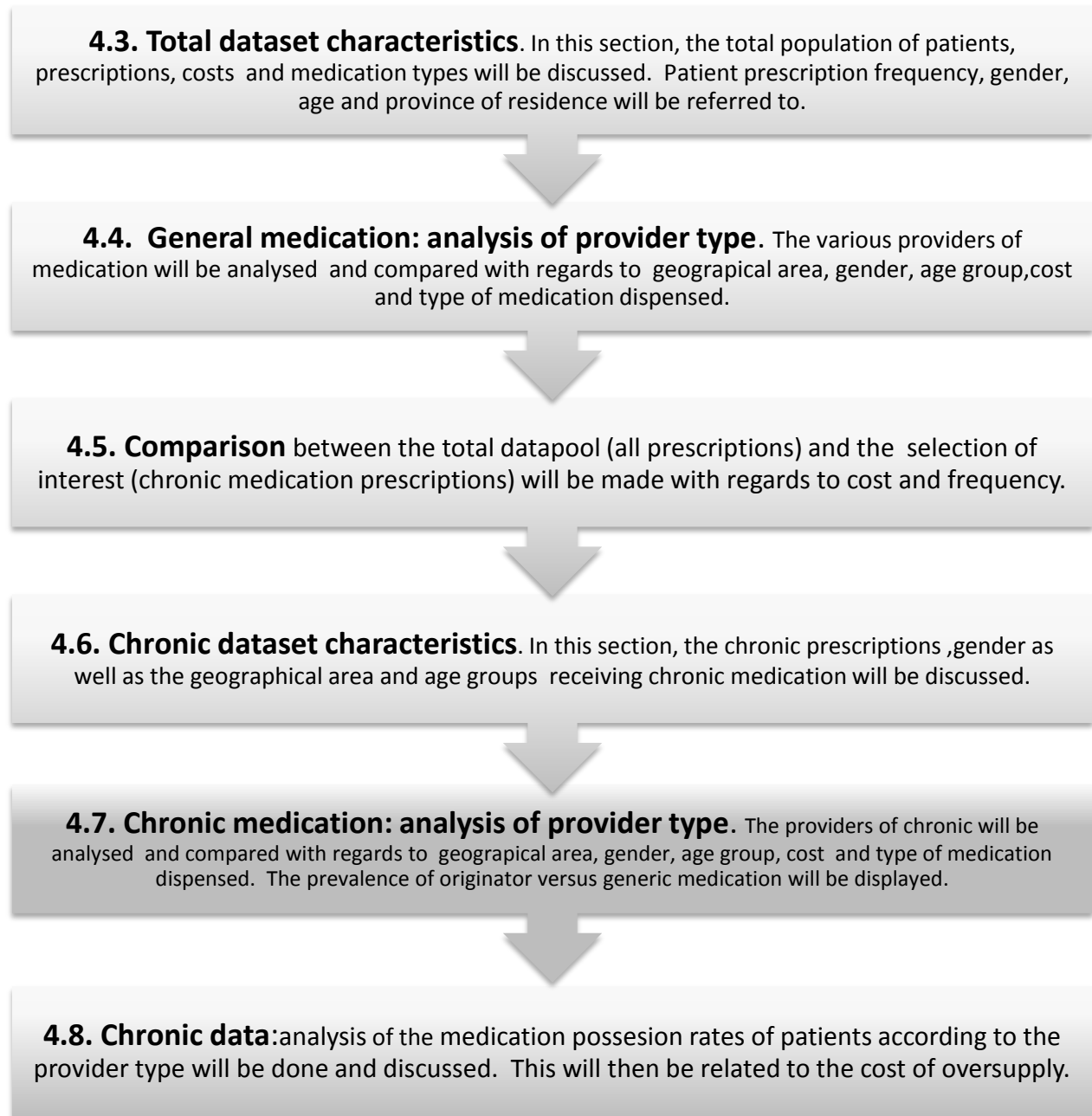


Figure 4.1: Flow of data analysis

4.3. Analysis of general medication prescriptions and demographics of patients receiving these prescriptions

In this paragraph, the overall data as obtained from a PBM company over the period 2009 to 2010 will be discussed.

4.3.1. Number of prescriptions and patients receiving medication in study period

The total number of patients to whom medication was dispensed over the period January 2009 to December 2010 was 3 111 675. Of this number of patients, 1 708 548, or 54.01%, were females and the remaining 1 403 127, or 45.09%, were males. The number of patients who received medication declined by 5% from 2009 to 2010. The number of females receiving medication declined by 6% from 2009 to 2010, while the number of male patients decreased by 5%.

Table 4.2 illustrates the characteristics of the patients in the total population.

Table 4.2: Total number of patients in dataset

	2009	2010	Total	Change 2009 to 2010
N_{patients}	1598342	1513333	3111675	-5%
n_{Female}	879925	828623	1708548	-6%
n_{Male}	718417	684710	1403127	-5%

According to the Council for Medical Schemes Report for 2010, the number of medical aid members have increased by 3.1% from 2009 to 2010 (CMS, 2011:159). Table 4.3 illustrates the increases in number of beneficiaries belonging to medical schemes from 2009 to 2010.

Table 4.3: Medical Scheme membership 2009 versus 2010 (adapted from CMS, 2011:159)

	2009	2010	Change %
Principal members	3 488 009	3 612 062	3.6
Dependants	4 580 496	4 703 656	2.7
Total beneficiaries	8 068 505	8 315 718	3.1

It would seem that the number of patients in the dataset in Table 4.3 contradicts the growing number of patients belonging to medical schemes. It should, however, be kept in mind that the overall growth in beneficiaries of medical aid schemes is driven mainly by the membership to closed schemes. According to the CMS report of 2010 (CMS 2011:159), the number of beneficiaries belonging to restricted medical aid schemes increased by 8.1% from 2009 to 2010, while the number of beneficiaries belonging to open medical aid schemes decreased by 0.3%. The largest restricted medical aid scheme is the Government Employees Medical Scheme (GEMS) (CMS, 2011:177), with an increase of 34.7% in 2010 alone (CMS, 2011:175).

The PBM from which the data for this study has been obtained is not the designated service provider for GEMS, and GEMS claims therefore do not form part of this study. The PBM mostly

services unrestricted medical aid schemes, which coincides with a decrease in number of beneficiaries serviced in 2010 versus 2009.

Table 4.4 presents the prescriptions claimed during the study period. The age of the patients claiming the prescriptions as well as the province that the prescriptions were claimed in are also given.

Table 4.4 Total number of prescriptions in dataset (gender, age group and province)

		Rx 2009	Rx 2010	Change 2009 to 2010	As % of total population 2009	As % of total population 2010	Change 2009 to 2010
Total Rx'es		9 105 893	8 600 631	-6%			
	Females	5 406 069	5 087 035	-6%	59%	59%	0%
	Males	3 699 824	3 513 596	-5%	41%	41%	0%
Age Group	1	1 189 373	1 062 219	-11%	13%	12%	-1%
	2	1 752 358	1 651 344	-6%	19%	19%	0%
	3	3 263 118	3 022 951	-7%	36%	35%	-1%
	4	2 330 232	2 273 295	-2%	26%	26%	1%
	5	570 812	590 822	4%	6%	7%	1%
Province	Eastern Cape	669 882	611 888	-9%	7%	7%	0%
	Free State	427 925	424 562	-1%	5%	5%	0%
	Gauteng	3 746 178	3 492 857	-7%	41%	41%	-1%
	Kwazulu-Natal	1 343 911	1 231 996	-8%	15%	14%	0%
	Limpopo	339 574	299 764	-12%	4%	3%	0%
	Mpumalanga	453 537	448 595	-1%	5%	5%	0%
	North West	494 953	478 472	-3%	5%	6%	0%
	Northern Cape	135 130	138 825	3%	1%	2%	0%
	Western Cape	1 458 755	1 434 577	-2%	16%	17%	1%
	Not Indicated	36 048	39 095	8%	0%	0%	0%

The number of prescriptions dispensed decreased by 6% from 2009 to 2010, with the number of female patient prescriptions declining by 6% and the number of male patient prescriptions declining by 5%. The male to female ratio remained constant over the study period at 59% females and 41% males receiving prescriptions. 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 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.

The age distribution of prescriptions claimed for the total population in the dataset (2009 – 2010) is represented by Figure 4.2.

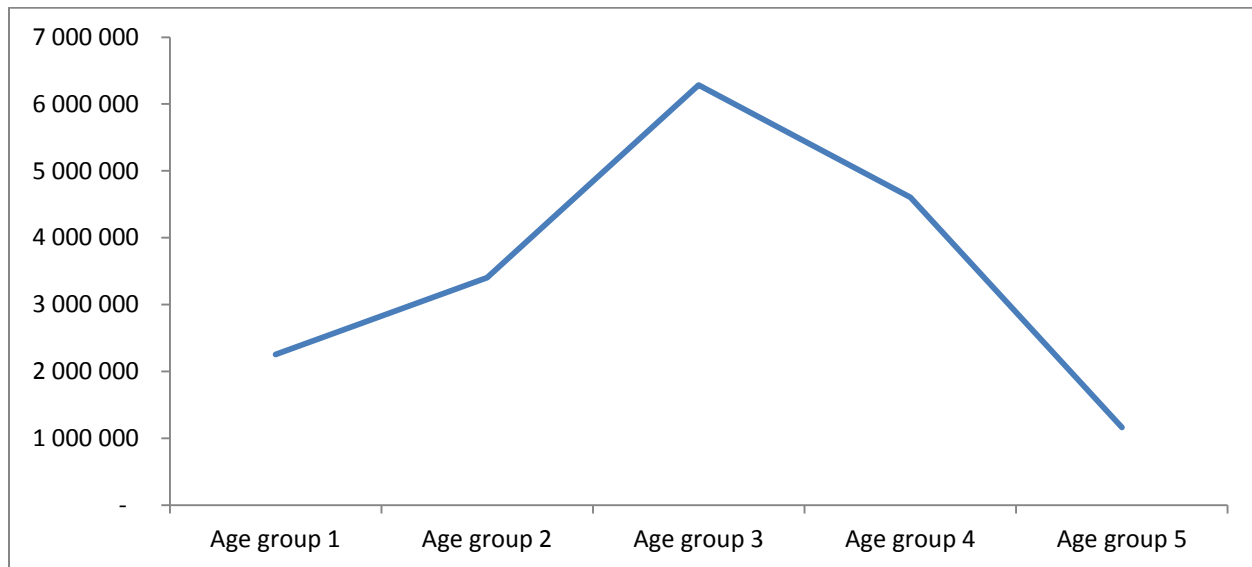


Figure 4.2: Age distribution of the number of prescriptions claimed 2009 to 2010.

According to Figure 4.2, most prescriptions were claimed for patients in age group 3 (40-59 years), at 6 286 069. 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 graph is expected to look slightly different when only chronic medication is analysed.

Age group 1 and 3 received 1% less prescriptions in 2010 than in 2009, while age groups 4 and 5 received 1% more prescriptions in 2010 than in 2009.

When comparing the average number of prescriptions claimed from 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 under 19 years, this group does not claim many prescriptions in the private health care system. Reasons could be that younger children do not belong to private medical schemes but access medical care through public health facilities, which is not covered by this study, or that younger patients do not utilise as many medication as older patients. Of all members covered by private medical schemes, 22% are in the age group 0-19 years (Bester & Badenhorst, 2011:9). This would indicate that this age group is proportionately covered within the private sector, but that people who do not

have private medical scheme cover have more children under the age of 19. Figure 4.3 indicates this trend.

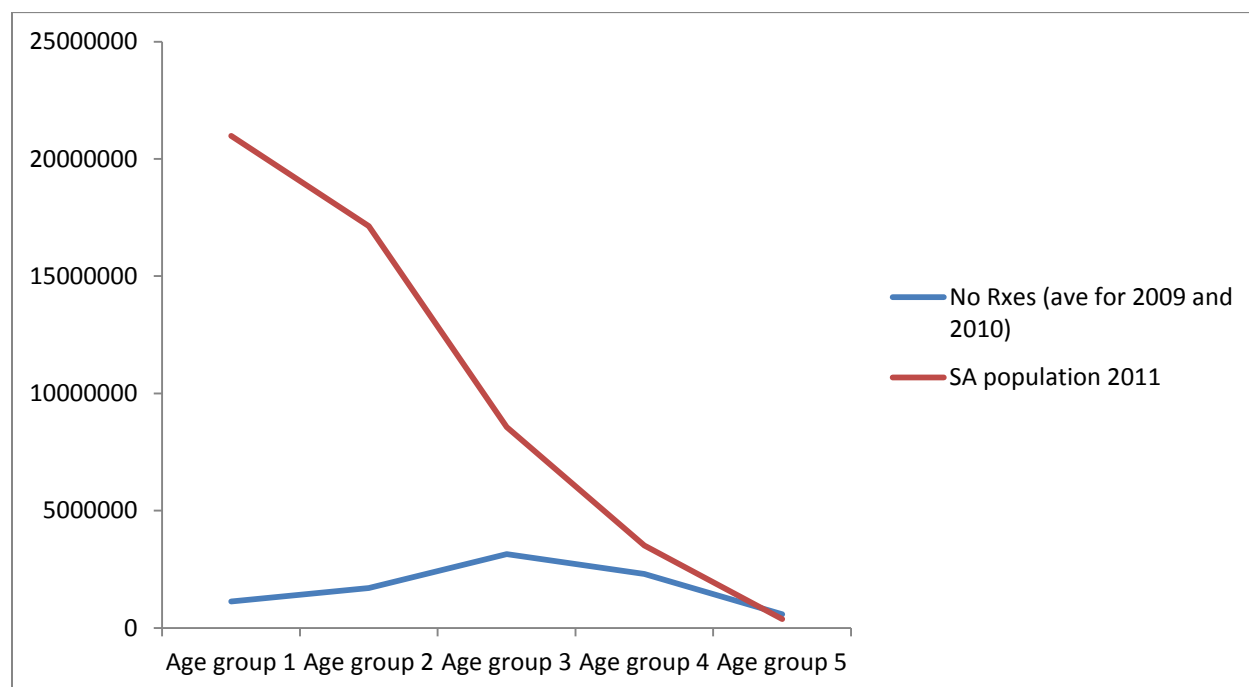


Figure 4.3: Age group distribution: general population versus number of prescriptions claimed in private medical sector

The distribution of prescriptions in the nine provinces remained fairly constant over the study period. 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 over the 2 study years of 1.5% of all prescriptions). This correlates with population demographics (Statistics SA, 2011), indicating that the biggest part of the population resides in Gauteng (22.39%), with the smallest part of the population residing in the Northern Cape (2.17%).

Table 4.5: Midyear population estimates per province (adapted from Statistics SA, 2011)

Mid-year population estimates by province, 2011		% of total population
Eastern Cape	6 829 958	13.50
Free State	2 759 644	5.46
Gauteng	11 328 203	22.39
KwaZulu-Natal	10 819 130	21.39
Limpopo	5 554 657	10.98
Mpumalanga	3 657 181	7.23
Northern Cape	1 096 731	2.17
North West	3 253 390	6.43

Western Cape	5 287 863	10.45
Total	50 586 757	100.00

When analysing Table 4.4, it can be deduced that there was a very small variance in data when comparing 2009 to 2010. The largest difference was for age group 4 (60-70 years) who claimed 0.84% more prescriptions in 2010 than in 2009. Prescriptions claimed by females decreased by 0.22% from 2009 to 2010 while prescriptions claimed by male patients increased by 0.22% over the same period. Figure 4.4 presents these trends graphically.

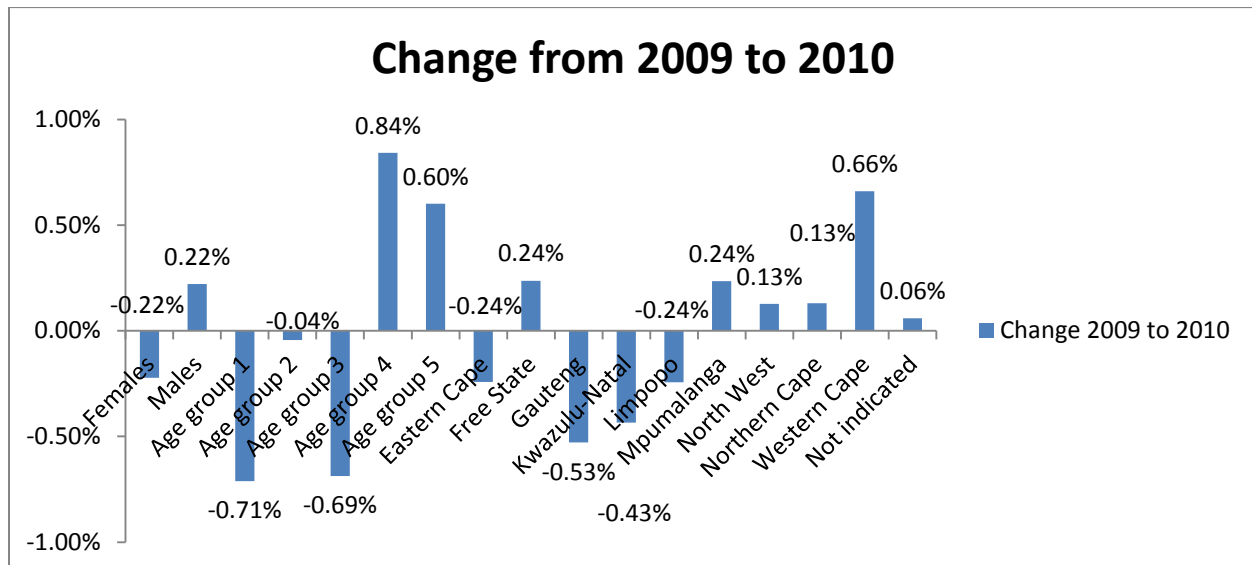


Figure 4.4: Change in data from 2009 to 2010 (including age, gender and province)

The number of patients and prescriptions for the study period has now been discussed. Table 4.6. to follow highlights the number of prescriptions per patient for the study period.

Table 4.6: Average number of prescriptions per patient for all medication claimed in the study period

	2009	2010	Trend	d-value
N_{patients}	1598342	1513333		
$\bar{X}_{Rx/Pt}$	5.70 ± 6.80	5.68 ± 6.79	-0.02	0.00
n_{Females}	879925	828623		
$\bar{X}_{Rx/Pt}$	6.14 ± 7.24	6.14 ± 7.24	0.00	0.00
n_{Males}	718417	684710		
$\bar{X}_{Rx/Pt}$	5.15 ± 6.19	5.13 ± 6.17	-0.02	0.00

From Table 4.6 it can be deduced that there was no significant difference (*d*-values of 0.00) between the average number of prescriptions per patient between 2009 and 2010. Tables 4.7 to 4.9 further explore the number of prescriptions by defining how many patients received a certain number of prescriptions per year. This is done for the whole population (Table 4.7) as well as for the female (Table 4.8) and male (Table 4.9) populations.

Table 4.7: Total dataset – general population characteristics: number of prescriptions per patient

	2009			2010		
	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total
	1	323644	24.75	1	302550	24.79
	2	188290	14.40	2	173176	14.19
	3	128167	9.80	3	116961	9.58
	4	92340	7.06	4	83530	6.85
	5	70111	5.36	5	63278	5.19
	6	56242	4.30	6	51172	4.19
	7	44507	3.40	7	41765	3.42
	8	36650	2.80	8	34814	2.85
	9	31730	2.43	9	30440	2.49
	10	28274	2.16	10	27731	2.27
	11	27771	2.12	11	27190	2.23
	12	30917	2.36	12	30691	2.52
	13	30473	2.33	13	30010	2.46
	14	28039	2.14	14	26907	2.20
	15-143	190373	14.56	15-143	180074	14.76
Total		1307528	100.00		1220289	100.00

Table 4.7 illustrates that most individual patients (25%) received only one prescription per year. This prescription is probably acute medication as a once-off prescription is usually for a curable condition. Of the total population, 14% received two prescriptions per year and 10% received three prescriptions per year. When considering that chronic medication should be taken monthly every month of the year, it seems that the patients who received 10, 11, 12, 13 or 14 prescriptions per year are 11.68% of the total population. When analysing the chronic data later in this chapter, the percentage chronic medications out of the total are found to be 31%. This may be due to not all chronic patients using chronic medications as regularly as prescribed. The medication possession ratios are discussed in section 4.8 of this chapter.

Table 4.8 refers to the number of female patients receiving varying numbers of prescriptions.

Table 4.8 Total dataset – general population characteristics: number of prescriptions per female patient

	2009			2010		
Females	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total
	1	163113	22.90	1	151232	22.88
	2	96390	13.53	2	88313	13.36
	3	67109	9.42	3	60741	9.19
	4	49301	6.92	4	44188	6.68
	5	38053	5.34	5	33889	5.13
	6	30781	4.32	6	27856	4.21
	7	24704	3.47	7	22951	3.47
	8	20645	2.90	8	19476	2.95
	9	18042	2.53	9	17085	2.58
	10	16087	2.26	10	15597	2.36
	11	15768	2.21	11	15290	2.31
	12	17859	2.51	12	17574	2.66
	13	17811	2.50	13	17478	2.64
	14	16496	2.32	14	15875	2.40
	15-143	120146	16.87	15-143	113462	17.16502
Total		712305	100.00			100.00

When reviewing the female patients in the dataset, it can be seen that 23% had one prescription per year, 13% received two prescriptions and 9% received three prescriptions per year. When comparing this with the male data in Table 4.9, it is clear that males received less prescriptions per patient per year. Of all male patients, 27% received one prescription per year, 15% received two prescriptions per year and 10% received three prescriptions per year. Of the female population, patients receiving more than 15 prescriptions per year represented 17% of the population. Only 12% of all males received more than 15 prescriptions per year.

The aim of this study is to investigate the prescribing and resulting claiming patterns of chronic medication specifically. Table 4.10 expresses the total (chronic and other prescriptions) claimed over the study period to indicate where chronic medication lies within the total medication landscape.

Table 4.9 Total dataset- general population characteristics: Number of prescriptions per male patient

	2009			2010		
Males	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total	Number of Rx'es	Number of patients with this nr of Rx	Percentage of total
	1	160531	26.97	1	151318	27.06
	2	91900	15.44	2	84863	15.17
	3	61058	10.26	3	56220	10.05
	4	43039	7.23	4	39342	7.03
	5	32058	5.39	5	29389	5.25
	6	25461	4.28	6	23316	4.17
	7	19803	3.33	7	18814	3.36
	8	16005	2.69	8	15338	2.74
	9	13688	2.30	9	13355	2.39
	10	12187	2.05	10	12134	2.17
	11	12003	2.02	11	11900	2.13
	12	13058	2.19	12	13117	2.35
	13	12662	2.13	13	12532	2.24
	14	11543	1.94	14	11032	1.97
	15-143	70227	11.80	15-143	66612	11.91
Total		595223	100.00		559282	100

Table 4.10: Number of prescriptions dispensed per medication benefit group 2009 to 2010

	2009	2010	Total no of Rxes	As % of total
Type of medication	n _{Rx}	n _{Rx}	N _{Rx}	
Acute	5831765	5362965	11194730	55%
Chronic	3126266	3064881	6191147	31%
HIV/AIDS	96557	113142	209699	1%
Oncology	68062	70179	138241	1%
OTC	1075557	1036969	2112526	10%
Other	208166	232415	440581	2%
Total	10406373*	9880551*	20286924*	100%

*The totals portrayed in table 4.10 are not equal to the total number of prescriptions, i.e. 17 706 524. This is because some patients may have received prescriptions that included more than one medication benefit type (e.g. HIV and chronic medication).

From table 4.10 it can be deduced that of all medication claimed over the study period, most were labelled as acute medication (55%). This is followed by chronic medication (31%) and

over-the-counter (OTC) medication (10%). HIV/AIDS and Oncology medication represented only 1% of all prescriptions dispensed.

The change in number of prescriptions dispensed per medication group for 2009 to 2010 is depicted in Figure 4.5.

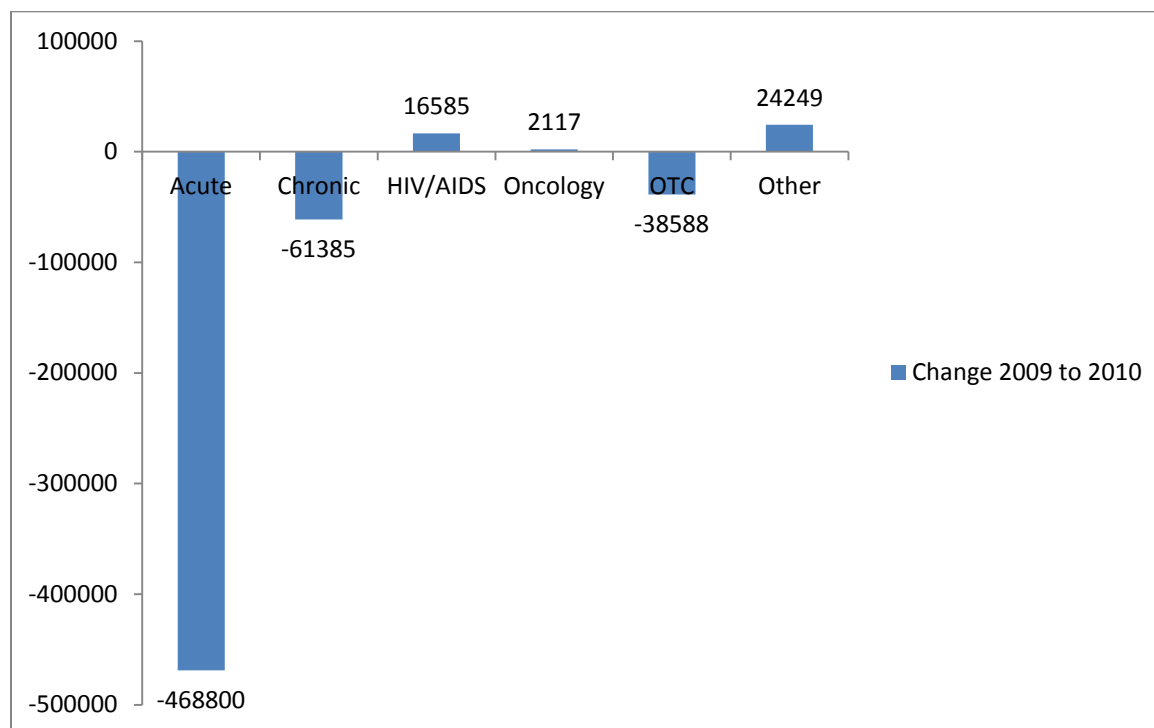


Figure 4.5: Change in number of prescriptions dispensed per medication group from 2009 to 2010

Figure 4.5 indicates that from 2009 to 2010 there was a decrease of 468 800 in the number of acute prescriptions dispensed. The number of chronic medication prescriptions dispensed also decreased slightly with 61 385 from 2009 to 2010. The only medication categories that experienced an increase in prescriptions from 2009 to 2010 were oncology, HIV/AIDS and “other” medication. The difference in each medication group’s prescription count between 2010 and 2009 are given in Table 4.11.

Table 4.11: Increases and decreases in prescriptions per medication benefit group – 2009 to 2010

Type of medication	Difference in number of Rx'es 2010 -2009	%
Acute	-468800	-8.04%
Chronic	-61385	-1.96%
HIV	16585	17.18%
Oncology	2117	3.11%

OTC	-38588	-3.59%
Other	24249	11.65%

Table 4.11 highlights that the largest decrease (8.04%) was found in acute prescriptions. 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.

Table 4.12 analyses the prescriptions within the different medication groups, with the focus being on the number of items per prescription for each group.

Table 4.12: Average number of Items per prescription per medication benefit group for 2009 and 2010

	2009		2010		Trend	d-value
	Item per Rx	SD	Item per Rx	SD		
Acute	2.04	1.30	2.07	1.31	0.03	0.02
Chronic	2.29	1.62	2.24	1.57	-0.05	-0.03
HIV/AIDS	2.55	0.81	2.63	0.83	0.08	0.10
Oncology	2.20	2.43	2.23	2.45	0.03	0.01
OTC	1.70	0.99	1.69	0.98	-0.01	-0.01
Other	1.52	0.99	1.52	0.99	0	0.00

For all medication groups there was no practically significant difference in the number of items per prescription from 2009 to 2010. HIV medication had the highest *d*-value of 0.1 but this number is statistically insignificant.

Because all the medication groups seem to have an average number of items per prescription of between 1.52 ± 0.99 and 2.55 ± 0.81 , one would expect prescription costs for all medication groups to be similar. However, this is not the case, and in section 4.3.2 item cost will therefore be investigated to understand its role as a prescription cost driver.

4.3.2. Costs of medication prescribed in the study period

The number of prescriptions claimed for a certain type of medication is of more value when combined with the cost. This allows for the calculation of the weight that each provider carries in servicing patient's medication needs.

Table 4.13 further analyses prescription costs and includes demographic details of patients that received medication over the study period. The data is stratified according to gender, age group and province.

Table 4.13 Total database: Total cost of all prescriptions claimed during study period

		Cost of all Rxes 2009 (R)	Cost of all Rxes 2010 (R)	Change 2009 to 2010	As % of total population 2009	As % of total population 2010	Change 2009 to 2010
Total Rx'es		2509210769.88	2460225811.00	-2%			
	Females	1460708720.03	1429235328.00	-2%	58%	58%	0%
	Males	1048502049.85	1030990482.00	-2%	42%	42%	0%
Age Group	1	213199295.39	195325980.00	-8%	8%	8%	-1%
	2	347514725.53	337008181.90	-3%	14%	14%	0%
	3	893347596.81	861847858.20	-4%	36%	35%	-1%
	4	860085086.01	858416094.70	0%	34%	35%	1%
	5	195064066.14	207627695.80	6%	8%	8%	1%
Province	Eastern Cape	143032271.74	137153958.20	-4%	6%	6%	0%
	Free State	119646849.22	123383385.10	3%	5%	5%	0%
	Gauteng	1162555668.86	1129741272.00	-3%	46%	46%	0%
	Kwazulu-Natal	381338493.93	365677366.30	-4%	15%	15%	0%
	Limpopo	68764218.26	64750249.62	-6%	3%	3%	0%
	Mpumalanga	99849212.30	106110556.70	6%	4%	4%	0%
	North West	117368921.26	116597135.50	-1%	5%	5%	0%
	Northern Cape	30692181.34	30914679.54	1%	1%	1%	0%
	Western Cape	376631458.37	376433799.60	0%	15%	15%	0%
	Not Indicated	9331494.60	9463408.60	1%	0%	0%	0%

According to Table 4.13, the total prescriptions claimed cost R2 509 210 769 in 2009 and R2 460 225 811 in 2010 (a decrease of 2%). While the total number of prescriptions decreased by 6% from 2009 to 2010 (Table 4.4), cost only decreased by 2%. This indicates that medication item costs may have increased from 2009 to 2010, as will be confirmed by analysis to follow in this chapter. Females, who represent 59% of the number of prescriptions claimed, were responsible for 58% of the cost of all prescriptions, indicating that the medication claimed by females were slightly less expensive than those claimed by males.

When considering the costs of medication per age group, it is clear that age group 3 (40 to 59 years) utilised the most medication. The amount spent on medication for this group represents 36% of total costs, and this group also received the most prescriptions (36%) according to Table 4.4. Age group 4, however, represented only 26% of the prescriptions dispensed but accounted for 34% of medication cost. This indicates that this older age group uses more costly medication, as will be confirmed by further investigations into average item and prescription cost to follow in this chapter.

Gauteng spent 46% of the total medication cost pool, followed by KwaZulu Natal at 15%. When comparing the amount spent on medication to the population estimates in Table 4.5, a big variance is seen in the cost of medication per province. Of the South African population, 22% reside in Gauteng, yet 46% of the private sector medication costs lie within Gauteng. KwaZulu Natal is home to 21% of the population but only contributes 15% to the private sector medication costs. This may indicate that less people in KwaZulu Natal have access to private medical care, which is confirmed by data of the total medical scheme membership pool in SA that shows that Gauteng represents 36% of the total pool and KwaZulu Natal only 15% (CMS,2011:162).

Figure 4.6. graphically illustrates the changes in the total medication costs from 2009 to 2010. According to this figure, there was not much variance in the data of 2009 when compared to 2010. The biggest difference was a decrease of 0.93 % in the medication cost of Gauteng.

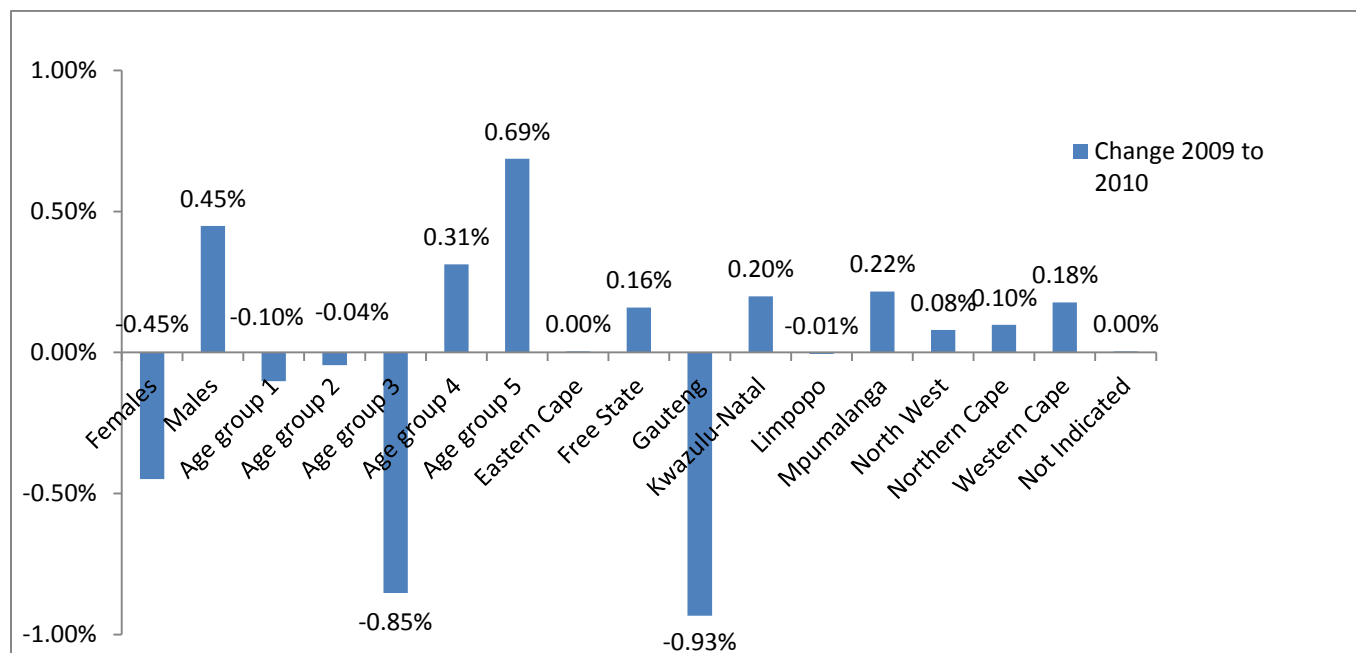


Figure 4.6: Medication cost changes 2009 to 2010

Table 4.14 depicts the total medication prescription costs over the study period and the percentage that each medication group contributes to the total cost.

Table 4.14: Total cost of prescriptions dispensed per medication benefit group: 2009 to 2010

Medication Type	Medication cost 2009	Medication cost 2010	Total medication cost (2009 and 2010)	As % of total
Acute	1007553553	917253570	1924807123	39%
Chronic	1053216784	1073299370	2126516155	43%
HIV/AIDS	57782793	68553640	126336433	3%
Oncology	265095478	269455444	534550922	11%
OTC	67585257	61966339	129551596	3%
Other	57976906	69697447	127674353	3%
TOTAL	2509210770	2460225811	4969436581	100%

Table 4.14 illustrates the total cost per medication group for the study period. Acute medication was responsible for 39% of the total medication prescription cost and chronic medication for 43% of the costs. Although oncology medication represented only 1% of the number of prescriptions dispensed, 11% of all medication costs could be attributed to this group.

Table 4.15 combines the frequency of prescriptions versus total cost per medication group.

Table 4.15: Number of prescriptions dispensed versus total medication costs for the study period, per medication benefit group

Type of medication	Contribution to total volume of prescriptions	Contribution to total cost of prescriptions
Acute	55%	39%
Chronic	31%	43%
HIV/AIDS	1%	3%
Oncology	1%	11%
OTC	10%	3%
Other	2%	3%

In Table 4.15, the contribution of each medication group to volume (number of prescriptions) and to cost are compared. Acute medication was the most frequently dispensed (55%) but it was only responsible for 39% of total cost, while chronic medication seems to be more costly, as it only represented 31% of medication dispensed but 43% of total medication costs. Only 1% of medication dispensed was oncological, but oncology represented 11% of the total costs of medication. A higher prescription cost is therefore evident amongst oncology and chronic medication. From the information in Table 4.15, the cost prevalence index (CPI) per medication type can be calculated. The CPI indicates the relative expense of a medication.

Table 4.16 represents the CPI as postulated by Serfontein (1989:180). A CPI of 1 is considered an equilibrium between costs and prevalence, whereas a CPI greater than one represents a relatively high medication cost. It can therefore clearly be seen that oncology (CPI of 11), HIV/AIDS (CPI of 3) and chronic medication (CPI of 1.39) are all seen as medication groups that are relatively expensive.

Table 4.16: CPI for different medication benefit types

Type of medication	Prevalence	Total cost	CPI
Acute	0.55	0.39	0.71
Chronic	0.31	0.43	1.39
HIV/AIDS	0.01	0.03	3.00
Oncology	0.01	0.11	11.00
OTC	0.1	0.03	0.30
Other	0.02	0.03	1.50

Table 4.17 further investigates medication cost by including the average prescription costs for all medication types dispensed.

Table 4.17: Average prescription costs of all medication groups dispensed for 2009 and 2010

Medication benefit type	Mean cost / Rx (R)			
	2009		2010	
	$\bar{X}_{\text{cost/Rx}}$ (R)	SD (R)	$\bar{X}_{\text{cost/Rx}}$ (R)	SD (R)
Acute	172.77	290.26	171.03	274.17
Chronic	336.89	562.97	350.19	646.91
HIV	598.43	288.14	605.91	370.26
Oncology	3894.91	8203.62	3839.55	8175.20
OTC	62.84	83.96	59.76	79.68
Other	278.51	1502.57	299.88	1758.94

Table 4.17 indicates that oncology had the highest average prescription costs at R3894.91± R8203.62 in 2009 and R3839.55 ± R8175.20 in 2010. HIV/AIDS medication was second most costly at R598 ± 288.14 in 2009 and R605.91 ± R370.26 in 2010. Although chronic medication is the third most costly group of medication, the overall intensity (average prescription cost times number of prescriptions or total cost) is the highest of all medication groups.

High prescription costs could be due to a high number of items per prescription or high cost items contained in the prescription. Table 4.12 indicated the average number of items per prescription per medication benefit type, and table 4.18 gives the average item cost per medication benefit type for the study period.

Table 4.18: Average item cost per medication type for 2009 and 2010

Medication benefit type	Mean cost /Item (R)			
	2009		2010	
	$\bar{X}_{\text{cost/Rx}}$ (R)	SD (R)	$\bar{X}_{\text{cost/Rx}}$ (R)	SD (R)
Acute	83.34	178.89	83.84	167.03
Chronic	150.09	327.35	152.71	379.34
HIV/AIDS	227.92	198.94	237.69	248.82
Oncology	1748.65	4940.61	1742.10	5000.90
OTC	37.11	52.05	35.18	47.43
Other	183.28	1145.87	197.10	1335.20
Overall Ave	115.90	513.60	119.85	553.31

From Table 4.18, it is clear that oncology medication has the highest average cost per item (R1748.65 ± R4940.61 in 2009 and R1742.10 ± R5000.90), followed by HIV/AIDS and then

chronic medication. The Department of Health (2012) in its essential medicines list also specifically refers to the high cost of medication used in cancer treatment.

4.4. General medication dispensed by different providers.

In this section, general medication dispensing trends will be analysed according to the *different types of dispensers*. Dispensers are described as “providers” in this study.

The types of providers as classified for the purpose of this study are:

- Dispensing doctor GP (DD GP)
- Dispensing doctor specialist (DDS)
- Other providers (OP)
- Courier pharmacy (CP)
- Retail pharmacy (RP)

4.4.1. Provider types – patients and prescriptions

The number of patients and prescriptions per provider type, as depicted in Table 4.19, will be discussed in this section.

Table 4.19: Number of patients and medication prescriptions per provider type

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	357295	29789	3423	79182	1128653	1598342
n_{Rxes}	985783	47095	8125	772354	7292506	9105863
2010						
n_{patients}	319251	30879	3469	77259	1082475	1513333
n_{Rxes}	857513	48900	7377	699664	6987311	8600765

The number of unique patients receiving prescriptions over the study period totalled 3 111 675 and the average number of prescriptions per patient, including chronic, acute, HIV/AIDS, OTC and oncology medication, was 5.7 ± 2.69 for 2009 and 5.68 ± 6.79 for 2010. The provider with the highest average number of prescriptions was courier pharmacies at 9.75 ± 6.45 (2009) and 9.06 ± 6.00 (2010) prescriptions per patient. This was followed by retail pharmacies at $6.46 \pm$

7.39 (2009) and 6.45 ± 7.39 (2010). These numbers support 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 be why their prescription average per patient being the highest. Specialists only dispensed on average 1.58 (that is 1.58 ± 2.00 in 2009 and 1.58 ± 1.85 in 2010) prescriptions per patient over the study period. This may include oncologists, where oncology medication is dispensed at the specialist's practice. Concerning overall prescriptions dispensed, most prescriptions are obtained from retail pharmacies (14 279 817 of 17 706 628, or 81% over the two year study period), which dispensed to 2 211 128 (71%) of all patients in the dataset. Courier pharmacies were responsible for 8% of all prescriptions dispensed.

When calculating the d -values, as depicted in Table 4.20, no significant variances were established.

Table 4.20: Trend 2009 to 2010-average number of prescriptions per patient

	2009		2010		Trend	d -value
	$\bar{x}_{Rx/Pt}$	SD	$\bar{x}_{Rx/Pt}$	SD		
DDGP	2.76	3.02	2.69	2.98	-0.07	-0.02
DDS	1.58	2.00	1.58	1.85	0.00	0.00
OP	2.37	3.21	2.13	2.27	-0.24	-0.07
CP	9.75	6.45	9.06	6	-0.69	-0.11
RP	6.46	7.39	6.45	7.39	-0.01	0.00

Table 4.21 discusses the prescriptions dispensed to the five age groups according to the various provider types. It indicates that age group 1 (0-19 years) had the lowest number of Rx'es per patient, at an average of 3.22 ± 3.36 in 2009 and 3.20 ± 3.36 in 2010. Age group 5 (80+ years) had the highest number of prescriptions per patient at 12.55 ± 11.49 in 2009 and 12.13 ± 11.47 in 2010. This concurs with Freid *et al.* (2012:1-3) who state that the number of medications taken increases with age.

Table 4.21: General prescriptions by prescriber type – age group analysis

	2009							2010					
	Age group	DD GP	DDS	OP	CP	RP	TOTAL/AVE	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	1	99258	3723	1504	3051	261332	368868	82137	3797	1660	2557	241573	331724
n_{Rxes}		215101	5226	2882	22236	943928	1189373	172788	5305	3094	18495	862547	1062229
$\bar{x}_{Rx/Pt}$		2.17	1.40	1.92	7.29	3.61	3.22	2.10	1.40	1.86	7.23	3.57	3.20
SD		1.78	1.22	1.36	5.02	3.69	3.36	1.75	1.14	1.30	5.34	3.65	3.36
n_{patients}	2	98289	6470	568	12029	303932	421288	88318	6358	525	11708	292352	399261
n_{Rxes}		242379	8973	1154	91865	1407987	1752358	212492	8902	1022	87500	1341453	1651369
$\bar{x}_{Rx/Pt}$		2.47	1.39	2.03	7.64	4.63	4.16	2.41	1.40	1.95	7.47	4.59	4.14
SD		2.37	1.39	2.48	5.05	5.17	4.76	2.30	1.41	2.59	4.89	5.13	4.74
n_{patients}	3	121450	10195	753	34660	353705	520763	108820	10156	705	33385	336473	489539
n_{Rxes}		388548	15838	2179	318701	2537824	3263090	334930	15850	1657	289948	2380601	3022986
$\bar{x}_{Rx/Pt}$		3.20	1.55	2.89	9.20	7.17	6.27	3.08	1.56	2.35	8.68	7.08	6.18
SD		3.30	2.01	3.94	5.80	7.44	6.80	3.20	1.95	2.61	5.44	7.36	6.73
n_{patients}	4	32884	8136	538	25301	175066	241925	33517	9061	510	25293	175725	244106
n_{Rxes}		114248	14974	1725	289469	1909814	2330230	110472	16348	1444	256979	1888111	2273354
$\bar{x}_{Rx/Pt}$		3.47	1.84	3.21	11.44	10.91	9.63	3.30	1.80	2.83	10.16	10.74	9.31
SD		4.65	2.59	4.97	7.15	9.75	9.29	4.48	2.26	3.37	6.64	9.63	9.11
n_{patients}	5	5414	1265	60	4141	34618	45498	6459	1507	69	4316	36352	48703
n_{Rxes}		25507	2084	185	50083	492953	570812	26831	2495	160	46742	514599	590827
$\bar{x}_{Rx/Pt}$		4.71	1.65	3.08	12.09	14.24	12.55	4.15	1.66	2.32	10.83	14.16	12.13
SD		6.92	1.81	7.09	8.12	11.87	11.49	6.36	1.40	2.98	7.47	11.91	11.47

In age group 1, the most prescriptions were obtained from retail pharmacies (1 806 475 out of the 2 251 602 prescriptions in the study period, or 80%). 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. There are many more retail pharmacies in South Africa than courier pharmacies and this may contribute to the high number of prescriptions claimed from this pharmacy type.

Table 4.22 highlights that:

- Age group 1 had the greatest decrease in number of prescriptions dispensed from 2009 to 2010 at 11%.
- Age group 2 and 3 decreased by 6% and 7% respectively in number of prescriptions dispensed from 2009 to 2010, while age group 4 decreased by 2% in number of prescriptions dispensed but increased by 4% in number of patients claiming
- Age group 5 is the only age group to have experienced an increase in both the number of claiming patients (7%) and number of prescriptions dispensed (4%). This is an indication that the older population may be living to older age and are consuming more medication. This group needs to be budgeted for when planning chronic medication distribution, as they may increase further year on year.

Table 4.22 Variances 2009 to 2010 – prescriber type of general medication dispensed

	Age group	DD GP	DDS	OP	CP	RP
n_{patients}	1	-17%	2%	10%	-16%	-8%
n_{Rxes}		-20%	2%	7%	-17%	-9%
$\bar{x}_{Rx/Pt}$		-3%	0%	-3%	-1%	-1%
SD		-2%	-6%	-5%	6%	-1%
n_{patients}	2	-10%	-2%	-8%	-3%	-4%
n_{Rxes}		-12%	-1%	-11%	-5%	-5%
$\bar{x}_{Rx/Pt}$		-2%	1%	-4%	-2%	-1%
SD		-3%	1%	5%	-3%	-1%

n_{patients}	3	-10%	0%	-6%	-4%	-5%
n_{Rxes}		-14%	0%	-24%	-9%	-6%
$\bar{x}_{Rx/Pt}$		-4%	0%	-19%	-6%	-1%
SD		-3%	-3%	-34%	-6%	-1%
n_{patients}	4	2%	11%	-5%	0%	0%
n_{Rxes}		-3%	9%	-16%	-11%	-1%
$\bar{x}_{Rx/Pt}$		-5%	-2%	-12%	-11%	-2%
SD		-4%	-13%	-32%	-7%	-1%
n_{patients}	5	19%	19%	15%	4%	5%
n_{Rxes}		5%	20%	-14%	-7%	4%
$\bar{x}_{Rx/Pt}$		-12%	0%	-25%	-10%	-1%
SD		-8%	-23%	-58%	-8%	0%

The data in Table 4.22 leads to the following conclusions:

- There were no major differences in the dispensing patterns by age group within the prescribing groups between 2009 and 2010.
- Age group 5 has the highest average number of prescriptions per patient except for the provider groups “other providers” and “dispensing specialists”. As “other providers” are unspecified, no sound conclusion to the reason for this finding can be made. “Dispensing specialists” may include oncologists dispensing medication to cancer patients and this type of treatment may be more related to age group 4 (60-70 years), as 63% of cancers are diagnosed in people aged 65 years and over, according to Cancer Research UK (2012).
- Age group 5 may have the most prescriptions per item for courier pharmacies, retail pharmacies and dispensing GPs because of increased medication use (especially chronic medication) with age.

Figures 4.7 and 4.8 graphically illustrate the average number of prescriptions per patient per provider type for 2009 and 2010 respectively. *Note that the standard deviations for these averages are described in Table 4.21.*

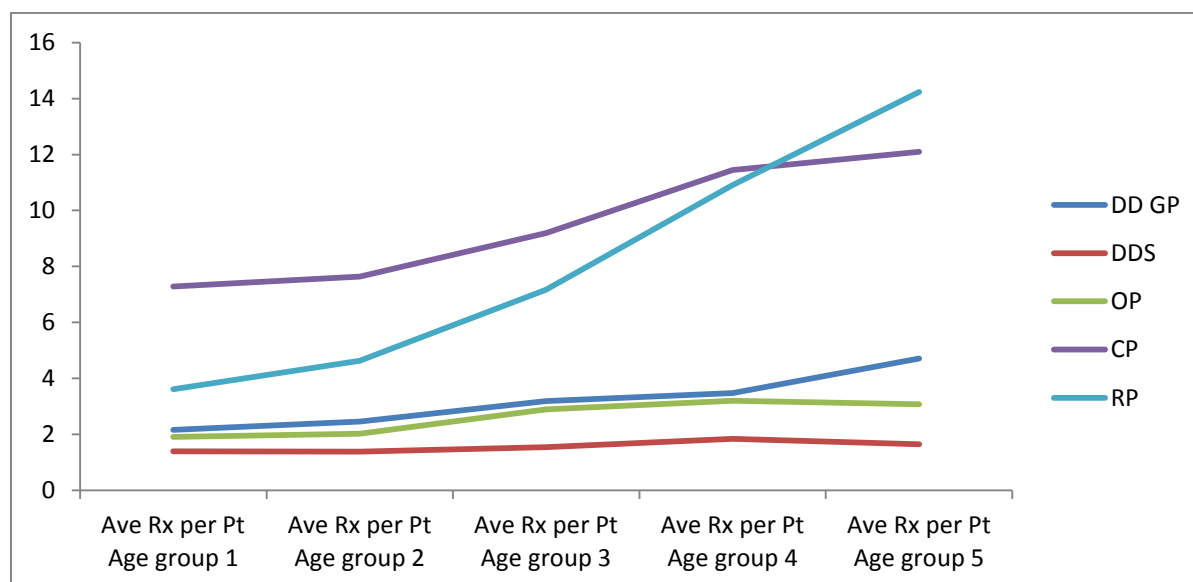


Figure 4.7: Average number of prescriptions per patient according to age group and prescriber type for 2009

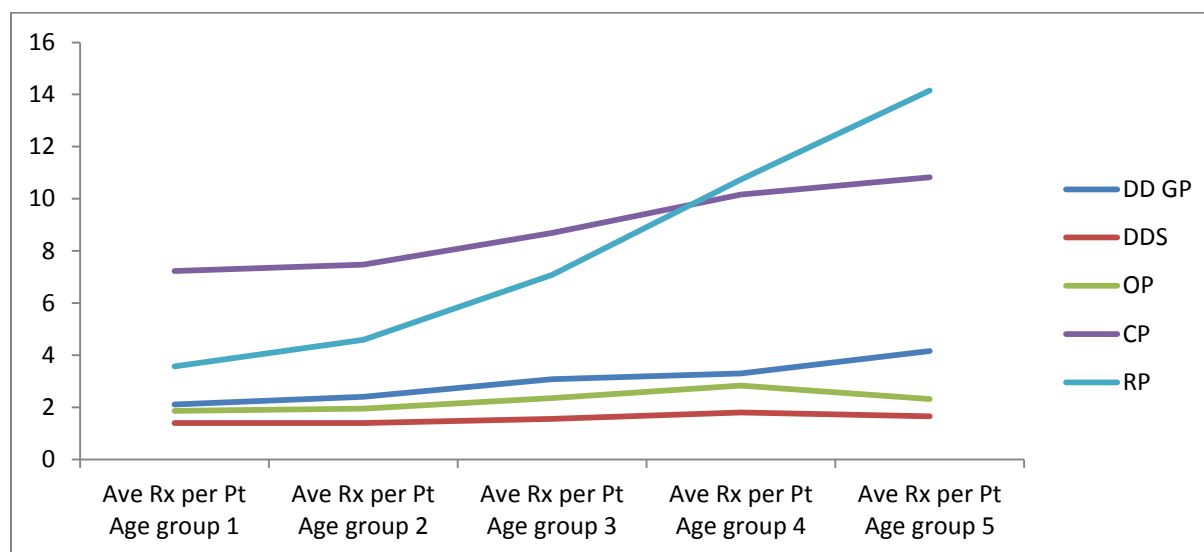


Figure 4.8: Average number of prescriptions per patient according to age group and prescriber type for 2010

From figures 4.7 and 4.8, it is clear that a higher number of prescriptions per patient are evident in older age groups. The highest number of prescriptions per age group for both years was found for medication dispensed by retail pharmacies to age group 5. The trends for 2009 and 2010 bear striking similarities.

Table 4.23 contains the total and average number of prescriptions per patient for 2009 and 2010 according to provider for female patients only.

Table 4.23: Female prescriptions per provider type

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	193174	17657	1993	43982	623119	879925
n_{Rxes}	549091	27994	4883	438643	4385456	5406067
$\bar{x}_{Rx/Pt}$	2.84	1.59	2.45	9.97	7.04	6.14
SD	3.17	1.98	2.98	6.68	7.86	7.24
2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	170981	18078	1976	42436	595152	828623
n_{Rxes}	472101	29016	4273	391118	4190613	5087121
$\bar{x}_{Rx/Pt}$	2.76	1.61	2.16	9.22	7.04	6.14
SD	3.13	1.91	2.33	6.15	7.87	7.24

When analysing the data in Table 4.23, it can be seen that the average number of prescriptions per female patient is 6.14 ± 7.24 (2009) and 6.14 ± 7.24 (2010). Females claimed 82% of their prescriptions from retail pharmacies. Table 4.24, which gives the same information as above for males, indicates that males also claimed 79% of their prescriptions from retail pharmacies, with the average number of prescriptions per patient at 5.75 ± 5.15 for 200 and 5.13 ± 6.17 for 2010.

Table 4.24: Male prescriptions per provider type

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	164121	12132	1430	35200	505534	718417
n_{Rxes}	436692	19101	3242	333711	2907050	3699796
$\bar{x}_{Rx/Pt}$	2.66	1.57	2.27	9.48	5.75	5.15
SD	2.83	2.02	3.5	6.14	6.71	6.19
2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{patients}	148270	12801	1493	34823	487323	684710
n_{Rxes}	385412	19884	3104	308546	2796698	3513644
$\bar{x}_{Rx/Pt}$	2.6	1.55	2.08	8.86	5.74	5.13
SD	2.8	1.78	2.19	5.81	6.7	6.17

4.4.2. Medication prescription costs per provider type

Table 4.25 contains the costs per prescription dispensed per provider. Total prescription cost consists of two possible components:

- Medical scheme contribution, which is the portion of total prescription cost paid for by the medical aid scheme. It is calculated and claimed 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 a 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

Total prescription cost is made up of the components listed. Total prescription cost is the real value of the prescription, regardless of the party responsible for payment.

Table 4.25: Total prescription cost per provider type for 2009 and 2010

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Rxes}	985783	47095	8125	772354	7292536	9105893
Cost _{Rxes (R)}	99935135.65	22936656.93	2508818.14	547518075.69	1836312083.47	2509210769.88
$\bar{x}$ cost/Rx (R)	101.38	487.03	308.78	708.90	251.81	275.56
SD Tcost (R)	217.90	2139.49	816.92	2670.78	492.13	921.03
n _{levy}	21868624	2033704	818925	39234748	411552283	475508285
$\bar{x}$ levy/Rx (R)	22.18	43.18	100.79	50.80	56.43	52.22
SD Levy (R)	60.48	339.24	245.50	445.17	176.81	207.38
n _{Scheme}	78066512	20902953	1689893	508283327	1424759800	2033702485
$\bar{x}$ scheme/per Rx (R)	79.19	443.85	207.99	658.10	195.37	223.34
SD Scheme (R)	201.34	2089.42	773.17	2619.82	439.80	885.28
2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Rxes}	857513	48766	7377	699664	6987311	8600631
Cost _{Rxes (R)}	89207685.00	27797863.00	2286955.00	555000000.00	1790000000.00	2460225811.00
$\bar{x}$ cost/Rx (R)	104.03	570.03	310.01	793.80	255.54	286.05
SD Tcost (R)						

n_{levy}	200.05	2609.66	732.96	2987.69	461.77	983.84
$\bar{x}_{levy/Rx}$ (R)	20467249	2265839	638533	35207778	417000000	475688669
SD Levy (R)	23.87	46.46	86.56	50.32	59.70	55.31
n_{Scheme}	75.71	466.29	225.86	492.73	146.16	197.66
$\bar{x}_{scheme/}$ per Rx (R)	68740435	25532023	1648422	520000000	1370000000	1984537142
SD Scheme (R)	80.16	523.56	223.45	743.48	195.84	230.74
	170.94	2505.52	709.09	2925.05	415.36	948.81

According to Table 4.25, the total cost for prescription medication over the two-year study period was R4 969 436 580.88. 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 $\pm$ R921.03 in 2009 and R286.05 $\pm$ R983.84 in 2010.

However, the average cost per prescription at courier pharmacies was noticeably higher than the average prescription cost, at R708.90 $\pm$ R2670.78 in 2009 (*d*-value of 0.16) and R793.80 $\pm$ R2987.69 in 2010 (*d*-value of 0.17). The reason for this trend is explained 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 medication and 4.6% for oncology. Piette *et al.* (2004:1782) agree that chronic medication is a more costly medication group. The average cost per prescription can therefore be expected to be higher. The practical significance of the differences in prescription costs between courier and retail pharmacies for chronic medication specifically is discussed in section 4.7 of this chapter.

Table 4.26: Prevalence and cost of general medication prescriptions per provider type 2009-2010 (total study period)

2009 and 2010 Total Rx'es and costs						
	DD GP	DDS	OP	CP	RP	TOTAL
$n_{Rx'es}$	1843296	95861	15502	1472018	14279847	17706524
% of total Rx'es	10%	1%	0%	8%	81%	100%
Tcost _{Rx'es} (R)	189142820	50734520	4795773	1102912883	3621850585	4969436581
% of total Rx cost	4%	1%	0%	22%	73%	100%
CPI	0.00	0.00	0.00	0.02	0.59	1.00

From Table 4.26, which indicates the cost prevalence index (CPI) for the different provider types, it can be seen that 81% of all prescriptions were claimed at retail pharmacies at 73% of the total

medication costs. From the CPI it can be deduced that not one provider had dispensed exceptionally expensive prescriptions in relation to prescription frequency over the study period, as all the CPIs are below 1. The highest CPI belongs to retail pharmacies (30 times higher than courier pharmacies at 0.02). This could be due mostly to the high volume of prescriptions (81% of total population) dispensed by retail pharmacies in the South African private health care sector.

Table 4.27: Analysis of prescription costs over the 2-year study period

	DD GP	DDS	OP	CP	RP
Pt levy as % of total Rx cost	22%	8%	30%	7%	23%
Scheme contribution as % of total Rx cost	78%	92%	70%	93%	77%

Table 4.27, which further explores the components of prescription costs within the different medication provider groups, clearly shows that although courier pharmacies (CP) have the highest average cost per prescription dispensed, the 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. Medical aid schemes paid 93% of all courier pharmacy prescription claims, 92% of specialist claims and 77% of retail pharmacy claims.

Tables 4.28-4.31 explore the total prescription cost, levy cost and medical scheme contributions for males and females respectively for 2009 and 2010.

Table 4.28: Prescription cost elements – females 2009

Females 2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n_{Rxes}	549091	27994	4883	438643	4385458	5406069
T_{costRxes} (R)	57336312.16	13550934.18	1485986.23	308763929.22	1079571558.24	1460708720.03
$\bar{x}$_{cost/Rx} (R)	104.42	484.07	304.32	703.91	246.17	270.20
SD Tcost (R)	264.36	2178.04	820.57	2658.75	452.99	889.41
T_{costLevy} (R)	12873504.95	1194117.51	481568.76	22731249.13	251754701.25	289035141.60
$\bar{x}$_{levy/Rx} (R)	23.45	42.66	98.62	51.82	57.41	53.46
SD Levy (R)	61.41	367.83	243.70	463.83	170.40	205.56
T_{costScheme} (R)	44462807.21	12356816.67	1004417.47	286032680.09	827816856.99	1171673578.43
$\bar{x}$_{scheme/ per Rx} (R)	80.98	441.41	205.70	652.09	188.76	216.73
SD Scheme (R)	249.89	2130.64	781.82	2605.66	401.99	854.71

Table 4.29: Prescription cost elements – males 2009

Males 2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Rxes}	436692	19101	3242	333711	2907078	3699824
T _{costRxes} (R)	42598823.49	9385722.75	1022831.91	238754146.47	756740525.23	1048502049.85
$\bar{x}$ cost/Rx (R)	97.55	491.37	315.49	715.45	260.31	283.39
SD Tcost (R)	138.88	2081.76	811.47	2686.51	545.79	965.31
T _{costLevy} (R)	8995118.89	839586.65	337356.65	16503499.19	159797581.74	186473143.12
$\bar{x}$ levy/Rx (R)	20.60	43.96	104.06	49.45	54.97	50.40
SD Levy (R)	59.25	292.32	248.17	419.38	186.05	209.99
T _{costScheme} (R)	33603704.60	8546136.10	685475.26	222250647.28	596942943.49	862028906.73
$\bar{x}$ scheme/ per Rx (R)	76.95	447.42	211.44	666.00	205.34	232.99
SD Scheme (R)	113.97	2027.56	760.05	2638.30	491.20	928.06

Table 4.30: Prescription cost elements – females 2010

Females 2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Rxes}	472101	28930	4273	391118	4190613	5087035
T _{costRxes} (R)	50880054.76	17990894.03	1234362.55	310230987.40	1048899030.00	1429235328.00
$\bar{x}$ cost/Rx (R)	107.77	621.88	288.87	793.19	250.30	280.96
SD Tcost (R)	230.36	2918.79	685.12	2907.19	422.31	935.36
T _{costLevy} (R)	11921842	1428841	374919	19193291	254566869	287485763
$\bar{x}$ levy/Rx (R)	25.25	49.39	87.74	49.07	60.75	56.51
SD Levy (R)	82.76	574.78	227.06	390.88	135.80	172.07
T _{costScheme} (R)	38958212	16562053	859444	291037696	794332161	1141749566
$\bar{x}$ scheme/ per Rx (R)	82.52	572.49	201.13	744.12	189.55	224.44
SD Scheme (R)	199.47	2774.22	659.01	2863.88	376.90	905.41

Table 4.31: Prescription cost elements – males 2010

Males 2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Rxes}	385412	19836	3104	308546	2796698	3513596
T _{costRxes} (R)	38327629.80	9806968.71	1052592.60	245163819.70	736639471.50	1030990482.00
$\bar{x}$ cost/Rx (R)	99.45	494.40	339.11	794.58	263.40	293.43
SD Tcost (R)	154.94	2075.67	793.31	3086.71	515.17	1050.03
T _{costLevy} (R)	8545407	836998	263614	16014486	162542401	188202906
$\bar{x}$ levy/Rx (R)	22.17	42.20	84.93	51.90	58.12	53.56
SD Levy (R)	66.03	229.52	224.21	597.37	160.42	229.71
T _{costScheme} (R)	29782223	8969971	788979	229149333	574097070	842787576
$\bar{x}$ scheme/ per Rx (R)	77.27	452.21	254.18	742.67	205.28	239.86
SD Scheme (R)	127.53	2049.46	771.80	3000.79	466.94	1008.28

When analysing the prescriptions according to gender, it is clear that there are limited variance in average prescription and levy costs between males and females for courier pharmacies, retail pharmacies and other providers. However, it is interesting to note that five time more males than

females (5 406 069 versus 1 021 192) received prescriptions from dispensing doctors during the study period. In 2010, the males visiting dispensing doctors also paid $R99.45 \pm R154.94$ per prescription on average of which $R22.17 \pm R66.03$ was an out-of pocket co-payment, whereas in the same year females paid $R107.77 \pm R230.36$ and had an average co-payment of $R25.25 \pm R82.76$. It would therefore seem that female patients are more reluctant to visit dispensing doctors and they are more likely to visit pharmacies to obtain their medication.

Where dispensing specialists are concerned, the picture is reversed, with more prescriptions claimed for females than males over the two-year study period (56 924 versus 38 937). This may indicate the females had more specialized conditions and needed to be treated by specialists. Females paid on average $R621.88 \pm R2918.79$ per prescription claimed from a specialist in 2010 and $R484.07 \pm R2178.04$ in 2009. Males paid $R494.40 \pm R2075.67$ in 2010 and $R491.37 \pm R2081.76$ in 2009.

When analysing prescription costs per provider type, the age group of the patient can also indicate the type of patient receiving medication from a specific provider and assist in building a profile of medication costs per provider. Tables 4.32 and 4.34 represent the prescription cost elements per provider and age group for 2009 and 2010 respectively.

Table 4.32 highlights the following points when analysing the various providers:

- For dispensing GPs, the average cost ranged from $R81.46 \pm R94.58$ to $R191.65 \pm R262.33$ and the cost increased per age group, with age group 1 having the lowest cost per prescription and age group 5 the highest. Age group 5, however, had to pay 26% of their prescription out-of-pocket. Age group 4 paid 24%, age group 3 paid 20%, age group 2 paid 22% and age group 1 paid 19%.
- For dispensing specialists, the highest average cost per prescription was found in age group 4 ($R693.57 \pm R2423.99$). As discussed in Table 4.18, although the average levy is high for dispensing specialists, it is low in relation to the total average prescriptions cost (8% of total prescription cost for the total study period).
- Courier pharmacies had, on average, the highest prescription cost per provider. Age group 4 represented the highest average prescription cost at $R755.5 \pm R2896.75$, followed by age group 2 at $R740.47 \pm R2347.57$.

- For retail pharmacies it was found that the lowest average cost per prescription was claimed by patients in age group 2 at R182.56± R405.58 (in contrast to courier pharmacies at R740.47± R2347.57).

Table 4.32: Prescription cost elements per provider and age group – 2009

2009											
		Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
		$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)
DD GP	$\bar{x}$ Tcost/Rx	81.46	94.58	81.59	107.94	104.81	293.75	149.01	231.54	191.65	262.33
	$\bar{x}$ Levy/Rx	15.86	42.1	18.57	48.71	21.72	36.42	36.9	82.39	50.97	99.67
	$\bar{x}$ Scheme/Rx	65.6	79.89	63.02	90.23	83.09	281.18	112.11	169.27	140.68	213.96
DDS	$\bar{x}$ Tcost/Rx	175.14	311.84	271.79	1585.74	513.01	2455.77	693.57	2423.99	514.4	1889.77
	$\bar{x}$ Levy/Rx	51.2	169.69	28.22	173.48	37.13	261.55	55.47	503.78	45.17	230.3
	$\bar{x}$ Scheme/Rx	123.94	255.99	243.57	1570.37	475.88	2430.53	638.09	2330.03	469.23	1807.84
OP	$\bar{x}$ Tcost/Rx	455.61	1110.7	200.42	293.37	255.48	568.04	221.82	725.76	135.83	251.89
	$\bar{x}$ Levy/Rx	152.01	307.39	93.5	236.79	80.23	201.39	51.21	161.64	52.86	183.15
	$\bar{x}$ Scheme/Rx	303.61	1053.54	106.92	206.84	175.24	562.4	170.61	710.17	82.96	159.13
CP	$\bar{x}$ Tcost/Rx	622.15	1984.72	740.47	2347.57	683.14	2566.96	755.5	2896.75	583.99	2148.89
	$\bar{x}$ Levy/Rx	50.81	506.02	36.16	477.98	42.03	325.77	62.48	545.29	65.91	357.3
	$\bar{x}$ Scheme/Rx	571.34	1906.44	704.32	2276.1	641.11	2533.33	693.02	2992.33	518.08	2110
RP	$\bar{x}$ Tcost/Rx	190.28	267.93	182.56	405.58	246.75	531.27	321.29	583.19	324.23	399.34
	$\bar{x}$ Levy/Rx	44.65	106.32	41.93	148.93	52.41	184.44	70.99	211.79	84.75	163.18
	$\bar{x}$ Scheme/Rx	145.64	237.58	140.63	358.77	194.34	480.68	250.29	521.75	239.48	338.62
TOTAL/AVE	$\bar{x}$ Tcost/Rx	179.25	375.93	198.31	673.15	273.77	960.96	369.1	1204.65	341.73	752.21
	$\bar{x}$ Levy/Rx	39.85	120.79	38.36	173.81	47.69	194.33	68.15	275.21	81.43	186.87
	$\bar{x}$ Scheme/Rx	139.41	348.49	159.95	637.15	226.08	930.13	300.95	1159.66	260.3	717.17

From Table 4.32, it can further be deduced that age group 4 (60-70 years) had the highest average cost per prescription in 2009 at R369.10 ± R1204.65. Across all the age groups, the provider with the highest average cost per prescription was courier pharmacies. As expected, patients in age group 4 also had the highest average cost at courier pharmacies among all the providers at R755.5 ± R2896.75. It is interesting to note that age group 2 (20-39 years) was also receiving high-value prescriptions from courier pharmacies with an average cost per prescription of R740.47 ± R2347.57. This raises the question of usage and cost of chronic medication in age group 2. The medication used by this group is further analysed in Table 4.33, which shows that only 11% of all items and 28% of all costs in this group were spent at courier pharmacies. This may indicate that patients in age group 2 are receiving higher value items at courier pharmacies than the other age groups.

Table 4.33: Medication benefit types dispensed for age group 2 in 2009

Medication type	N _{Items}	As % of total	Cost _{Items} (R)	As % of total
Acute	2628933	69%	180997478.1	52%
Chronic	399894	11%	96077511.64	28%
HIV/AIDS	94736	2%	22646035.63	7%
Oncology	9720	0%	15140977.6	4%
OTC	580714	15%	18663499.67	5%
Other	77797	2%	13989222.9	4%
Total	3791794	100%	347514725.5	100%

Table 4.34 illustrates the trends for cost per prescription within age group and provider for 2010.

The average prescription costs per provider in 2010 showed a similar pattern to that of 2009, with:

- For dispensing doctors, the average cost ranged from R81.28 ± R152.22 (age group 2) to R194.62 ± R270.56 (age group 5). Age group 1 had a higher average cost than age group 2 at R84.03 ± R109.28 in 2010. The average cost per prescription also increased from R179.25 ± R375.93 in 2009 to R183.88 ± R398.23 in 2010. Where age group 3 only contributed 20% out-of-pocket to GP-dispensed prescriptions in 2009, they paid 36% of the total average prescription cost in levies in 2010. All the other age groups had similar levy co-payments as a portion of total average prescription cost when comparing 2009 to 2010.
- For dispensing specialists, age group 4 again had the highest average cost per prescription at R834.35 ± R2961.87.

- In 2010, courier pharmacies again had, on average, the highest prescription cost of all the providers. Age group 4, which had the highest average prescription cost at R755.5 ± R2896.75 in 2009, again received the most costly courier pharmacy prescriptions on average in 2010 at R841.85 ± R3206.88.
- For retail pharmacies, the lowest average cost per prescription was claimed by patients in age group 1 at R183.88 ± R398.23 and the highest in age group 5 at R329.77± R433.38.

Table 4.34: Prescription cost elements per provider and age group – 2010

2010											
		Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
		$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)	$\bar{x}$ cost (R)	SD (R)
DD GP	$\bar{x}$ Tcost/Rx	84.03	109.28	81.28	152.22	105.15.31		153.66	342.36	194.62	270.56
	$\bar{x}$ Levy/Rx	16.61	46.35	19.69	56.21	23.09	86.4	38.72	95.95	52.18	105.21
	$\bar{x}$ Scheme/Rx	67.42	94.96	61.59	136.77	82.062	147.89	114.93	309.84	142.44	216.32
DDS	$\bar{x}$ Tcost/Rx	218.84	390.37	264.94	2317.56	592.92	2865.6	834.35	2961.87	529.9	1820.04
	$\bar{x}$ Levy/Rx	43.78	148.95	45.79	887.38	39.27	339.72	52.78	302.85	58.9	265.14
	$\bar{x}$ Scheme/Rx	175.06	361.35	219.15	1748.5	553.65	2836.95	781.57	2942.28	471	1729.99
OP	$\bar{x}$ Tcost/Rx	401.67	724.32	199.84	477.81	228.21	643.66	294.73	294.72	226.3	712.43
	$\bar{x}$ Levy/Rx	92.21	196.57	95.08	254.17	86.66	226.29	74.85	269.25	27.53	53.56
	$\bar{x}$ Scheme/Rx	309.47	713.51	104.76	425.24	141.55	608.06	219.88	914.98	198.76	711.75
CP	$\bar{x}$ Tcost/Rx	707.34	2094.34	839.16	2908.25	762.89	2944.48	841.85	3206.88	670.701	2384.21
	$\bar{x}$ Levy/Rx	45.83	306.69	31.18	468.75	41.81	469.92	61.92	481.37	76.91	734.31
	$\bar{x}$ Scheme/Rx	661.513	2071.08	807.97	2825.23	721.07	2881.95	779.93	3158.11	593.79	2243.5
RP	$\bar{x}$ Tcost/Rx	191.67	296.54	181.71	421.55	250.22	468.36	323.65	531.97	329.77	433.38
	$\bar{x}$ Levy/Rx	47.85	111.77	44.15	154.97	55.39	135.29	74.391	161.33	86.1	154.67
	$\bar{x}$ Scheme/Rx	143.82	265.8	137.561	368.96	194.83	424.19	249.26	485.99	243.68	379.61
TOTAL/AVE	$\bar{x}$ Tcost/Rx	183.88	398.23	204.08	805.14	285.1	1038.42	377.61	1223.69	351.42	800.67
	$\bar{x}$ Levy/Rx	42.84	111.78	40.35	198.48	50.44	192.77	71.09	221.43	83.7	253.68
	$\bar{x}$ Scheme/Rx	141.04	376.96	163.73	759.2	234.661	1005.05	306.52	1192.6	267.72	740.53

The total prescription costs, medical scheme costs and levy contributions over the study period are depicted in Table 4.35.

Table 4.35: Prescription and levy costs 2009 and 2010

Age group	T _{costRx} 2009 – 2010 (R)	T _{costScheme} 2009 – 2010 (R)	T _{costLevy} 2009 – 2010 (R)	T _{costLevy} as % of T _{cost}
1	408525275.40	315625404.24	92899871.16	23%
2	684522907.40	550667991.79	133854915.61	20%
3	1755195455.00	1447098859.60	308096595.40	18%
4	1718501181.00	1398089763.18	320411417.82	19%
5	402691762.00	306757608.31	95934153.69	24%

Table 4.35 illustrates that age group 5 paid the highest levies in relation to prescription cost at 24%. Patients aged 40-59 years pay the least levies at 18% of total prescription cost.

Figures 4.9 to 4.17 illustrate the average patient levy and medical scheme contribution within the total prescription cost according to the different providers for each age group individually for 2009 and 2010. *The Standard Deviations (SD) for these averages are noted in Tables 4.32 and 4.34.*

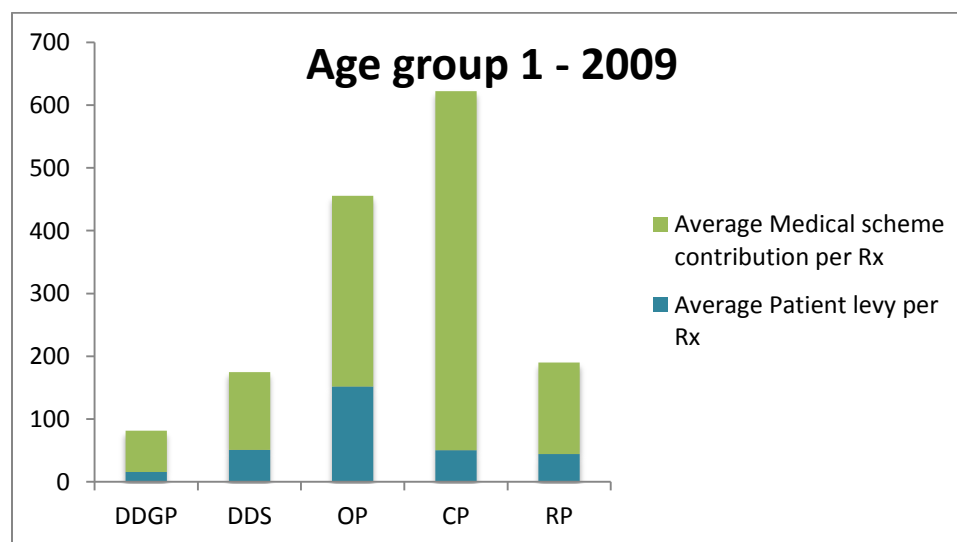


Figure 4.9: Age group 1 – Average patient levy and medical scheme contribution for 2009

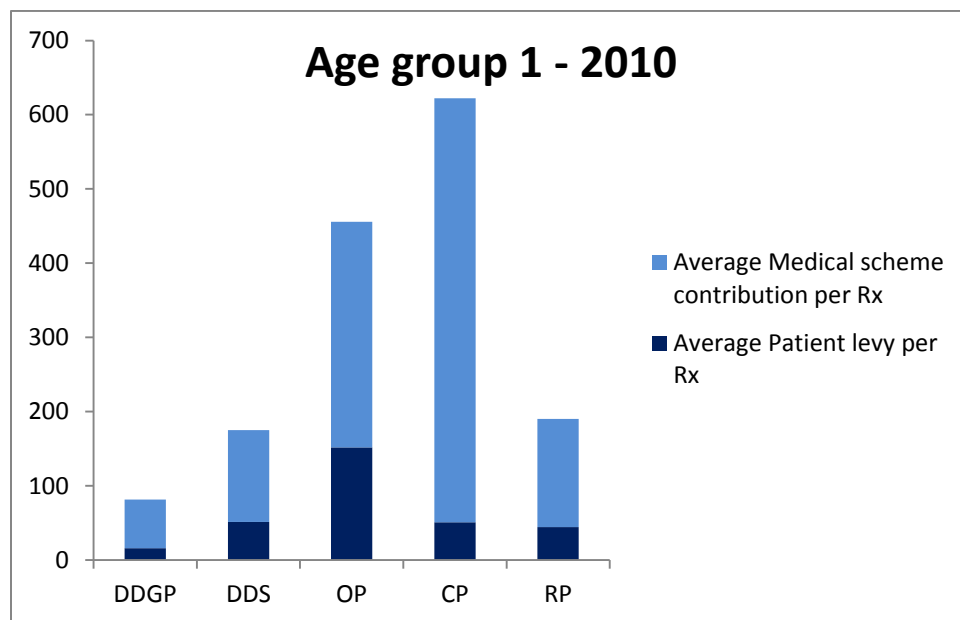


Figure 4.10: Age group 1 – Average patient levy and medical scheme contribution for 2010

When comparing the average prescription cost elements in 2009 to 2010 for age group 1 (0-19 years), it is seen that similar contributions (levy to medical scheme contribution ratio) are made for all providers in 2009 and 2010. In 2009 and 2010, 2% of all patients between ages 1 and 19 years claimed prescriptions from courier pharmacies. These were high value prescriptions (average of R622.15± R1984.72 per prescription in 2009 and R707.34 ± R2094.34 in 2010). This may be because these prescriptions could be for specialized medicines. In 2009, 79% of all prescriptions for this age group were claimed at retail pharmacies. This percentage increased to 81% in 2010, while 2% less prescriptions were claimed at dispensing doctors in 2010 for this age group.

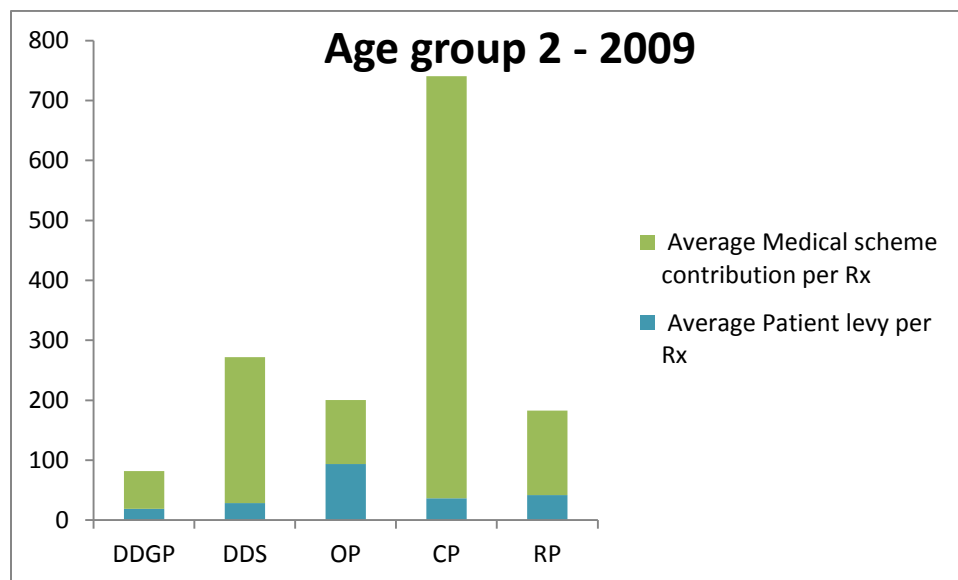


Figure 4.11: Age group 2 – Average patient levy and medical scheme contribution for 2009

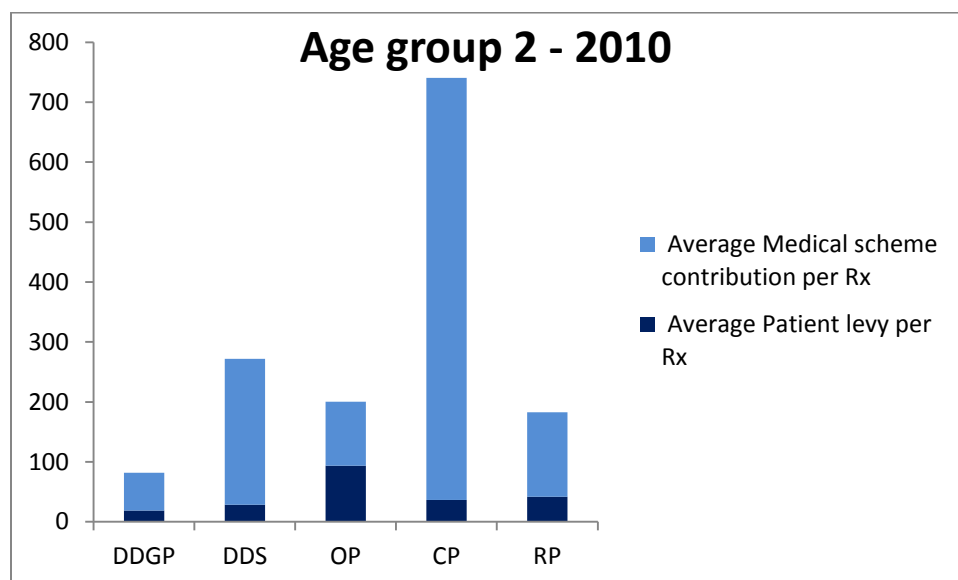


Figure 4.12: Age group 2 – Average patient levy and medical scheme contribution for 2010

From Figures 4.11 and 4.12 it can be seen that the highest total cost per provider belongs to courier pharmacies once again. In relation to the total cost, courier pharmacies had the lowest patient levy (6% of total prescription cost) while retail pharmacies have the highest patient levy (22% of total prescription cost). The frequency of prescriptions dispensed by courier pharmacies was, however, only 9% in 2009 and 5% in 2010 for this age group. Retail pharmacies dispensed the most prescriptions (80% in 2009 and 81% in 2010) at an average total cost of R182.56 ±

R41.93 (2009) and R181.71 ± R421.55 (2010) per prescription. Also refer to Tables 4.32 and 4.34 for average prescription cost, levies and medical scheme contributions per age group.

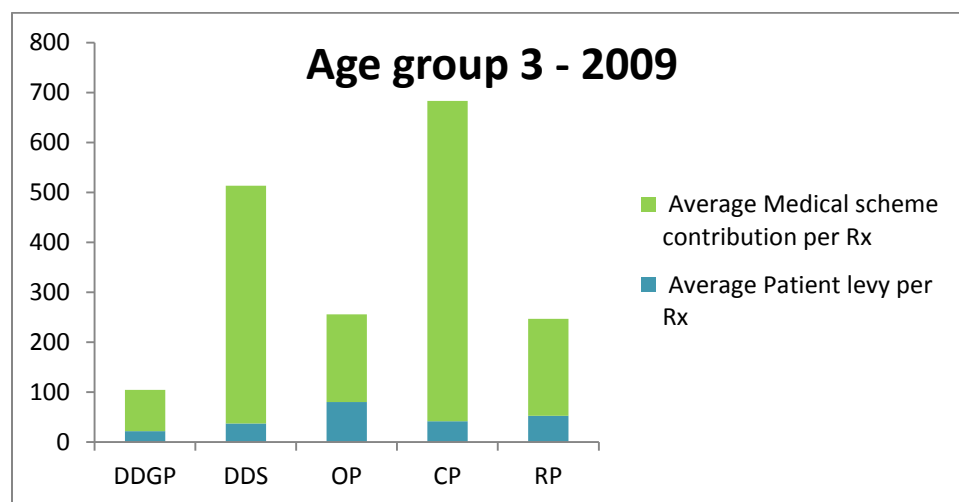


Figure 4.13: Age group 3 – Average patient levy and medical scheme contribution for 2009

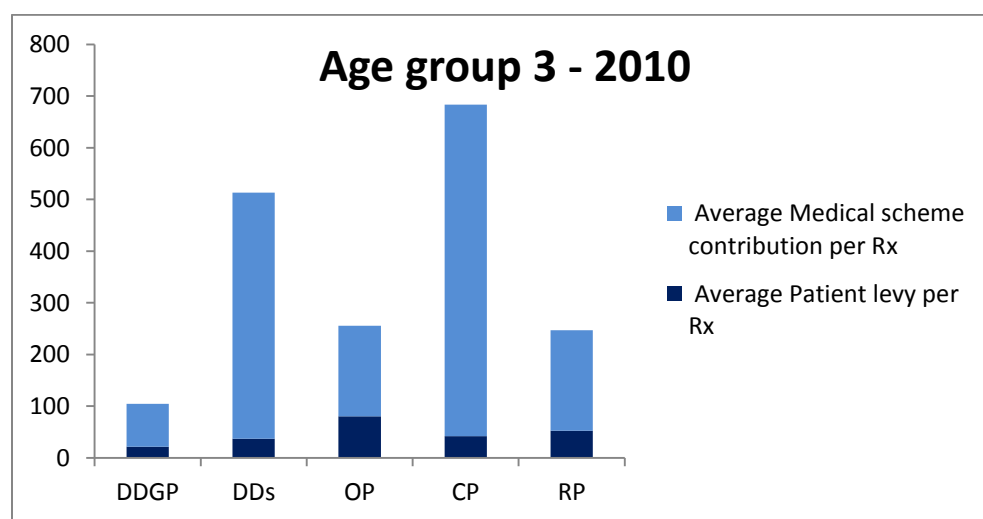


Figure 4.14: Age group 3 – Average patient levy and medical scheme contribution for 2010

Most patients in age group 3 (40-59 years) received their prescriptions from retail pharmacies (78% in 2009, 79% in 2010 with an average of 78% over the study period). The average cost per prescription at a retail pharmacy for this age group was R246.75 ± R531.27 in 2009 and R250.22 ± R468.36 in 2010. Patient levies accounted for 21% (2009) and 22% (2010) of total prescription cost. In this age group, only 10% of patients claimed medication from courier pharmacies, while 12% made use of dispensing GPs to fill their prescriptions.

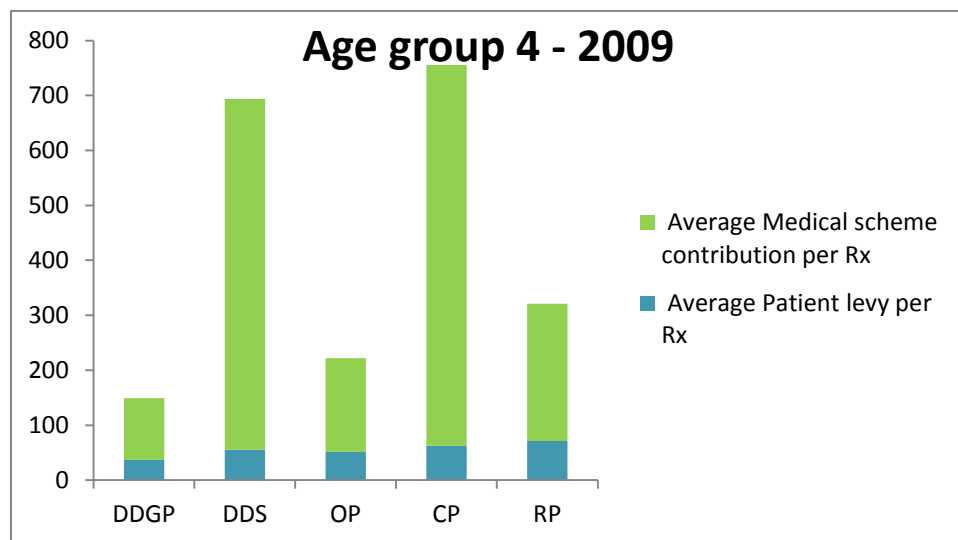


Figure 4.15: Age group 4 – Average patient levy and medical scheme contribution for 2009

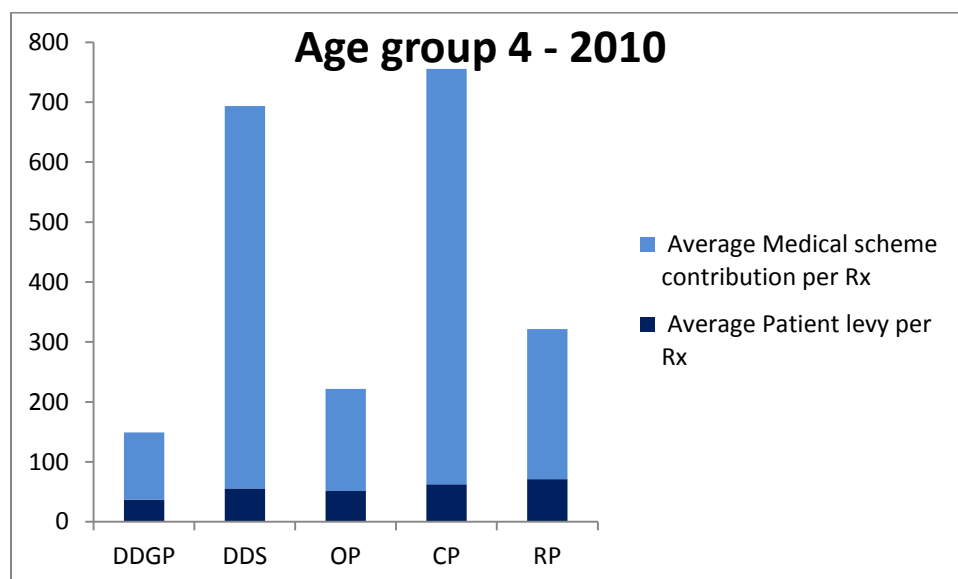


Figure 4.16: Age group 4 – Average patient levy and medical scheme contribution for 2010

In age group 4 (60-79 years), the average cost per prescription for dispensing specialists are considerably higher than the other age groups, at $R693.57 \pm R2423.99$ in 2009 and $R834.35 \pm R2961.87$ in 2010. This group also made use of dispensing specialists the most: 0.64% of all prescriptions for age group 4 in 2009 and 0.71% of all prescriptions for age group 4 in 2010 were dispensed by specialists.

The use of courier pharmacies is also the highest in this age group (12% for the study period), while most prescriptions were still claimed by retail pharmacies (82% over the study period).

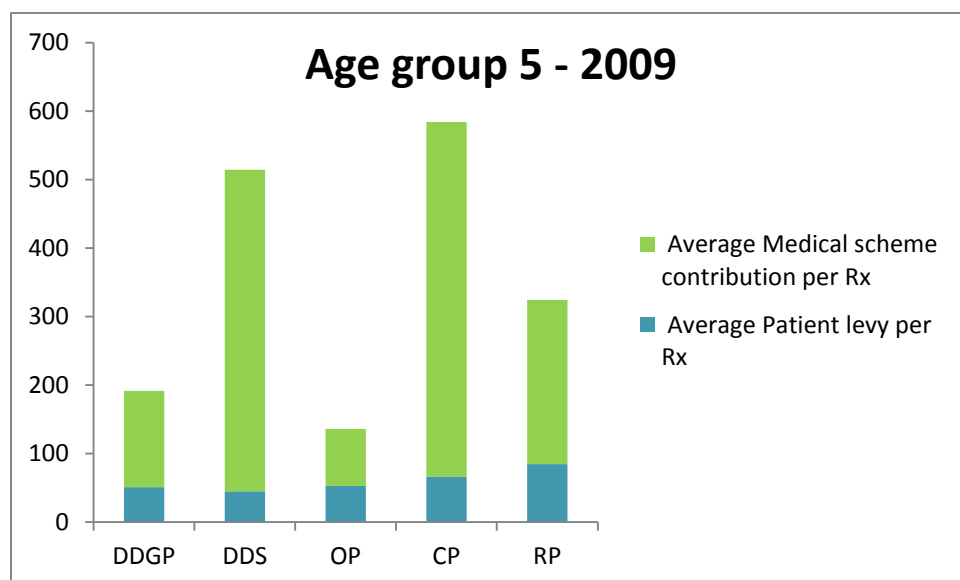


Figure 4.17: Age group 5 – Average patient levy and medical scheme contribution for 2009

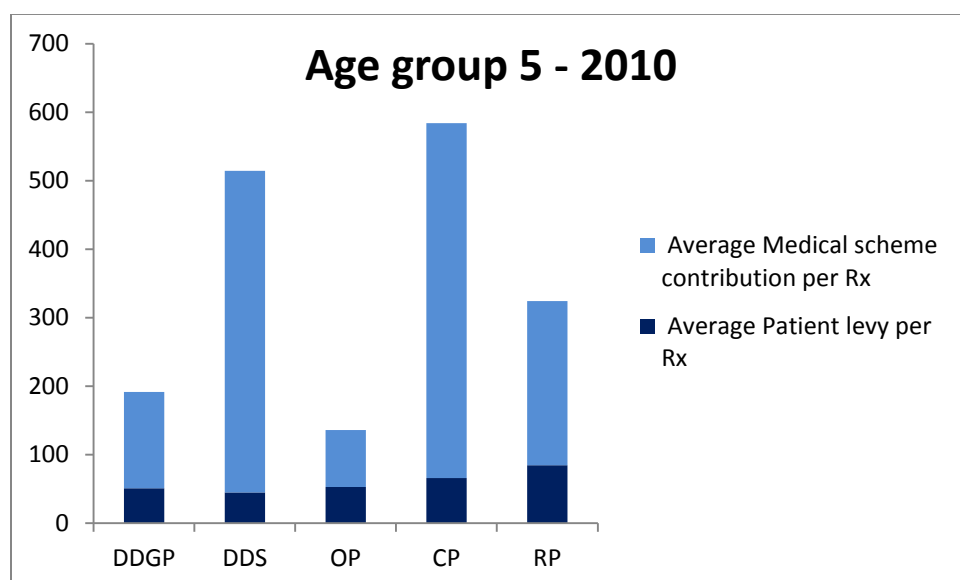


Figure 4.18: Age group 5 – Average patient levy and medical scheme contribution for 2010

For age group 5, 86% of all patients received their medication from a retail pharmacy and 9% from a courier pharmacy. The provider with the highest average prescription cost in this age group was courier pharmacies at R755.50 ± R2896.75 in 2009 and R 670.701 ± R2384.21 in 2010 (refer to Tables 4.24 and 4.26). The average out-of-pocket levy paid by patients in this age group was 24% of total prescription cost; with retail pharmacies on average costing patients 26% out-of-pocket and courier pharmacies only 11% (also refer to Table 4.27).

4.4.3. Medication costs per provider type per item

The cost per prescription has been described, and the next level of analysis is to investigate the number of items and average cost per item within the prescription. The total number of chronic medication items were $n = 7\,017\,029$ in 2009 and $n = 7\,028\,517$ items in 2010. The cost of these items were R1 053 216 784.00 in 2009 and R1 073 299 370.40 in 2010, totaling R2 126 516 154 over the study period.

Table 4.36: Average cost per item per provider type for 2009

2009					
	DD GP	DDS	OP	CP	RP
N_{Items}	2726840	88042	11470	2174473	16648166
T_{cost Items (R)}	99935135.65	22936656.93	2508818.14	547518075.70	1836312083.47
$\bar{x}_{\text{Cost/Item (R)}}$	36.65	260.52	218.73	251.79	110.3
SD (R)	100.74	1281.75	653.21	1401.36	268.87

Table 4.37: Average cost per item per provider type for 2010

2010					
	DD GP	DDS	OP	CP	RP
N_{Items}	2332561	89731	10781	2028231	16066473
T_{cost Items (R)}	89207684.56	27797862.74	2286955.15	555394807.10	1785538501.00
$\bar{x}_{\text{Cost/Item (R)}}$	38.24	309.79	212.13	273.83	111.13
SD (R)	96.61	1635.56	542.01	1576.34	238.21

Tables 4.36 and 4.37 display the average medication item costs per provider for the two-year study period. It is noted that dispensing specialists had the highest average item cost for the study period, followed by courier pharmacies. Dispensing GPs had the lowest average cost per item at $R36.65 \pm R100.71$ in 2009 and $R38.24 \pm R96.61$ 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. (In this study, the lowest average item cost per year was for acute medication, at $R83.32 \pm R178.89$ in 2009 and $R83.34 \pm R178.89$ in 2010). The average cost per item increased to 3% from 2009 to 2010. This is low, as a national Single Exit Price increase of 7.4% was accepted in April 2010 (Department of Health, 2010a).

4.5. Comparison between general medication and chronic medication

In this section, some general trends between chronic and other medication are discussed. This forms the basis for the exclusive chronic medication analysis to follow in section 4.6.

Table 4.38 gives the percentage of chronic medication claimed for the different age groups and provinces.

Table 4.38: Comparison between chronic prescriptions and total prescription population for the full study period based on prescription volumes

		All Rx'es	As % of total Rx population	Chronic Rx'es	As % of total chronic Rx population	Chronic Rx'es as a percentage of total RXes
Total Rx'es		17706524		6191147		34.97%
	Females	10493104	59%	3648401	59%	34.77%
	Males	7213420	41%	2542746	41%	35.25%
Age Group	1	2251592	13%	155347	3%	6.90%
	2	3403702	19%	449823	7%	13.22%
	3	6286069	36%	2232933	36%	35.52%
	4	4603527	26%	2674934	43%	58.11%
	5	1161634	7%	678110	11%	58.38%
Province	Eastern Cape	1281770	7%	475716	8%	37.11%
	Free State	852487	5%	321825	5%	37.75%
	Gauteng	7239035	41%	2571570	42%	35.52%
	Kwazulu-Natal	2575907	15%	914050	15%	35.48%
	Limpopo	639338	4%	157215	3%	24.59%
	Mpumalanga	902132	5%	248437	4%	27.54%
	North West	973425	5%	307607	5%	31.60%
	Northern Cape	273955	2%	100213	2%	36.58%
	Western Cape	2893332	16%	1079414	17%	37.31%
	Not indicated	75143	0%	15100	0%	20.10%

Table 4.38 and Figure 4.19 indicate the similarities and differences between general medication (including acute, oncology, OTC, HIV/AIDS) versus chronic medication claimed over the two year study period.

The male/female ratio and distribution of medication per province are proportionately similar for chronic and general medication claimed. The biggest variances were found in age groups, where the lower age groups (1 and 2) had less chronic medication usage and the older age groups (4 and 5) claimed more chronic medication.

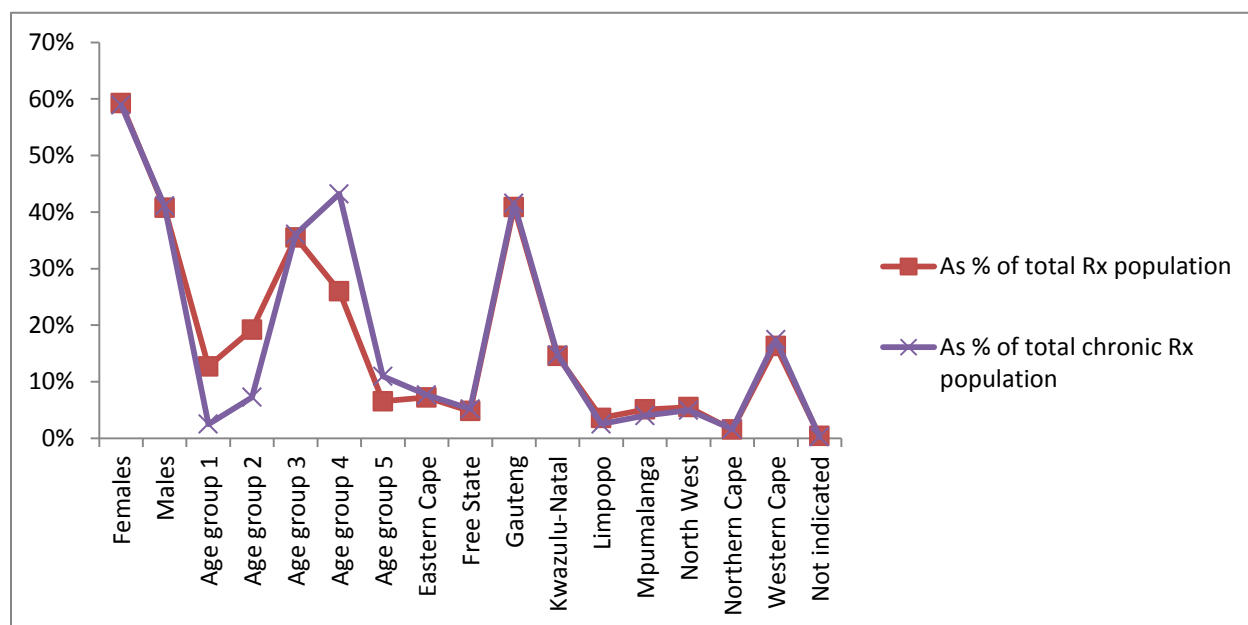


Figure 4.19: Comparison of general medication trends to chronic medication trends

According to table 4.39 and figure 4.20, which illustrate the differences in cost when comparing the general medicine data pool to chronic medication only, costs for general medication seem similar to that of chronic medication. It has to be remembered that chronic medication represent 42% of the cost of the general medication data. This will cause the general, all-inclusive medicine data to have similar trends to that of the isolated chronic medication data. Where chronic medication alone varied in cost, it was due to age group (where younger age groups spend less on chronic medication than higher age groups).

Table 4.39: Comparison between chronic prescriptions and total prescription population for the full study period based on prescription costs

		All Rx'es Cost (R)	As % of total Rx population	Chronic Rx'es Cost (R)	As % of total Chronic Rx population	Chronic Rx'es as a percentage of total RXes
Total Rx'es		4969436581.00		2126516155.00		42.79%
	Females	2889944048.00	58%	1189475110.00	56%	41.16%
	Males	2079492532.00	42%	937041044.90	44%	45.06%
Age Group	1	408525275.40	8%	68839998.40	3%	16.85%
	2	684522907.40	14%	197443125.30	9%	28.84%
	3	1755195455.00	35%	751258999.40	35%	42.80%
	4	1718501181.00	35%	898809185.70	42%	52.30%
	5	402691762.00	8%	210164846.10	10%	52.19%

Province	Eastern Cape	280186230.00	6%	143180808.20	7%	51.10%
	Free State	243030234.30	5%	107967730.90	5%	44.43%
	Gauteng	2292296940.00	46%	942141810.10	44%	41.10%
	Kwazulu-Natal	747015860.20	15%	333761407.60	16%	44.68%
	Limpopo	133514467.90	3%	48074611.47	2%	36.01%
	Mpumalanga	205959769.00	4%	74559911.27	4%	36.20%
	North West	233966056.70	5%	94119007.05	4%	40.23%
	Northern Cape	61606860.88	1%	26977138.23	1%	43.79%
	Western Cape	753065258.00	15%	350068655.30	16%	46.49%
	Not indicated	18794903.20	0%	5665074.81	0%	30.14%

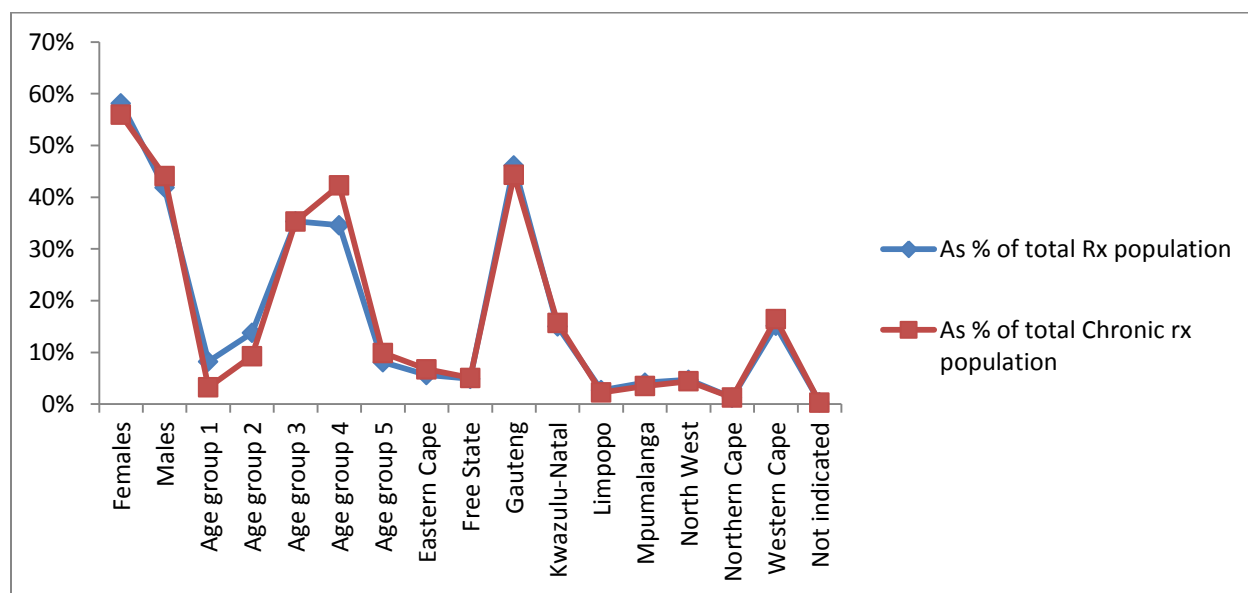


Figure 4.20. Comparison of general medication cost trends to chronic medication cost trends

4.6. Chronic medication analyses – demographics of chronic medication patients

In this section, chronic medication specifically will be analysed.

4.6.1. Number of chronic medication prescriptions

Table 4.40 indicates the number chronic medication prescriptions dispensed over the study period. This table includes characteristics of the patients receiving this chronic medication.

Table 4.40: Chronic population characteristics – chronic prescriptions

		Rx 2009	Rx 2010	Change 2009 to 2010	As % of total population 2009	As % of total population 2010	Change 2009 to 2010
Total Rx'es		3126266	3064881	-2%			
	Females	1849235	1799166	-3%	59%	59%	0%
	Males	1277031	1265715	-1%	41%	41%	0%
Age Group	1	80010	75337	-6%	3%	2%	0%
	2	227834	221989	-3%	7%	7%	0%
	3	1140735	1092198	-4%	36%	36%	-1%
	4	1345898	1329036	-1%	43%	43%	0%
	5	331789	346321	4%	11%	11%	1%
Province	Eastern Cape	240163	235553	-2%	8%	8%	0%
	Free State	160035	161790	1%	5%	5%	0%
	Gauteng	1312968	1258602	-4%	42%	41%	-1%
	Kwazulu-Natal	458473	455577	-1%	15%	15%	0%
	Limpopo	79466	77749	-2%	3%	3%	0%
	Mpumalanga	122107	126330	3%	4%	4%	0%
	North West	154089	153518	0%	5%	5%	0%
	Northern Cape	49082	51131	4%	2%	2%	0%
	Western Cape	542318	537096	-1%	17%	18%	0%
	Not indicated	7565	7535	0%	0%	0%	0%

According to Table 4.40, the total number of prescriptions decreased from 2009 to 2010. Females received 59% of all chronic medication dispensed and males the remaining 41%. This is similar to the patient profile in Table 4.13, where total prescriptions (including acute) were described. Where the total number of prescriptions dispensed decreased by 6% from 2009 to 2010 (Table 4.5), the number of chronic medication prescriptions dispensed decreased by only 2%. This means that more patients retained their chronic medication prescriptions over the two years than acute prescriptions. This could be due to the fact that chronic medication is taken over a period of several years or even lifelong, while acute medication varies more from year to year depending on acute conditions, for example infections.

Table 4.40 further indicates that most prescriptions were claimed in Gauteng (42% in 2009 and 41% in 2010) with the least number of chronic prescriptions claimed in the Northern Cape (2%).

Figures 4.21 and 4.22 illustrate the change in the number of chronic prescriptions over the data period per province, and the number of chronic prescriptions per province, respectively.

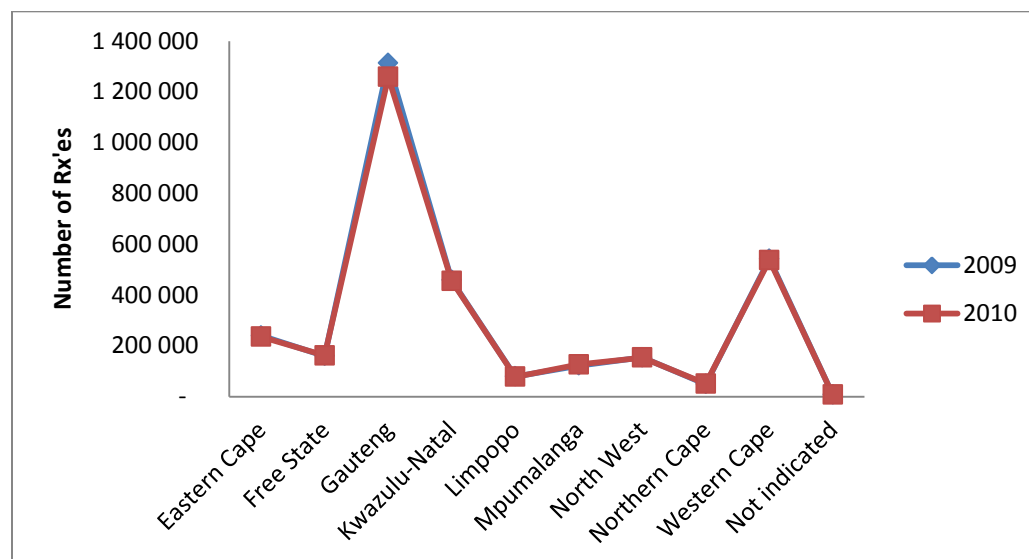


Figure 4.21: Change in number of chronic medication prescriptions over the study period.

Figure 4.21 highlights that there was little change in the number of prescriptions claimed over the study period and that Gauteng remained the province receiving the most chronic prescriptions in 2009 and 2010. The Northern Cape received the least number of chronic prescriptions for both study years.

Figure 4.22 displays graphically that Gauteng received 41% of all chronic medication prescriptions, followed by the Western Cape (17%) and KZN (15%). The province utilising the least chronic medication was the Northern Cape at 2%.

When looking at the age profile of chronic prescription claimants in Table 4.37, it is clear that the most patients using chronic medication are between the ages of 60-79 years (43%). This differs from the general population data (chronic and acute prescriptions) where the most claimants were between 40 and 59 years of age. This once again indicates that chronic medication is dispensed mostly to older patients and that any health system servicing patients must be aware of the increased chronic medication needs of patients above 60 years of age. Figures 4.22 and 4.23 describe this trend.

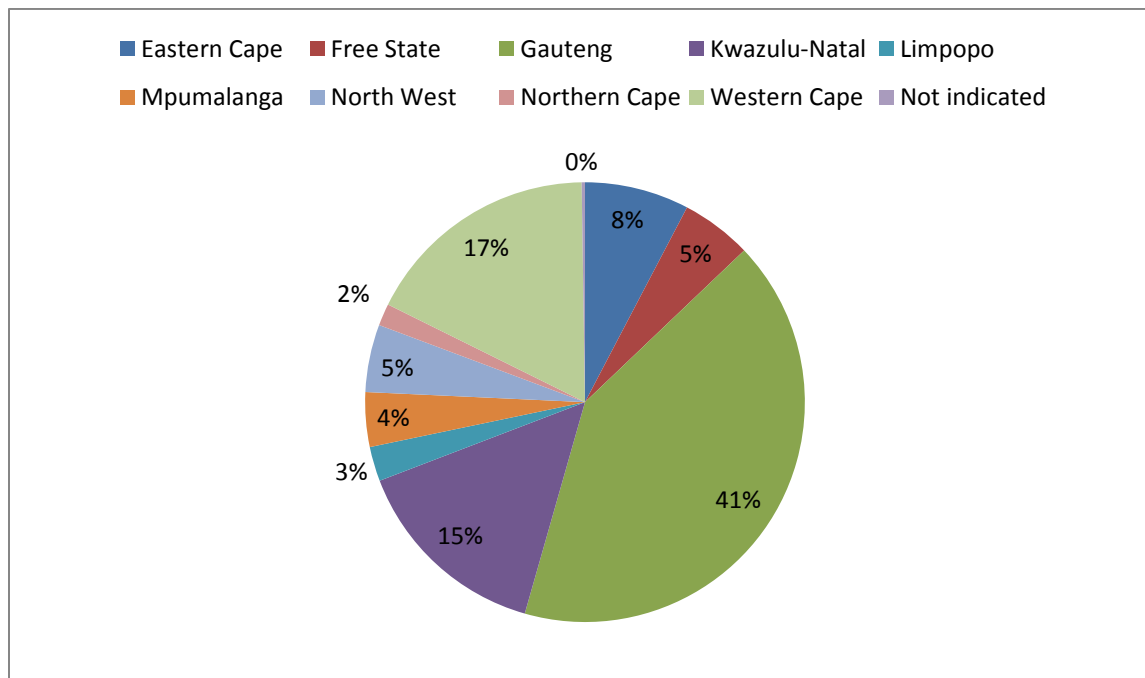


Figure 4.22: Chronic medication prescriptions per province

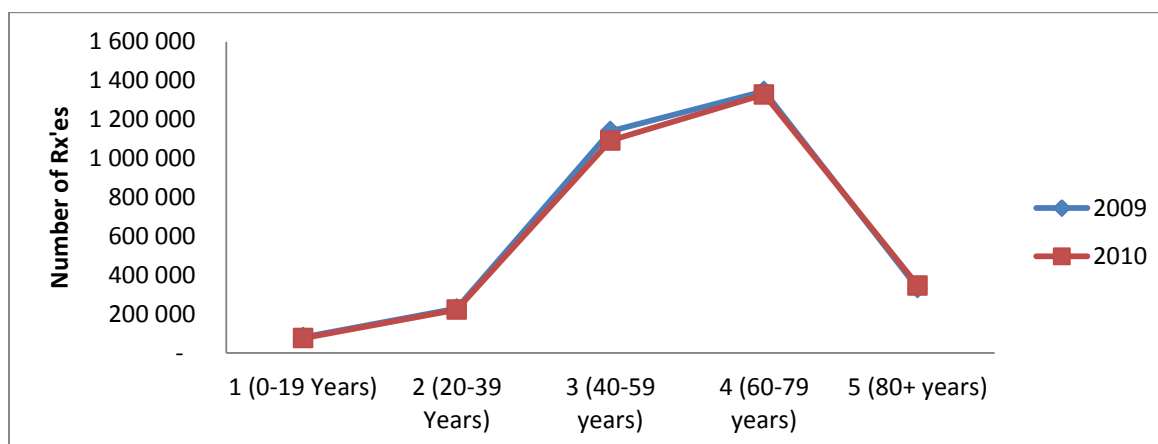


Figure 4.23: Change in chronic medication trends per age group 2009 to 2010.

Figure 4.23 shows very little change in the chronic prescription distribution per age group for the two years of the study period. For both study years, age group 4 claimed the most chronic prescriptions and age group 1 the least.

According to Figure 4.24, 43% of all chronic medication claims were made by patients aged between 60 and 79 years. Of all chronic medication, 36% was claimed by patients between 40-59 years, and only 3% of all chronic prescriptions were claimed by patients between the ages of 0 and 19 years.

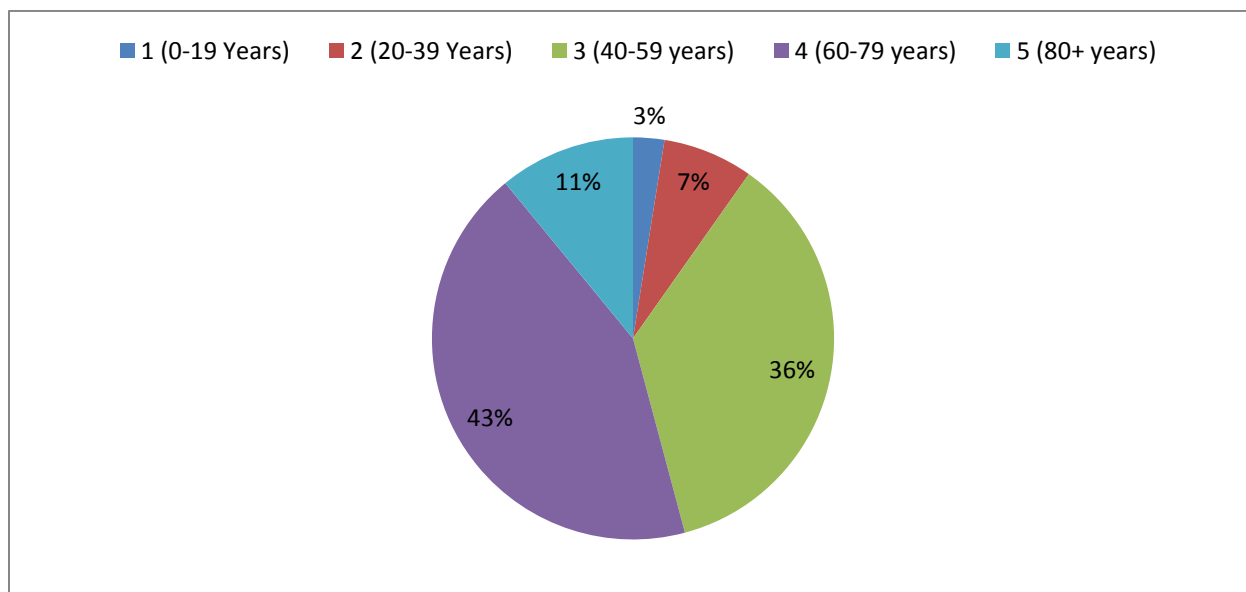


Figure 4.24: Portion of chronic prescriptions per age group

4.6.2. Cost of chronic medication prescriptions

In section 4.6.2, the costs of chronic medication are reviewed within the different age groups, provinces and genders.

Table 4.41: Chronic population characteristics – cost of all chronic prescriptions in dataset

		Cost of chronic Rxes 2009	Cost of all chronic Rxes 2010	Change 2009 to 2010	As % of total population 2009	As % of total population 2010	Change 2009 to 2010
Total Rx'es		1053216784	1073299370	2%			
	Females	592478347	596996763	1%	56%	56%	-1%
	Males	460738437	476302607	3%	44%	44%	1%
Age group	1	34582501	34257497	-1%	3%	3%	0%
	2	96077512	101365614	6%	9%	9%	0%
	3	375650115	375608884	0%	36%	35%	-1%
	4	445154466	453654720	2%	42%	42%	0%
	5	101752190	108412656	7%	10%	10%	0%
Province	Eastern Cape	71872201	71308607	-1%	7%	7%	0%
	Free State	52923965	55043765	4%	5%	5%	0%
	Gauteng	469971988	472169822	0%	45%	44%	-1%
	Kwazulu-Natal	163335717	170425691	4%	16%	16%	0%
	Limpopo	23764855	24309757	2%	2%	2%	0%

	Mpumalanga	35605258	38954653	9%	3%	4%	0%
	North West	46256414	47862593	3%	4%	4%	0%
	Northern Cape	13078640	13898498	6%	1%	1%	0%
	Western Cape	173464527	176604128	2%	16%	16%	0%
	Not indicated	2943219	2721855	-8%	0%	0%	0%

Table 4.41 indicates that the cost of chronic medication dispensed increased by 2% from 2009 to 2010, the same trend as for the total medication dataset (Table 4.6). Where chronic medication is considered, females spent 56% of the cost and males only 44%. This is in line with the general medication profile in Table 4.13.

Table 4.41 also confirms that older population groups spend more on chronic medication (age group 4 at 42% of total chronic medication cost) while younger patient groups such as age group 1 and 2 only represent 3% and 6% of total costs respectively.

The cost distribution for chronic medication per province looks similar to the cost distribution of general medication as depicted in Table 4.13, where Gauteng is responsible for 45% to 56% of the total chronic medication costs and KZN is second at 15% to 16%. All the other provinces also show a similar cost distribution for general medication and chronic medication.

When investigating the demographic characteristics of the population receiving chronic medication, calculating the cost-prevalence index (CPI) indicates which parts of the chronic study population has relatively high or low prescription cost needs. This is done by combining the prevalence percentage and cost percentage. Table 4.42 expresses the CPI of the chronic medication population for gender, age groups and province of residence.

Table 4.42: CPI of chronic medication per demographic subsection – 2009 and 2010 combined

	Total Rx's 2009	Total Rx's 2010	Total Rx's 2009-2010	As % of population subsection	Total Rx Cost 2009-2010 (R)	As % of population subsection	CPI
n_{Rx'es}	3126266	3 064881	6191147	100%	2126516155	100%	
n_{Males}	1849235	1 799166	3648401	59%	1189475110	56%	0.33
n_{Females}	1277031	1 265715	2542746	41%	937041045	44%	0.18
n_{Age1}	80010	75337	155347	3%	68839998	3%	0
n_{Age2}	227834	221989	449823	7%	197443125	9%	0.01
n_{Age3}	1 140735	1 092198	2232933	36%	751258999	35%	0.13
n_{Age4}	1 345898	1 329036	2674934	43%	898809186	42%	0.18

nAge5	331789	346321	678110	11%	210164846	10%	0.01
nEastern Cape	240163	235553	475716	8%	143180808	7%	0.01
nFree Cate	160035	161790	321825	5%	107967731	5%	0
nGauteng	1312968	1 258602	2571570	42%	942141810	44%	0.18
nKwazulu-Natal	458473	455577	914050	15%	333761408	16%	0.02
nLimpopo	79466	77749	157215	3%	48074611	2%	0
nMpumalanga	122107	126330	248437	4%	74559911	4%	0
nNorth West	154089	153518	307607	5%	94119007	4%	0
nNorthern Cape	49082	51131	100213	2%	26977138	1%	0
nWestern Cape	542318	537096	1079414	17%	350068655	16%	0.03
nNot indicated	7565	7535	15100	0%	5665075	0%	0

In Table 4.42, reference is made to “population subsection” . This indicates the subsection of the total population, e.g. all provinces form part of 100% of the total population. “Provinces” are therefore subsections of the total population. Males and females also total up to 100% of the population, and “gender” is therefore also considered a subsection of the total population.

In analysing Table 4.42, it is found that females, as part of the gender subsection, has the highest CPI in chronic prescriptions (0.33). Females therefore need to be taken into consideration when planning for chronic medication distribution. Although females have the highest CPI at 0.33, it is still well below a CPI of 1, which is considered an equilibrium between costs and prevalence (Serfontein, 1989:180).

The CPIs of the age group subsections indicate that all chronic prescriptions are relatively inexpensive for all age groups. Age group 4, however, stands out with a CPI of 0.18, followed by age group 3 with a CPI of 0.13. The assumption can therefore be made that chronic medication prescriptions between the ages of 40-79 are more prominent and costly than in other age groups.

The CPIs of the province subsection again indicate that all chronic prescriptions are relatively inexpensive. The highest CPI is found in Gauteng (0.18). Interesting to note is that Gauteng has a CPI six-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 cost prevalence index 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.

4.7. Chronic medication- analyses according to provider type

Now that chronic medication has been discussed in terms of the demographics of its users, the type of provider who dispenses this chronic medication will be investigated.

4.7.1. Number of chronic prescriptions per provider type

Table 4.43 gives the number of chronic medication prescriptions per provider for the study period.

Table 4.43: Number of chronic prescriptions per provider type

Number of chronic Rx'es						
	DDGP	DDS	OP	CP	RP	TOTAL
n₂₀₀₉	73481	119	89	610964	2441613	3126266
n₂₀₁₀	69279	128	82	536723	2458669	3064881
N₂₀₀₉₋₂₀₁₀	142760	247	171	1147687	4900282	6191147
As a % of total	2.31%	0.00%	0.00%	18.54%	79.15%	100.00%

Table 4.44 illustrates that 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.

Table 4.44: Average number of chronic prescriptions per patient by provider type

Provider	2009			2010		
	$\bar{x}$ Rx'es	SD	95% CI	$\bar{x}$ Rx'es	SD	95% CI
DD GP	3.96	4.39	3.89-4.02	4.08	4.54	4.01-4.15
DDS	1.52	1.01	1.31-1.74	1.64	1.50	1.29-2.00
OP	3.71	2.22	2.77-4.64	3.04	3.84	1.52-4.55
CP	9.74	5.91	9.70-9.79	8.94	5.61	8.90-8.99
RP	8.65	6.45	8.63-8.64	8.77	6.42	8.74-8.79
AVE	8.59	6.37		8.57	6.29	

Table 4.44 describes the average number of chronic prescriptions per provider type for the two years of the study period. It can be seen that courier pharmacies have the highest number of chronic prescriptions per patient at 9.74 ± 5.91 (95% CI = 9.70-9.79) prescriptions per patient in 2009 and 8.94 ± 5.61 in 2010 (95% CI = 8.90-8.99). Retail pharmacies dispensed an average of 8.65 ± 6.45 (2009), with 95% CI = 8.63-8.64 and 8.77 ± 6.42 (2010) chronic prescriptions per

patient (95% CI = 8.74-8.79). The d -values indicate that there was no practically significant differences between the average number of chronic prescriptions dispensed between retail and courier pharmacies (d -value for 2009 was 0.18 and for 2010 $d = 0.03$). This is interesting to note, as one would expect the average number of chronic prescriptions per patient to be higher in a courier pharmacy, as this type of pharmacy couriers/mailed medication to the patient on a monthly basis, whereas patients need to walk into retail pharmacies on a monthly basis to collect their chronic medication. This trend will be investigated in more depth in section 4.8, where medication possession ratios for specific conditions will be measured for retail and courier pharmacies respectively. Dispensing specialists dispensed the least amount of chronic medication prescriptions per patient. The small difference in the 95% Confidence Intervals for both courier and retail pharmacies support the given averages.

Table 4.45: Number of chronic medication items per provider type

Provider	2009			2010		
	n_{items}	$\bar{x}_{\text{items/Rx}}$	SD	n_{items}	$\bar{x}_{\text{items/Rx}}$	SD
DD GP	73481	1.97	1.40	69279	2.01	1.48
DDS	119	1.25	0.59	128	1.25	0.59
OP	89	1.10	0.48	82	1.26	0.60
CP	610964	2.62	1.70	536723	2.74	1.77
RP	2441613	2.16	1.53	2458669	2.20	1.57

Table 4.45 highlights that courier pharmacies had the highest average number of items per prescription for both 2009 and 2010. The d -values for the difference in 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 practical significance in the difference between average number of items for retail and courier pharmacies in 2010.

When analysing the chronic medication prescriptions for the different provider types per age group, as given in Table 4.46, it can be seen that retail pharmacies dispensed the most prescriptions in each age group. As the data for 2009 and 2010 do not differ significantly, the number of prescriptions and patients receiving chronic medication from the various providers will be discussed based on the 2009 data (the larger number of prescriptions dispensed). The discussions, referring to figures 4.25 to 4.29, follow.

Table 4.46: Average number of chronic prescriptions per provider type – age group

2009							
	Age group	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	1	1338	20	14	2086	15931	19389
n _{Rx'es}		2412	32	53	14411	69139	86047
$\bar{X}_{Rx/Pt}$		1.80	1.60	3.79	6.91	4.34	4.44
SD		1.79	0.99	1.76	4.43	4.08	4.14
95% CI		1.71-1.90	1.13-2.07	2.77-4.80	6.72-7.10	4.28-4.40	-
n _{Pts}	2	3124	11	3	6749	34063	43950
n _{Rx'es}		6342	24	8	50981	180927	238282
$\bar{X}_{Rx/Pt}$		2.03	2.18	2.67	7.55	5.31	5.42
SD		2.32	2.04	2.89	4.91	4.79	4.83
95% CI		1.95-2.11	0.81-3.55	-4.50-9.84	7.44-7.67	5.26-5.36	-
n _{Pts}	3	9454	25	1	27028	110653	147161
n _{Rx'es}		33398	34	1	245861	888113	1167407
$\bar{X}_{Rx/Pt}$		3.53	1.36	1.00	9.10	8.03	7.93
SD		3.70	0.64	-	5.42	5.71	5.68
95% CI		3.46-3.61	1.10-1.62	-	9.03-9.16	7.99-8.06	-
n _{Pts}	4	25794	35	25	256280	1083630	1365764
n _{Rx'es}		4359	26	5	23125	104726	132241
$\bar{X}_{Rx/Pt}$		5.92	1.35	5.00	11.08	10.35	10.33
SD		5.39	0.56	2.92	6.27	6.72	6.66
95% CI		5.76-6.08	1.12-1.57	1.38-8.62	11.00-11.16	10.31-10.39	-
n _{Pts}	5	1022	4	1	3833	24028	28888
n _{Rx'es}		8407	6	2	44625	281717	334757
$\bar{X}_{Rx/Pt}$		8.23	1.50	2.00	11.64	11.72	11.59
SD		6.30	1.00	0.00	6.78	7.61	7.49
95% CI		7.84-8.61	-0.09-3.09	-	11.43-11.86	11.63-11.82	-
2010							
	Age group	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	1	870	17	6	1699	13193	15785
n _{Rx'es}		1601	35	15	11213	62663	75527
$\bar{X}_{Rx/Pt}$		1.84	2.06	2.50	6.60	4.75	4.78
SD		1.97	1.43	1.52	4.63	4.28	4.32
95% CI		1.71-1.97	1.35-2.90	0.91-4.09	6.38-6.82	4.68-4.82	
n _{Pts}	2	2783	6	3	6449	31292	40533
n _{Rx'es}		5463	20	19	44374	172422	222298
$\bar{X}_{Rx/Pt}$		1.96	3.33	6.33	6.88	5.51	5.48
SD		2.31	3.83	8.39	4.40	4.84	4.77

95% CI		1.88-2.05	-3.65-12.32	-14.50-27.17	6.77-6.99	5.46-5.56	-
n_{Pts}	3	8197	25	6	25185	105691	139104
n_{Rx'es}		29064	31	10	212675	851170	1092950
$\bar{X}_{Rx/Pt}$		3.55	1.24	1.67	8.44	8.05	7.86
SD		3.79	0.72	0.82	5.09	5.66	5.58
95% CI		3.46-3.63	0.96-1.44	0.81-2.52	8.38-8.51	8.02-8.09	-
n_{Pts}	4	4039	29	10	22791	105096	131965
n_{Rx'es}		24615	41	36	226973	1077973	1329638
$\bar{X}_{Rx/Pt}$		6.09	1.41	3.60	9.96	10.26	10.08
SD		5.52	1.02	4.35	6.01	6.66	6.56
95% CI		5.92-6.26	0.86-1.87	0.49-6.71	9.88-10.04	10.22-10.30	-
n_{Pts}	5	1084	1	2	3918	25363	30368
n_{Rx'es}		8550	1	2	41808	296060	346421
$\bar{X}_{Rx/Pt}$		7.89	1.00	1.00	10.67	11.67	11.41
SD		6.10	0.00	0.00	6.69	7.65	7.52
95% CI		7.52-8.25	-	-	10.46-10.88	11.58-11.77	-

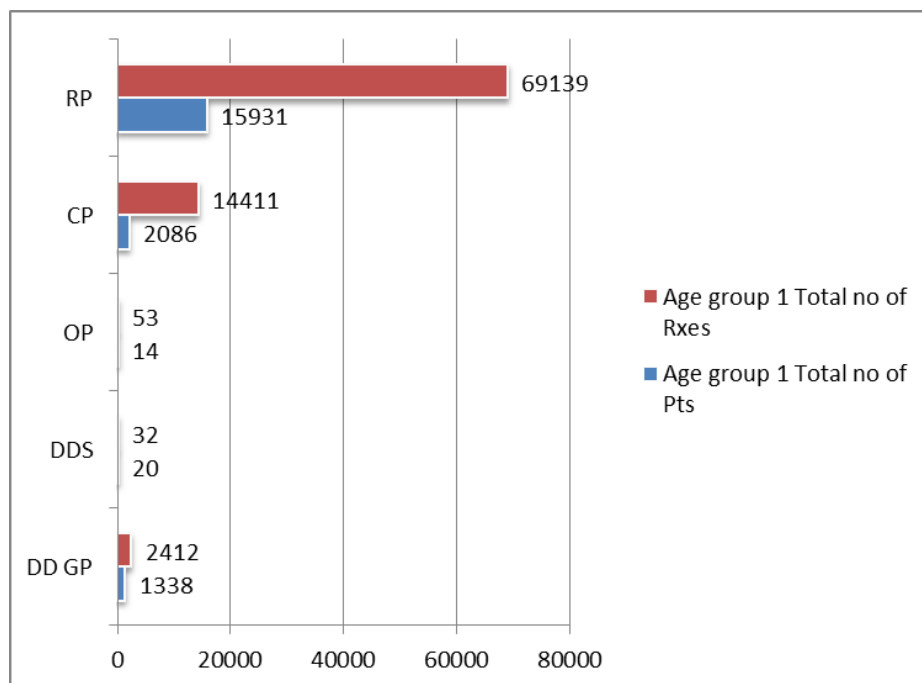


Figure 4.25: Number of chronic medication patients and prescriptions per provider type – Age group 1, 2009

Figure 4.25 indicates that, for age group 1 (0-19 years), most patients received their chronic medication from retail pharmacies, followed by courier pharmacies. The ratio of prescriptions retail to courier pharmacy is 4.80 to 1. Table 4.46 indicates that the average number of chronic

medication prescriptions per patient was 6.91 ± 4.43 for courier pharmacies and 4.34 ± 4.08 for retail pharmacies in 2009.

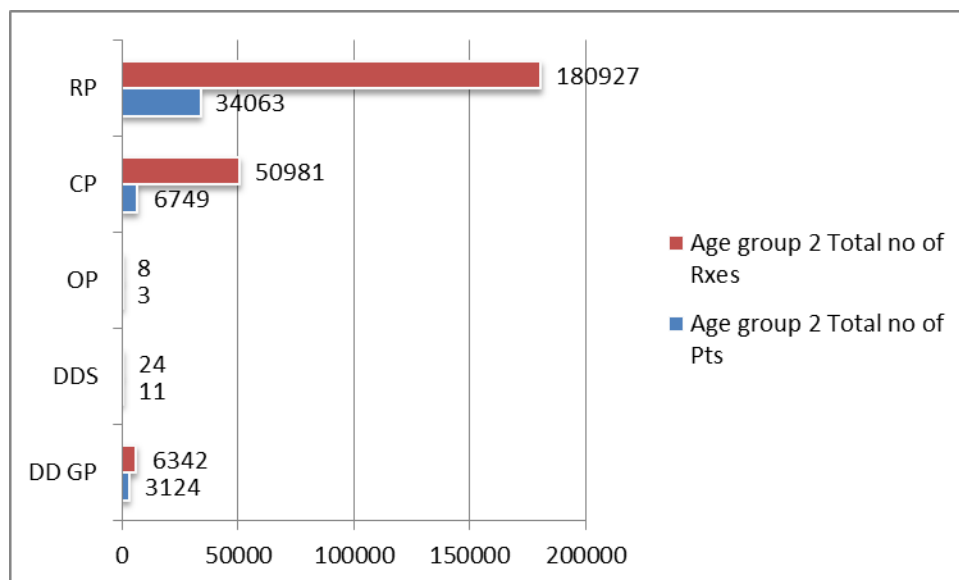


Figure 4.26: Number of chronic medication patients and prescriptions per provider type – Age group 2, 2009

For age group 2, the most chronic prescriptions were once again dispensed by retail pharmacies. For every one prescription dispensed by a courier pharmacy, 3.55 prescriptions were dispensed by a retail pharmacy.

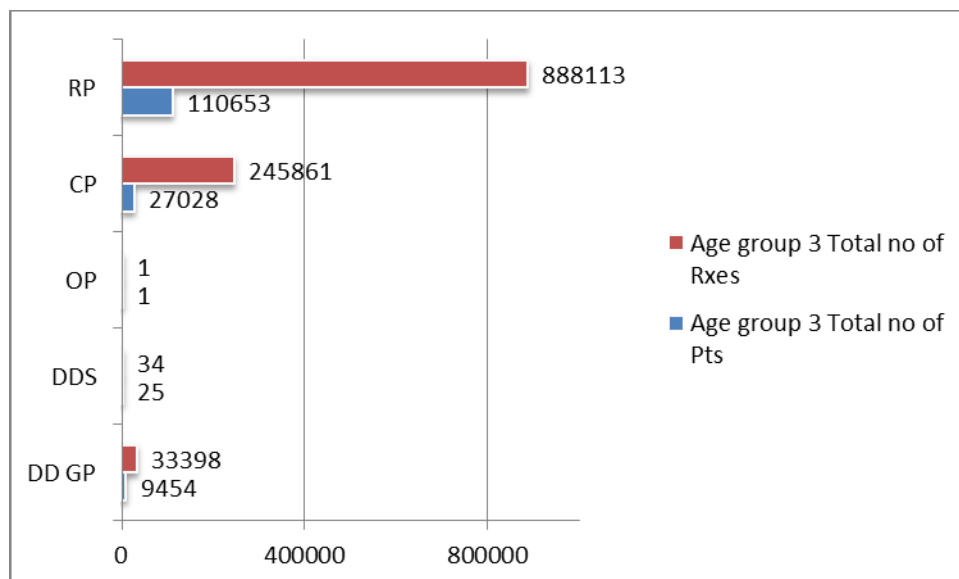


Figure 4.27: Number of chronic medication patients and prescriptions per provider type – Age group 3, 2009

As with age groups 1 and 2, the most chronic medications were dispensed by retail pharmacies, at retail: courier ratio of 3.61:1. The average number of chronic prescriptions per patient was 9.10 ± 5.71 for courier pharmacies and 8.03 ± 5.42 for retail pharmacies.

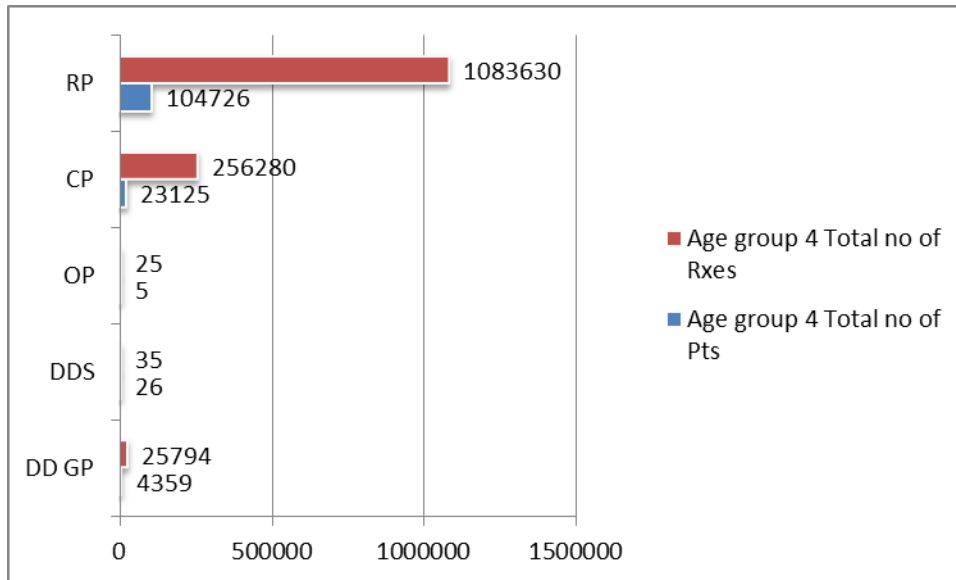


Figure 4.28: Number of chronic medication patients and prescriptions per provider type – Age group 4, 2009

Age group 4 portrays a similar trend as age groups 1-3. Figure 4.28 illustrates that, for every chronic medication prescription dispensed by a courier pharmacy, 4.23 prescriptions were dispensed by a retail pharmacy.

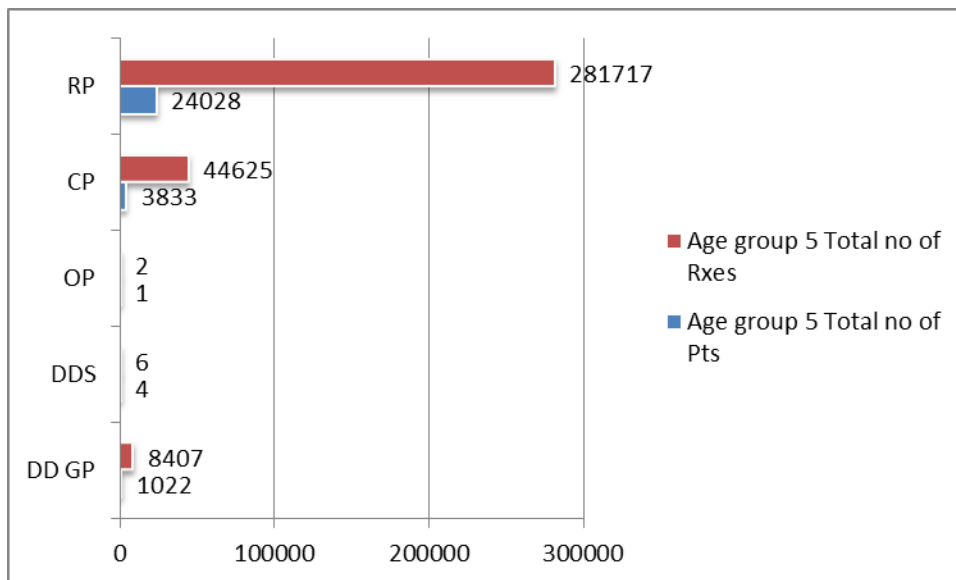


Figure 4.29: Number of chronic medication patients and prescriptions per provider type – Age group 5, 2009

For age group 5 (80+ years), it is interesting to note that retail pharmacies dispense 6.31 times more chronic medication prescriptions than courier pharmacies. Because patients in this age group are sometimes less physically mobile or do not drive their cars any more, one would expect that these patients may prefer a delivery service. Patients in this age group seem to be the most compliant, as the number of chronic medication prescriptions per year is 11.72 ± 7.61 for courier and 11.59 ± 7.49 for retail pharmacies. This finding will be investigated further in section 4.8

Table 4.47: Chronic prescriptions per gender – females

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	10589	61	14	33977	168114	212755
n _{Rx'es}	44572	99	56	339245	1499626	1883598
$\bar{x}_{Rx/Pt}$	4.20927	1.62	4.00	9.98	8.92	8.85
SD	4.54807	1.13	2.15	6.09	6.55	6.49
95% CI	4.12-4.30	1.33-1.91	2.76-5.24	9.92-10.05	8.89-8.95	-
2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	9437	49	15	32259	162419	204179
n _{Rx'es}	40316	77	55	294370	1465417	1800235
$\bar{x}_{Rx/Pt}$	4.27	1.57	3.67	9.13	9.02	8.82
SD	4.61	1.65	4.91	5.72	6.54	6.42
95% CI	4.18-4.37	1.01-2.04	0.95-6.39	9.07-9.19	8.99-9.05	-

Table 4.48: Chronic prescriptions per gender – males

2009						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	8708	25	10	28844	121287	158874
n _{Rx'es}	31781	32	33	272913	1003900	1308659
$\bar{x}_{Rx/Pt}$	3.65	1.28	3.30	9.46	8.28	8.24
SD	4.17	0.61	2.36	5.69	6.28	6.20
95% CI	3.56-3.73	1.03-1.53	1.61-4.99	9.40-9.53	8.24-8.31	-
2010						
	DD GP	DDS	OP	CP	RP	TOTAL/AVE
n _{Pts}	7536	29	12	27783	118216	153576
n _{Rx'es}	28977	51	27	242673	994871	1266599

$\bar{x}_{Rx/Pt}$	3.85	1.76	2.25	8.73	8.42	8.25
SD	4.45	1.24	1.71	5.48	6.22	6.10
95% CI	3.74-3.95	1.30-2.27	1.16-3.34	8.67-8.80	8.38-8.45	-

Tables 4.47 and 4.48 indicate that although the most patients and prescriptions 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% of all patients 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. The 95% confidence intervals for courier and retail pharmacies showed small variances, indicating a high likelihood that the averages are representative of the study population.

The same type of analysis was performed on the different provinces, as set out in Tables 4.49 and 4.50. These tables show that the highest amount of patients and chronic prescriptions are in the Gauteng province (49% of all patients for both study years). Although most patients receiving chronic medication reside in Gauteng, the patients with most prescriptions per patient reside in the Eastern Cape (9.29 ± 6.92 prescriptions per patient in 2009 and 9.13 ± 6.86 in 2010) followed closely by KwaZulu-Natal (8.88 ± 6.22 prescriptions per patient in 2009 and 9.22 ± 6.19 in 2010).

According to Statistics South Africa (Statistics SA, 2011), the province with the highest income per household is Gauteng, followed by KwaZulu Natal and then the Eastern Cape (refer to Table 4.47). This coincides with the amount of chronic medication dispensed, suggesting that there may be a correlation between higher income and chronic medication use. As it is well known that a Western lifestyle is associated with chronic diseases such as diabetes and high cholesterol, it may be that affluent areas have more lifestyle-related chronic conditions. This possibility is one that may need further investigation in the South African population.

Table 4.49 Chronic prescriptions per province for 2009

2009										
	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Not Indicated	Western Cape
n_{Pts}	26511	20681	155674	52785	11592	16661	22331	6815	1763	56816
As a % of total	7%	6%	42%	14%	3%	4%	6%	2%	0%	15%
n_{Rx'es}	246381	164357	1336886	468676	81291	125262	156583	50151	7715	554955
As a % of total	8%	5%	42%	15%	3%	4%	5%	2%	0%	17%
$\bar{x}_{Rx/Pt}$	9.29	7.95	8.59	8.88	7.01	7.52	7.01	7.36	4.38	9.77
SD	6.92	6.18	6.27	6.22	5.74	5.62	5.72	5.61	4.40	6.94

Table 4.50 Chronic prescriptions per province for 2010

2010										
	Eastern Cape	Free State	Gauteng	Kwazulu-Natal	Limpopo	Mpumalanga	North West	Northern Cape	Not Indicated	Western Cape
n_{Pts}	25809	20311	148442	49445	10945	16818	21621	7224	1764	55376
As a % of total	7%	6%	41%	14%	3%	5%	6%	2%	0%	15%
n_{Rx'es}	235660	161869	1259380	456030	77766	126403	153599	51167	7538	537422
As a % of total	8%	5%	41%	15%	3%	4%	5%	2%	0%	18%
$\bar{x}_{Rx/Pt}$	9.13	7.97	8.48	9.22	7.11	7.52	7.1	7.08	4.27	9.70
SD	6.86	6.16	6.14	6.19	5.64	5.58	5.67	5.5	4.48	6.88

Table 4.51: Income per household, (adapted from Statistics SA, 2011)

	Thousands									
	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu-Natal	North West	Gauteng	Mpumalanga	Limpopo	South Africa
Total number of households RSA	1 532	1 781	320	885	2 712	982	3 684	1 015	1 394	14 304
Salaries/wages/commission	1 145	872	195	528	1 589	594	2 732	640	623	8 918
Income from a business	207	196	27	90	253	110	604	131	201	1 818
Remittances	150	370	39	163	508	144	398	196	378	2 346
Pensions	122	46	14	27	77	25	108	11	28	458
Grants	544	1 000	167	456	1 353	479	1 118	499	812	6 428
Sales of farm products and services	8	36	17	16	46	32	10	12	40	216
Other income sources e.g. rental income, interest	84	19	6	22	45	17	135	12	22	362
No income	13	5	6	5	10	18	37	5	15	113

For the purpose of this study, the differences in claiming patterns between retail and courier pharmacies will be investigated specifically. Table 4.52 highlights the differences in chronic medication claimed per province according to by retail/community and mail order/courier pharmacies. The data in this table indicate that retail pharmacies have a majority share in terms of number of

prescriptions and patients for all provinces. The North West province had the largest margin of chronic prescriptions dispensed by retail pharmacies over courier pharmacies (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, where it was found that retail prescriptions comprised 54% of total chronic prescriptions in 2009 and 48% in 2010, with courier pharmacies dispensing 44% of total chronic prescription in 2009 and 52% in 2010. As stated earlier in paragraph 4.3.1 (Table 4.5), the Northern Cape is the province with the smallest population in South Africa which may mean that there is a lack of retail pharmacies for patients to go to and that they therefore utilise courier pharmacies.

Table 4.52 Chronic prescriptions per province – courier and retail pharmacies

		2009							2010						
	Type of Pharmacy	nPts	Ratio	nRx'es	Ratio	$\bar{x}_{Rx/Pt}$	SD	95%CI	nPts	Ratio	nRx'es	Ratio	$\bar{x}_{Rx/Pt}$	SD	95%CI
Eastern Cape	Courier	4115	20%	40747	21%	9.90	5.57	9.73-10.07	3881	19%	34341	18%	8.85	5.63	8.67-9.03
	Retail	20468	80%	196479	79%	9.60	7.16	9.50-9.69	20216	81%	193133	82%	9.55	7.08	9.50-9.70
Free State	Courier	4213	28%	37290	31%	8.85	5.38	8.69-9.01	4280	29%	35272	29%	8.24	5.15	8.09-8.40
	Retail	15188	72%	119684	69%	7.88	6.41	7.78-7.98	14746	71%	119673	71%	8.12	6.43	7.78-7.98
Gauteng	Courier	25429	20%	252895	24%	9.95	6.30	9.87-10.02	23101	19%	210891	20%	9.13	5.89	9.05-9.21
	Retail	124533	80%	1068015	76%	8.58	6.22	8.54-8.61	120057	81%	1034073	80%	8.61	6.16	8.54-8.61
Kwazulu-Natal	Courier	9508	23%	94201	26%	9.91	5.74	9.79-10.02	8962	23%	83525	23%	9.32	5.42	9.79-10.02
	Retail	40495	77%	364896	74%	9.01	6.28	8.95-9.07	38325	77%	364049	77%	9.50	6.31	8.95-9.07
Limpopo	Courier	1872	23%	16399	28%	8.76	5.72	8.50-9.02	1969	26%	16615	30%	8.44	5.61	8.50-9.02
	Retail	8145	77%	57982	72%	7.12	5.72	6.99-7.24	7601	74%	55041	70%	7.24	5.60	6.99-7.24
Mpumalanga	Courier	2943	24%	26275	28%	8.93	5.00	8.75-9.11	3167	26%	25076	26%	7.92	4.83	8.74-7.11
	Retail	12087	76%	92452	72%	7.65	5.75	7.55-7.75	12143	74%	95267	74%	7.85	5.76	7.55-7.75
North West	Courier	2998	17%	25564	20%	8.53	5.46	8.33-8.72	2626	15%	20554	16%	7.83	5.49	8.33-8.72
	Retail	17934	83%	126433	80%	7.05	5.75	6.97-7.13	18058	85%	129140	84%	7.15	5.70	6.97-7.13
Northern Cape	Courier	1712	38%	14880	46%	8.69	5.17	8.44-8.94	1955	42%	16475	52%	8.43	5.17	8.45-8.94
	Retail	4491	62%	32079	54%	7.14	5.76	6.97-7.31	4675	58%	31679	48%	6.78	5.59	6.97-7.31
Not Indicated	Courier	156	11%	1031	17%	6.61	4.97	5.82-7.40	212	15%	1177	20%	5.55	5.50	5.82-7.40
	Retail	1464	89%	6233	83%	4.26	4.36	4.03-4.48	1396	85%	5868	80%	4.20	4.32	4.03-4.48
Western Cape	Courier	9875	11%	102876	17%	10.42	5.79	10.30-10.53	9889	15%	93117	20%	9.42	5.52	9.31-9.53
	Retail	44596	89%	439273	83%	9.85	7.17	6.99-7.24	43418	85%	432365	80%	9.96	7.16	9.89-10.03

4.7.2. Chronic prescription costs per provider type

Table 4.53 gives the cost and prevalence of chronic medication per provider type

Table 4.53: Cost and prevalence of chronic prescriptions per provider

2009 to 2010 total Rx frequency and Cost						
	DDGP	DDS	OP	CP	RP	TOTAL
nRx'es	142760	247	171	1147687	4900282	6191147
as % of total Rx'es	2%	0%	0%	19%	79%	100%
Tcost _{Rx'es} (R)	29547818.51	136803.85	528786.32	477825260.68	1618477485.45	2126516154.81
as % of total Rx cost	1%	0%	0%	22%	76%	100%
CPI	0.5	0	0	1.16	0.96	

Table 4.53, which gives the cost and prevalence of chronic medication per provider type, highlights that chronic prescriptions are mostly dispensed by retail pharmacies (79%), and that retail pharmacies also contribute 76% of the total chronic medication cost. Retail pharmacies contribute more towards chronic medication cost than to general medication costs (73%). Courier pharmacies represent 22% of costs for general medication (refer to Table 4.26) as well as for chronic medication. Where dispensing specialists represent 1% of the total cost for general medication (refer to Table 4.26), it is clear from Table 4.53 that specialists rarely dispense chronic medication at all. Dispensing GPs are only responsible for 1% of total chronic medication costs, while GPs make up 4% of total prescription cost for general medication (which includes chronic medication).

The CPI reflects these findings. Chronic medication is relatively expensive at courier pharmacies. Retail pharmacies and dispensing GPs offered more affordable chronic medication at CPIs of 0.96 and 0.5 respectively. The average prescription and item cost for chronic medication per provider which is analysed next and concurs with these CPI findings.

Table 4.54: Average prescription cost components for chronic medication per provider

Year	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
2009	DD GP	200.31	238.81	197.21 - 200.58	172.7	233.08	158.55 - 161.39	41.34	77.13	38.41-39.44
	DDS	261.28	453.83	189.69 - 341.98	777.51	2604.52	153.15 - 294.46	48.36	90.41	21.42-62.63
	OP	4404.83	4037.16	3554.40-5355.27	1657.18	3240.73	3346.23-4957.97	10.58	67.39	56.62-448.84

	CP	398.56	937.61	396.52 - 401.21	398.53	1175.5 7	358.77 - 363.40	38.04	171.87	37.52- 38.05
	RP	325.43	425.74	323.96 - 325.01	279.41	412.92	271.22 - 272.19	55.69	104.18	52.66- 52.90
	AVE	336.89	562.97		297.92	618.9		52.28	118.58	
2010	DD GP	214.04	273.52	212.01 - 216.09	160.68	200.88	170.96 - 174.43	39.63	73.59	40.78- 41.93
	DDS	825.87	2642.9 2	363.61 - 1288.1 3	222.92	424.47	321.97 - 1233.0 5	38.36	113.05	32.55- 64.17
	OP	1667.7 6	3239.8 5	955.89 - 2379.6 3	4152.1	3825.5 8	945.11 - 2369.2 5	252.73	930.96	-4.22- 25.39
	CP	436.57	1199.4 6	433.51 - 439.92	360.79	925.8	395.51 - 401.80	37.78	106.71	37.60- 38.52
	RP	335.1	449.84	334.74 - 335.87	272.19	393.19	279.09 - 280.12	53.24	99.04	55.57- 55.83
	AVE	350.19	646.91		286.99	540.05		49.9	100.4	

From Table 4.54 it can be deduced that “other providers” had the highest average cost per provider for both 2009 and 2010. Dispensing specialists had a high average cost per chronic prescription in 2009 ($R825.87 \pm R2642.92$) but it lowered in 2010 ($R261.28 \pm R453.83$).

Courier pharmacies had average chronic prescription costs of $R436.57 \pm R1199.46$ and $R398.56 \pm R937.61$, with co-payments of $R38.04 \pm R171.87$ and $R37.78 \pm R106.71$ for 2009 and 2010 respectively. Retail pharmacies had lower average prescription costs for both years but higher patient levies than courier pharmacies. Average prescription cost variance between courier and retail pharmacies has 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, has a statistically significant 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). The 95% confidence intervals for courier pharmacy, retail pharmacy and dispensing GPs are narrow, and this could be due to the large volume of data analysed.

When comparing the levies paid by patients for courier versus retail pharmacies, the difference in average levy per prescription has a d -value of only 0.15 for both 2009 and 2010, indicating that although the co-payment is statistically significantly higher in retail pharmacies, it is not practically significant ($d < 0.8$).

Table 4.55: Average chronic prescription cost elements – gender groups per provider: females

Females										
Year	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
2009	DD GP	201.01	227.83	196.78-200.98	159.69	189.54	156.67-160.17	41.32	72.1	39.80-41.12
	DDS	268.41	487.07	179.45-367.00	238.28	465.9	149.07-326.90	30.13	66.14	18.10-52.38
	OP	3815.13	4080.38	2722.40-4907.87	3611.49	3886.58	2570.66-4652.32	203.64	838.9	-21.02-428.30
	CP	383.03	826.32	380.54-386.10	344.77	813.69	342.32-347.80	38.26	96.44	37.93-38.58
	RP	309.31	384.87	307.91-309.14	256.69	352.25	255.80-256.92	52.62	96.67	52.01-52.32
	TOTAL/AVE	320.39	495.77		270.66	471.98		49.73	96.41	
2010	DD GP	212.71	256.65	210.20-215.21	170.11	213.86	168.02-172.20	42.59	74.04	41.88-43.32
	DDS	1223.93	3348.96	192.98-1820.79	1170.25	3301.37	150.99-1756.11	53.69	87.34	30.74-75.93
	OP	753.21	1928.69	231.82-1274.61	750.48	1929.65	228.82-1272.14	2.74	11.75	-0.44-5.91
	CP	417.17	941.01	413.86-420.66	379.01	926.52	375.74-382.43	38.15	120.23	37.74-38.61
	RP	317.89	397.71	317.40-318.69	263.4	360.85	262.97-264.14	54.49	101.16	54.33-54.66
	TOTAL/AVE	331.82	526.61		280.27	500.1		51.55	104.19	

The overall average cost per chronic medication prescription for females was R320 ± 495.77 in 2009 and R331.89 ± 526.61 in 2010. “Other providers” had the highest prescription costs in 2009 and dispensing specialists dispensed on average the most expensive prescriptions to females in 2010.

Table 4.56: Average chronic prescription cost elements – gender groups per provider: males

Males										
Year	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
2009	DD GP	199.32	253.54	196.13-201.71	162.08	215.9	159.78-164.52	37.24	75.6	35.95-37.60
	DDS	240.13	342.81	121.11-364.81	177.35	267.53	84.75-275.11	62.79	194.69	-5.02-131.08
	OP	5405.54	3816.23	4052.36-6758.71	5069.5	3592.28	3795.73-6343.27	336.04	1078.16	-46.26-718.34

	CP	417.87	1059.47	414.23-422.17	380.7	1048.23	377.07-384.93	37.17	118.24	36.75-37.64
	RP	349.7	479.78	347.40-349.27	295.52	446.85	293.77-295.51	54.18	102.49	53.49-53.89
	TOTAL/AVE	360.79	647.29		310.63	624.86		50.16	105.91	
2010	DD GP	215.9	295.38	212.51-219.31	176.29	257.4	173.33-179.26	39.61	81.19	38.69-40.56
	DDS	224.88	286.28	141.31-305.58	184.56	259.52	107.96-256.69	40.32	95.17	13.86-68.40
	OP	3530.72	4427.38	1779.31-5282.14	3504.16	4438.88	1748.20-5260.12	26.56	116.04	-19.34-72.46
	CP	460.1	1452.16	454.54-466.09	422.2	1419.86	416.74-428.04	37.9	218.71	37.06-38.80
	RP	360.47	516.09	359.71-361.74	302.99	478.46	302.30-304.19	57.48	108.45	57.26-57.69
	TOTAL/AVE	376.31	786.14		323	755.6		53.31	136.45	

The average cost per chronic prescription is higher for males than for females (R360.97± R647.29 in 2009 and R376.31± R786.17 in 2010). “Other providers” dispensed the most expensive prescriptions to males, and courier pharmacy prescriptions were second most costly to males (average cost of R417.87 ± R1059.47 in 2009 and R460.10 ± R1452.16 in 2010). As in the female population, dispensing GPs dispensed the least expensive chronic medication prescriptions.

Table 4.57: Trends and effect sizes between male and females for each study year

Year	Provider	Ave Cost (R)		Ave Scheme Cost (R)		Ave Pt levy (R)	
		Trend	d-value	Trend	d-value	Trend	d-value
2009 Males:Females	DD GP	-1.69	-0.01	2.39	0.01	-4.08	-0.05
	DDS	-28.27	-0.06	-60.93	-0.23	32.66	0.17
	OP	1590.41	0.39	1458.01	0.38	132.40	0.12
	CP	34.84	0.03	35.93	0.03	-1.10	-0.01
	RP	40.39	0.08	38.83	0.09	1.56	0.02
	AVE	40.40	0.06	39.97	0.06	0.43	0.00
2010 Males:Females	DD GP	3.19	0.01	6.17	0.02	-2.98	-0.04
	DDS	-999.06	-0.30	-985.69	-0.30	-13.37	-0.14
	OP	2777.51	0.63	2753.68	0.77	23.83	0.21
	CP	42.93	0.03	43.19	0.03	-0.26	0.00
	RP	42.58	0.08	39.59	0.08	2.99	0.03
	AVE	44.49	0.06	42.73	0.06	1.77	0.01

Table 4.57 compares the trends between male female chronic prescriptions per provider for the study period. Steyn (2009b:21) suggests that

- a *d*-value of about 0.20 (one-fifth of a standard deviation) is “small”,
- a *d*-value of 0.50 (one-half of a standard deviation) is “medium”, and
- a *d*-value of 0.80 (eight-tenths of a standard deviation) is “large”.

According to this classification, average chronic prescription costs in 2009 and 2010 for males were similar to that of females. Only “other providers” showed a small difference, with the average cost being higher for males than for females in 2009 and again in 2010. The medical scheme contribution for “other providers” also shows a small deviation between males and females, but the patient levies were similar between males and females for both years.

Table 4.58: Average chronic prescription cost elements – 2009

2009	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Age group1	DD GP	129.86	185.24	120.67-135.03	110.61	163.83	103.19-115.89	19.25	43.76	16.62-20.00
	DDS	136.86	99.9	112.01-215.81	124.1	93.88	100.41-193.91	12.76	6.51	9.55-23.94
	OP	7181.44	2834	6400.29-7962.58	6763.32	2732.15	6010.24-7516.39	418.12	1181.44	92.47-743.76
	CP	534.68	2148.84	499.56-569.63	494.86	2147.8	459.70-529.74	39.82	90.06	38.41-41.36
	RP	413.9	477.18	399.12-406.03	358.03	451.97	345.17-351.70	55.87	127.98	53.21-55.07
	TOTAL/AVE	432.23	1025.01		380.02	1013.71		52.21	124.69	
Age group 2	DD GP	124.89	234.63	120.27-131.01	102.45	212	00.24-109.45	22.44	55.6	20.26-22.93
	DDS	224.77	416.68	70.67-431.88	181.44	325.17	50.09-318.98	43.33	95.49	4.28-129.19
	OP	473.28	722.8	130.99-1077.55	473.28	722.8	-130.99-1077.55	0	0	
	CP	577.6	1644.97	563.52-592.07	542.11	1636.77	528.10-556.50	35.49	134.14	34.33-36.66
	RP	385.29	716.21	374.66-381.13	331.46	684.28	322.23-328.41	53.83	131.38	51.98-53.17
	TOTAL/AVE	421.7	1000.07		372.76	980.39		48.94	130.93	
Age group3	DD GP	163.44	202.96	161.37-165.74	131.96	173.26	130.63-134.36	31.48	63.48	30.39-31.73
	DDS	294.27	307.38	168.21-373.96	267.01	274.53	153.45-338.79	27.26	41.68	11.26-38.72
	OP	1210.68	0	-	1210.68	0	-	0	0	-
	CP	391.02	851.31	388.02-394.74	355.62	837.21	352.67-359.28	35.4	105.38	34.99-35.81
	RP	317.91	475.38	315.98-317.94	267.65	445.1	266.27-268.12	50.26	101.04	49.55-49.97

	TOTAL/ AVE	329.31	574.28		282.77	550.94		46.53	101.35	
Age group 4	DD GP	90.2	107.66	246.35- 252.83	72.83	94.08	196.37- 201.82	17.38	38.1	49.47- 49.97
	DDS	243.82	197.77	134.31- 616.10	221.24	186.51	71.29- 543.04	22.59	30.19	3.46- 132.59
	OP	1210.68	0	149.02- 359.61	1,210.68	0	143.21- 229.51	0	0	13.77- 39.67
	CP	159.35	516.39	367.49- 372.47	144.93	510.08	327.42- 332.31	14.43	59.19	39.69- 40.50
	RP	156.7	263.23	322.49- 323.76	131.93	251.52	268.18- 269.31	24.77	56.83	54.21- 54.55
	TOTAL/ AVE	155.76	342.49		133.75	333.55		22.01	57.24	
Age group 5	DD GP	259.33	248.33	253.88- 264.49	205.54	196.31	201.36- 209.74	53.8	83.29	51.86- 55.41
	DDS	200	32.47	165.92- 234.08	177.1	49.51	125.15- 229.06	22.9	41.12	20.26- 66.01
	OP	29.6	21.66	-165.00- 224.19	25.06	15.24	-111.85- 161.96	4.54	6.42	53.15- 62.22
	CP	357.52	1009.83	348.54- 367.26	317.99	1001.74	309.06- 327.63	39.53	90.72	38,72- 40.40
	RP	299.99	287.6	298.94- 301.07	243.93	241.92	243.20- 244.99	56.06	88.97	55.58- 56.24-
	TOTAL/ AVE	306.68	456.42		252.89	430.67		53.78	89.24	

Table 4.59: Average chronic prescription cost elements – 2010

2010	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Age group 1	DD GP	155.6	203.95	145.60- 165.60	130.91	176.49	122.25- 139.56	24.7	57.27	21.89- 27.50
	DDS	164.97	138.17	117.50- 212.43	122.28	58.92	102.05- 142.52	42.68	102.84	7.36-78.01
	OP	5541.26	5028.94	2756.33- 8326.20	5541.26	5028.94	2756.33- 8326.20	0	0	-
	CP	578.66	1517.04	551.06- 607.19	536.09	1497.69	508.81- 564.22	42.57	257.66	37.85- 47.38
	RP	439.15	516.61	435.78- 443.93	380.16	491.67	377.03- 384.78	58.99	122.03	58.00- 59.91
	TOTAL/ AVE	454.72	760.42		398.92	740.83		55.8	149.46	
Age group 2	DD GP	127.18	318.93	118.72- 135.64	104.53	295.67	96.69- 112.37	22.65	71.29	20.76- 24.54
	DDS	3342.82	6071	501.52- 6184.14	3271.69	5972.95	476.26- 6067.12	71.14	104.89	22.05- 120.23
	OP	736.43	2115.5	-283.22- 1756.09	736.39	2115.56	-283.27- 1756.06	0.04	0.18	-0.05-0.13
	CP	712.36	2784.1	686.40- 738.18	682.01	2756.58	656.29- 707.56	30.35	146.27	29.00- 31.73
	RP	400.86	745.1	397.73- 404.77	346.11	704.25	343.14- 349.79	54.75	133.3	54.15- 55.45
	TOTAL/ AVE	456.62	1415.3		407.54	1388.71		49.08	135.24	
Age group 3	DD GP	174.67	223.04	172.13- 177.26	141.87	193.97	139.64- 144.11	32.8	63.22	32.09- 33.54
	DDS	539.43	802.22	245.28- 833.69	501.48	810.84	204.06- 798.90	37.95	59.02	16.30- 59.60

	OP	1792.58	2607.9	-73.00- 3658.16	1780.84	2615.68	-90.31- 3651.99	11.75	30.05	-9.75- 33.24
	CP	423.66	1002.51	419.49- 428.01	389.82	981.43	385.73- 394.07	33.84	176.81	33.10- 34.60
	RP	329.73	502.49	328.85- 330.99	277.36	468.44	276.60- 278.55	52.36	106.73	52.14- 52.59
	TOTAL/ AVE	343.9	629.11		295.66	601.69		48.24	122.96	
Age group 4	DD GP	261.07	299.82	257.31- 264.81	210.09	252.87	206.92- 213.23	50.99	86.18	49.91- 52.59
	DDS	398.5	595.62	201.51- 586.50	347.36	588.4	161.63- 533.08	51.15	93.2	21.73- 80.56
	OP	400.81	780.32	136.79- 664.83	381.52	746.29	129.91- 634.02	19.3	100.16	-14.59- 53.18
	CP	401.1	877.66	397.68- 404.90	358.76	843.47	355.44- 362.38	42.33	175.03	41.66- 43.10
	RP	330.59	364.6	330.06- 331.43	272.94	323.36	272.47- 273.70	57.65	98.58	57.47- 57.84
	TOTAL/ AVE	341.34	491.71		286.43	456.71		54.91	115.24	
Age group 5	DD GP	278.92	290.47	272.78- 285.09	221.23	231.8	216.31- 226.14	57.7	91.24	55.78
	DDS	20	0	-	20	0	-	0	0	-
	OP	3644.99	5077.37	-41973.33- 49263.31	3617.62	5116.08	- 42348.54- 49583.77	27.38	38.71	-320.57- 375.21
	CP	364.22	498.1	359.53- 369.08	321.23	471.63	316.78- 325.82	43	115.48	41.90- 44.11
	RP	306.78	293.86	305.78- 307.90	248.78	244.41	247.97- 249.73	57.99	92.29	57.66- 58.32
	TOTAL/ AVE	313.04	326.1		256.86	282.76		56.18	95.48	

When analysing Tables 4.58 (2009 chronic medication costs) and 4.59 (2010 chronic medication costs), it can be seen that dispensing GPs had the lowest average cost per prescription for all age groups except for age group 5, with other providers (2009) and dispensing specialists (2010) having a lower average prescription cost. As the average number of chronic medication items for dispensing doctors and specialists were low (refer to Table 4.45), this could be seen to be the reason for the low average prescription cost. For dispensing doctors, the average number of chronic items per prescription was 1.97 ± 1.40 in 2009 and 2.01 ± 1.48 in 2010. Dispensing specialists had on average 1.25 chronic medication items per prescription for both study years (refer to table 4.45).

Table 4.60 shows that the age groups with the most prominent difference in chronic prescription costs are age groups 1 and 4. The difference is observed most clearly in 2009, where the difference in average medication cost was R276.46 and the *d*-value 0.27. Age group 4 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. A *d*-value of 0.27, however, is still regarded as of low significance.

Table 4.60: Trend and effect sizes in average prescription costs – age group 1 and 4

Age group 1 vs age group 4	Ave Rx Cost (R)		Ave Scheme Cost (R)		Ave Pt levy (R)	
	Trend	<i>d</i> -value	Trend	<i>d</i> -value	Trend	<i>d</i> -value
2009	276.46	0.27	246.27	0.242935	30.20	0.242217
2010	113.38	0.15	112.49	0.151848	-0.37	-0.00251

It has now been established that chronic medication costs may differ per age group. Costs per province will be investigated next.

Table 4.61: Average chronic prescription cost elements – province per provider, 2009

2009	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Eastern Cape	DD GP	209.42	237.37	205.27-215.02	171.56	204.59	168.55-176.97	37.86	65.93	36.04-38.73
	DDS	109.24	78.26	73.50-181.73	99.19	76	63.90-172.34	10.06	10.2	4.43-14.56
	CP	383.7	840.47	375.48-391.78	355.49	829.81	347.40-363.49	28.21	86.57	27.35-29.03
	RP	285.47	320.85	283.22-286.04	244.38	292.98	242.61-245.19	41.09	76.18	40.39-41.06
	TOTAL/AVE	299.26	452.67		260.48	433.77		38.79	77.83	
Free State	DD GP	225.56	219.68	218.62-228.59	176.36	176.6	171.28-179.30	49.21	70.05	46.73-49.90
	DDS	1.06	0	-896.41-1503.92	1.06	0	-275.05-449.66	0	0	-621.69-1054.59
	CP	382.48	1277.1	369.94-395.85	351.88	1272.14	339.33-365.14	30.6	81.32	29.83-31.49
	RP	320.57	419.74	316.40-321.11	261.82	386.07	258.89-263.22	58.75	103.87	57.11-58.27
	TOTAL/AVE	330.7	714.32		278.94	698.34		51.77	98.45	
Gauteng	DD GP	162.48	241.64	158.19-165.68	130.43	202.89	127.06-133.35	32.05	74.61	30.57-21.89
	DDS	207.41	208.14	154.56-263.86	161.2	145.59	125.08-203.00	46.21	148.24	7.75-82.58
	OP	725.87	0	-	402.16	0	-	323.71	0	-
	CP	431.58	1122.83	427.62-436.37	382.96	1108.42	379.05-387.69	48.62	127.77	48.13-49.13
	RP	343.04	473.63	341.38-343.18	284.31	441.28	283.19-284.86	58.72	105.82	58.06-58.46
	TOTAL/AVE	357.95	650.68		301.48	627.39		56.47	110.19	
KZN	DD GP	202.8	253.09	194.61-204.68	166.37	222.38	159.85-168.65	36.43	74.51	33.93-36.87
	DDS	707.71	985.39	183.33-1195.26	634.66	918.58	143.78-1087.79	73.05	124.76	9.95-138.08

	CP	389.32	730.1	384.77-394.90	364.44	722.42	359.94-369.16	24.89	78.71	24.38-25.38
	RP	351.35	452.2	348.37-351.30	307.09	422.46	304.33-307.06	44.26	96.2	43.82-51.04
	TOTAL/AVE	356.26	519.43		316.12	497.33		40.14	92.82	
Limpopo	DD GP	221.27	240.41	213.05-224.29	170.73	191.06	164.91-173.85	50.54	74.75	47.55-51.04
	DDS	69.09		-85.43-250.01	55.27		-180.14-330.90	13.82		-80.89-94.71
	CP	390.83	1241.7	371.95-409.95	349.45	1237.52	330.63-368.51	41.38	90.16	40.00-42.75
	RP	281.62	269.35	279.62-284.01	223.61	228.68	222.35-226.08	58.01	87.39	56.89-58.31
	TOTAL/AVE	299.06	613.84		245.11	599.22		53.95	87.24	
Mpumalanga	DD GP	206.87	263.32	199.89-212.66	168.61	221.25	162.96-173.67	38.27	75.07	36.14-39.77
	DDS	385.76	0	-	308.61	0	-	77.15	0	-
	CP	319.87	341.84	316.01-324.27	293.86	328.53	290.15-298.09	26.01	65.16	25.23-26.01
	RP	289.33	305.14	286.76-290.67	235.9	272.98	234.17-238.66	53.44	78.29	52.30-53.31
	TOTAL/AVE	291.59	312.28		244.84	285.03		46.75	76.34	
North West	DD GP	177.86	227.99	172.09-185.43	138.83	185.54	134.31-145.17	39.03	86.5	36.53-41.51
	DDS	110.91	118.81	19.36-199.91	110.91	118.81	16.07-199.43	0	0	-2.58-6.36
	CP	364.4	456.24	359.52-370.72	325.27	436.16	320.54-331.24	39.13	86.24	38.18-40.29
	RP	291.42	295.81	289.56-292.81	240.02	257.7	238.67-241.51	51.4	88.29	50.61-51.58
	TOTAL/AVE	300.19	328.08		251.19	295.58		49.01	88.04	
Northern Cape	DDS GP			190.35-204.29	262.88	443.99	151.20-162.39	40.82	66.16	38.24-42.82
	CP	286.88	456.68	279.67-294.39	262.88	443.99	255.90-270.16	24	67.26	22.89-25.05
	RP	263.63	271.94	260.27-266.09	219.15	242.23	216.28-221.55	44.47	74.28	43.41-45.02
	TOTAL/AVE	266.47	336.1		228.41	314.99		38.05	72.33	
Not Indicated	DD GP	245.43	372	284.04	226.67	369.67	188.30-265.04	18.77	46.06	13.99-23.55
	DDS	856.89	1264.18	-1154.71-2868.48	856.89	1264.18	-1154.71-2868.48	0	0	-
	OP	4446.64	4040.87	3590.46-5302.82	4194.71	3826.2	3384.02-5005.41	251.93	936.26	53.55-450.30
	CP	555.72	1477.26	464.92-644.90	523.21	1479.25	432.41-612.64	32.52	74.11	27.87-36.90
	RP	310.56	555.68	295.95-323.29	266.54	433.39	254.88-276.22	44.02	200.01	39.16-48.99
	TOTAL/AVE	389.06	969.57		345.4	897.28		43.66	209	
Western Cape	DD GP	217.74	222.94	210.06-217.72	175.31	188.75	169.44-175.92	42.43	73.28	39.96-42.47

	DDS	184.63	144.64	116.93-252.32	147.89	157.58	74.14-221.63	36.74	65.05	6.30-67.18
	CP	381.93	620.51	378.47-386.05	348.52	606.24	345.12-352.52	33.41	105.18	32.79-34.09
	RP	307.87	394.3	305.84-308.16	256	357.93	254.67-256.77	51.87	98.47	50.99-51.57
	TOTAL/AVE	319.86	444.53		271.69	415.76		48.16	99.55	

Table 4.62: Average chronic prescription cost elements – province per provider, 2010

2010	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Eastern Cape	DD GP	220.03	263.23	214.31-225.72	179.45	227.03	174.50-184.34	40.58	70.11	39.08-42.12
	DDS	107.25	86.13	61.35-153.14	71.99	68.3	35.59-108.38	35.26	67.11	-0.50-71.02
	CP	390.41	873.38	381.31-399.79	361.08	860.24	352.11-370.31	29.33	123.4	28.04-30.65
	RP	290.65	341.15	289.26-292.31	247.26	308.13	246.01-248.76	43.39	84.55	43.02-43.78
	TOTAL/AVE	302.73	458.72		261.48	435.07		41.24	90.95	
Free State	DD GP	227.85	241.94	222.15-233.55	179.43	195.22	174.82-184.03	48.43	73.43	46.70-50.16
	CP	412.33	1736.37	394.18-430.41	383.62	1688.06	365.98-401.20	28.71	126.93	27.38-30.03
	RP	325.47	414.4	323.34-328.05	267.79	380.93	265.86-270.18	57.68	97.29	57.13-58.23
	TOTAL/AVE	340.22	887.73		289.24	855.83		50.97	104.31	
Gauteng	DD GP	174.29	298.81	169.42-179.20	141.28	259.99	137.05-145.56	33.01	78.52	31.72-34.29
	DDS	223.05	204.99	167.09-279.00	182.46	162.46	138.11-226.80	40.59	86.69	16.93-64.25
	OP	166.26	157.69	-1250.55-1583.06	121.92	172.41	-1427.16-1670.99	44.34	14.72	-87.93-176.61
	CP	491.68	1491	485.49-498.22	441.75	1466.14	435.65-448.16	49.93	235.78	48.94-50.95
	RP	354.19	491.84	252.47-355.37	291.69	452.64	291.04-292.78	62.5	114.57	62.29-62.73
	TOTAL/AVE	375.15	758.26		315.1	729.66		60.06	142.08	
KZN	DD GP	241.83	315.79	235.15-248.62	199.9	274.62	194.09-205.80	41.93	90.12	40.02-43.86
	DDS	343.78	275.03	55.14-632.40	262.2	249.9	-0.05-524.45	81.57	106.15	-29.82-192.97
	CP	429.2	868.56	423.54-435.32	405	860.01	399.34-411.00	24.2	88.23	23.66-24.87
	RP	364.51	491.21	363.14-366.33	318.49	453.94	317.25-320.20	46.02	105.56	45.66-46.35
	TOTAL/AVE	374.09	577.61		332.14	550.32		41.94	102.68	
Limpopo	DD GP	223.09	250.01	216.81-229.36	171.65	197.88	166.68-176.61	51.44	81.27	49.40-53.48

	DDS	44.25	49.88	5.91- 82.59	37.37	45.81	2.16- 72.58	6.88	4.07	3.75- 10.01
	CP	426.04	1594.7 3	401.98- 450.48	383.97	1585. 76	360.02- 408.24	42.07	104.1 3	40.52- 43.69
	RP	288.42	277.79	286.18- 290.82	228.44	237.2	226.53- 230.50	59.99	87.55	59.26- 60.72
	TOTAL/ AVE	312.67	778.87		257.19	764.6 7		55.48	91.18	
Mpumalanga	DD GP	226.31	290.14	219.01- 233.62	187.94	251.5 5	181.60- 194.28	38.37	73.54	36.52- 40.22
	DDS	496	0	0	396.8	0	0	99.2	0	0
	CP	357.19	393.02	352.40- 362.13	332.83	378.8 9	328.20- 337.58	24.36	67.25	23.54- 25.21
	RP	300.71	317.44	298.77- 302.80	245.83	287.4 1	244.07- 247.72	54.88	82.27	54.36- 55.41
	TOTAL/ AVE	308.36	333.86		260.32	308.5 8		48.04	80.05	
North West	DD GP	210.58	231.31	203.31- 217.84	162.89	179.5 2	157.25- 168.53	47.68	90.44	44.84- 50.52
	DDS	296.21	333.82	-12.52- 604.95	237.74	266.3 1	-8.56- 484.03	58.47	67.54	-3.99- 120.94
	CP	389.53	478.38	383.01- 396.10	349.21	458.6 7	342.95- 355.49	40.32	87.93	39.13- 41.53
	RP	302.45	354.41	300.71- 304.61	247.24	314.0 7	245.71- 249.17	55.21	94.56 49	54.70- 55.73
	TOTAL/ AVE	311.77	372.46		258.75	336.6 7		53.03	93.73 981	
Northern Cape	DD GP	205.33	220.29	197.38- 213.11	161.21	183.7 8	154.57- 167.69	44.13	65.23	41.78- 46.44
	OP	103.9	0	0	77.92	0	0	25.98	0	0
	CP	286.66	369.17	280.86- 292.13	262.84	348.6 4	257.37- 268.02	23.82	68.98	22.74- 24.85
	RP	270.43	287.69	267.31- 273.65	222.72	251.5	220.00- 225.54	47.71	82.57	46.80- 48.62
	TOTAL/ AVE	271.82	313.54		232.01	284.4 8		39.81	78.27	
Not Indicated	DD GP	237.79	321.66	206.25- 269.32	218.58	304.1 5	188.76- 248.40	19.21	39.6	15.32- 23.09
	DDS	1430.2 7	1384.2 8	550.73- 2309.80	1429.1 3	1384. 51	549.45- 2308.80	1.14	3.95	-1.37- 3.65
	OP	1726.1 1	3287.1 9	989.82- 2462.40	1717.0 2	3287. 35	980.70- 582.55	9.09	68.18	-6.18- 24.36
	CP	543.85	1328.3 6	468.06- 620.00	506.39	1329. 43	430.50- 582.55	37.47	82.64	32.77- 42.22
	RP	312.47	523.82	300.00- 326.64	266.52	496.4 6	253.74- 279.15	45.95	144.2 1	42.74- 50.70
	TOTAL/ AVE	361.23	799		318.49	786.1		42.74	132.0 6	
Western Cape	DD GP	221.76	253.73	217.22- 226.33	180.06	216.8 3	176.15- 183.93	41.69	69.01	40.49- 42.97
	DDS	3587.6 6	6126.4 9	634.79- 6540.53	3480.4 5	6044. 15	567.26- 6393.64	107.2 1	140.6 3	39.43- 174.99
	OP	61		0	0		0	61		0
	CP	403.4	745.52	398.75- 408.33	368.14	705.9 8	363.73- 372.80	35.25	139.0 5	34.39- 36.17

	RP	315.56	432.27	314.43- 317.01	262.55	397.2	261.52- 263.89	53.01	94.75	52.73- 53.29
	TOTAL/ AVE	328.81	501.06		279.13	466.6 3		49.68	103.5 7	

From Tables 4.61 (2009) and 4.62 (2010) it can be seen that dispensing GPs generally have the lowest average cost per chronic prescription, except for the Northern Cape in 2010 where other providers had a lower average cost and Limpopo and Eastern Cape in 2010 where dispensing specialists had lower cost chronic medication prescriptions. In 2009, dispensing specialists had the lowest cost per prescription in five provinces, with the Free State's dispensing specialists having an average chronic medication prescription cost of R1.06 ± R0.00. Some provinces had no average, meaning that no chronic medication was dispensed by specialists. Because dispensing specialists dispensed only 247 out of the 6191147 chronic medication prescriptions, they can not necessarily be regarded as the most cost-effective provider of chronic medication. After analysing courier pharmacies as a provider, statistical significance was found between the average costs of the various provinces but no practical significance of $d=0.8$ or higher was established. This applied for both study years. For retail pharmacy providers, statistical significance was also found for both study years but no practical significance of $d=0.8$ or higher was found between average chronic medication costs within the different provinces.

Figure 4.30 indicates the average cost per provider per province for 2009. Standard deviations for the averages portrayed can be found in Table 4.61. In 2009, the province with the highest average chronic medication prescription cost was Gauteng, at R357.95 ± R650.68. The province with the lowest average chronic prescription cost was the Northern Cape, at R266.47 ± R336.10. The highest prescription values over this year were for other providers in Gauteng and for dispensing specialists in KZN. Dispensing specialists also had the lowest chronic prescription cost in the Free State.

For 2010, as indicated in Figure 4.31, the province with the highest average chronic medication cost was KZN, at R75.15 ± R577.61 and the province with the lowest was again the Northern Cape (R271.82 ± R313.54). Earlier in this chapter it was found that the Northern Cape was the only province where more chronic prescriptions were dispensed by courier pharmacies than by retail pharmacies. It is therefore interesting to note that this province also has the lowest average chronic medication prescription costs for the study period.

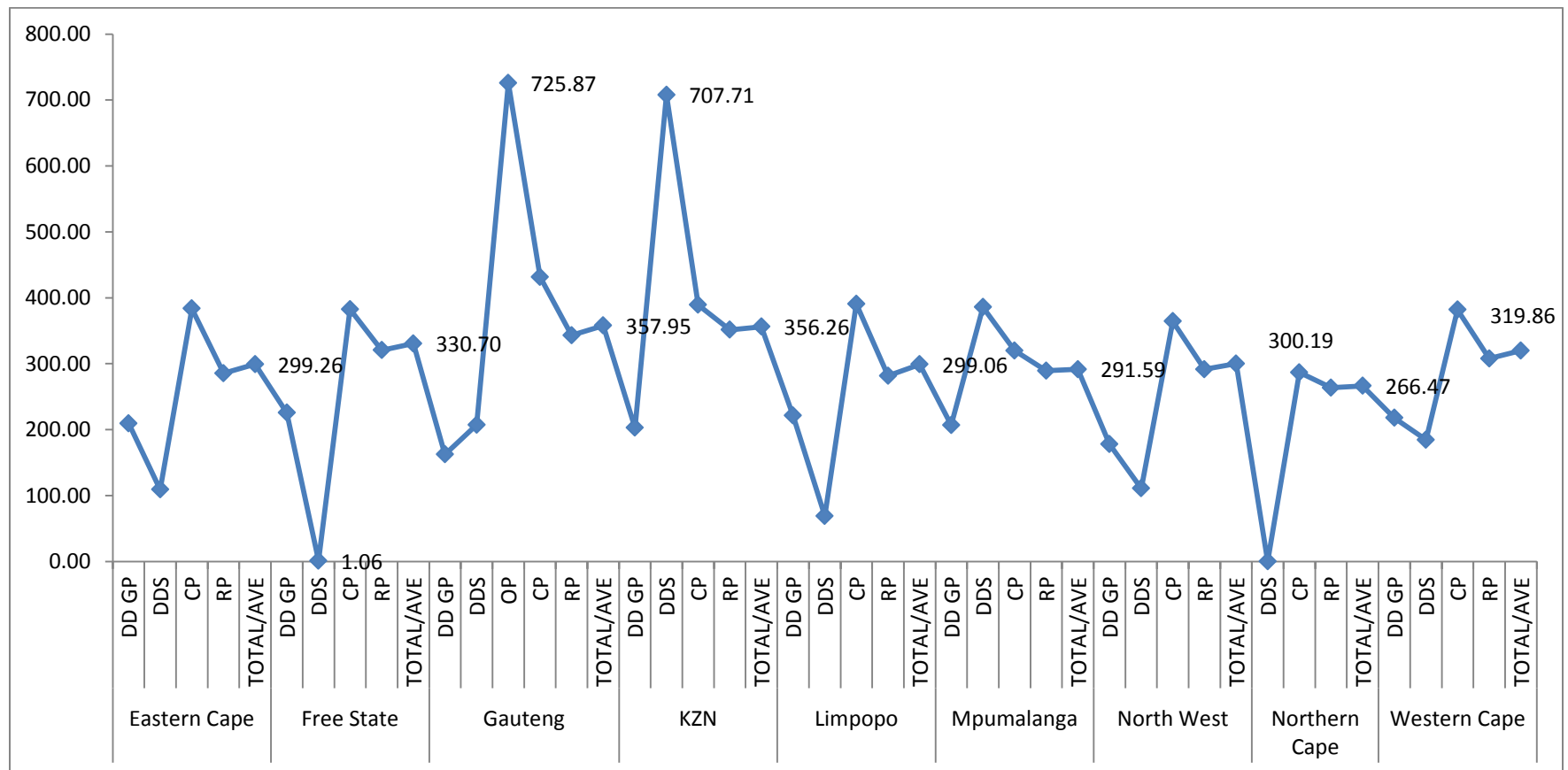


Figure 4.30: Average total chronic prescription cost per provider per province for 2009 (standard deviations for the averages found in Table 4.61)

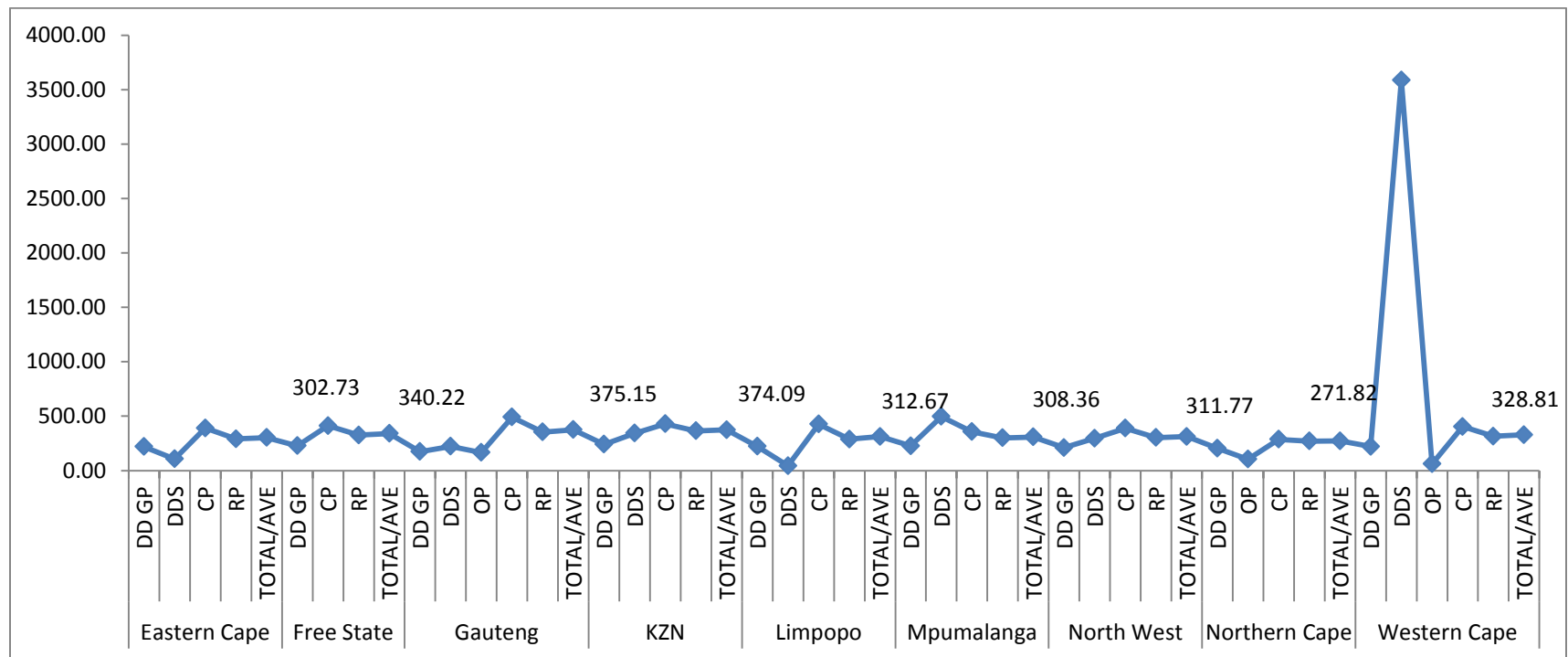


Figure 4.31: Average total chronic prescription cost per provider per province for 2010 (standard deviations for the averages found in Table 4.62)

As courier and retail pharmacy respectively contribute 18.54% and 79.15% of all chronic medication prescriptions dispensed, these two providers are the biggest providers of chronic medication.

The trends that emerge when comparing the total courier pharmacy cost to total retail pharmacy cost per chronic prescription in the various provinces are portrayed in Tables 4.63 and 4.64.

Table 4.63: Trend and effect sizes: courier vs. retail pharmacies per province for 2009

	Eastern Cape		Free State		Gauteng		Kwazulu-Natal		Limpopo	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier	383.7	840.47	382.48	1277.1	431.58	1122.83	389.32	730.1	390.83	1241.7
Retail	285.47	320.85	320.57	419.74	343.04	473.63	351.35	452.2	281.62	269.35
Trend	98.23		61.91		88.54		37.97		109.21	
d-value	0.1169		0.0485		0.07886		0.052		0.0879	
	Mpumalanga		North West		Northern Cape		Not Indicated		Western Cape	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier	319.87	341.84	364.4	456.24	286.88	456.68	555.72	1477.26	381.93	620.51
Retail	289.33	305.14	291.42	295.81	263.63	271.94	310.56	555.68	307.87	394.3
Trend	30.54		72.98		23.25		245.16		74.06	
d-value	0.0893		0.16		0.0509		0.166		0.11936	

When analysing the trends (difference in average cost between courier and retail pharmacy) for 2009, 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 (North West) which is considered a non-significant difference (0.2 is a small variance). 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.

From the trends for all the provinces in 2010 (Table 4.64), it can once again be seen that although courier pharmacies has a higher prescription cost for all provinces, no *d*-value was larger than 0.18 (North West province), indicating that the costs were similar for both types of pharmacies in all provinces (no practically significant differences).

Table 4.64: Trend and effect sizes: courier vs. retail pharmacies per province for 2010

	Eastern Cape		Free State		Gauteng		Kwazulu-Natal		Limpopo	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier	390.41	873.38	412.33	1736.37	491.68	1491	429.2	868.56	426.04	1594.73
Retail	290.65	341.15	325.47	414.4	354.19	491.84	364.51	491.21	288.42	277.79
Trend	99.75		86.86		137.49		64.69		137.62	
d-value	0.11		0.05		0.09		0.07		0.09	
	Mpumalanga		North West		Northern Cape		Not Indicated		Western Cape	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier	357.19	393.02	389.53	478.38	286.66	369.17	543.85	1328.36	403.4	745.52
Retail	300.71	317.44	302.45	354.41	270.43	287.69	312.47	523.82	315.56	432.27
Trend	56.48		87.08		16.22		231.39		87.84	
d-value	0.14		0.18		0.04		0.17		0.12	

In order to scrutinize costs even further, the item costs, as set out in Table 4:65, are explored.

Table 4.65: Average chronic medication item cost components per provider

Year	Provider	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
2009	DD GP	101.69	113.78	101.07-102.22	81.57	97.97	81.26-82.25	20.12	41.33	19.68-20.10
	DDS	208.67	399.26	154.40-275.53	178.03	373.25	124.86-237.10	30.64	101.34	17.30-50.68
	OP	4000.31	4051.65	3188.00-4812.61	3,770.78	3,837.58	3001.40-4540.17	229.52	889.51	51.19-407.86
	CP	152.1	545.86	151.28-152.97	137.68	540.79	136.88-138.55	14.42	58.07	14.32-14.50
	RP	150.74	226.15	150.54-150.92	126.08	213.65	126.03-126.39	24.66	54.32	24.47-24.56
	TOTAL/AVE	150.09	327.35		127.86	318.86		22.23	55.24	
2010	DD GP	106.65	130.39	105.97-107.34	86.05	113.86	85.45-86.64	20.6	42.13	20.38-29.83
	DDS	660.7	2382.26	125.13-757.59	622.01	2346.40	125.13-757.59	38.69	79.34	23.12-49.51
	OP	1327.73	2773.77	785.62-1869.83	1319.31	2773.58	273.29-777.24	8.42	59.99	-3.30-20.15
	CP	159.46	691.83	158.38-160.61	145.57	680.02	144.49-146.69	13.89	91.53	13.75-14.05
	RP	152.02	236.63	151.89-152.29	126.75	222.09	126.64-127.01	25.27	56.4	25.22-25.31
	TOTAL/AVE	152.71	379.34		129.91	367.87		22.8	65.28	

Table 4.65 shows that (except for “other providers”), the highest average total item cost was for dispensing specialists in 2009 and 2010. Dispensing GPs had the lowest chronic item cost on average, while courier and retail pharmacies had similar item costs.

When comparing the average chronic medication item costs per provider, statistical significance was determined between the average item costs of courier and retail pharmacies. It was found that the difference was of no practical significance (*d*-value of 0.0043). The only other practical significance in difference between items costs was found between dispensing specialists and dispensing GPs, with a *d*-value was 0.35. As previously discussed, the type of items dispensed by specialists may be higher in cost than items dispensed by a GP. Other providers varied significantly when comparing average item costs, but this aspect will not be discussed in further detail.

Table 4.66, which illustrates the trends between retail and courier pharmacies, will explore the variations between the providers further.

Table 4.66: Trends and effect sizes: item costs for retail and courier pharmacies

Provider	2009		2010	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier Pharmacy	152.10	545.86	159.46	691.83
Retail Pharmacy	150.74	226.15	152.02	236.63
Trend	1.35		7.44	
<i>d</i>-value	0.00248		0.010758	

Table 4.66 illustrates that, indeed, the difference in total average item costs between retail and courier pharmacies were statistically non-significant for chronic medication in both study years. The split of chronic medication item costs per gender is investigated in Tables 4.67 and 4.68.

Table 4.67: Average medication item costs according to gender groups per provider in 2009

		$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Males	DD GP	102.34	119.64	101.66-103.55	83.22	104.93	82.81-84.46	19.12	41.72	18.64-19.30
	DDS	175.71	226.9	109.19-244.21	129.76	157.47	83.82-177.90	45.94	166.49	-3.05-94.73
	OP	5246.55	3870.62	3896.03-6597.07	4920.40	3642.71	3649.39-6191.40	326.16	1063.26	-44.83-697.14
	CP	157.71	605.86	156.43-159.13	143.68	600.84	142.33-145.09	14.03	65.45	13.88-14.18
	RP	157.79	251.74	157.37-158.03	133.34	238.85	133.08-133.70	24.45	55.9	24.24-24.38

	TOTAL/ AVE	156.71	370.76		134.92	362.25		21.79	58.44	
Females	DD GP	101.23	109.53	100.25- 101.69	80.42	92.81	79.82- 81.04	20.81	41.04	20.27- 20.81
	DDS	221.19	447.96	149.60- 308.86	196.36	426.84	124.51- 274.82	24.83	60.98	15.04- 44.09
	OP	3338.2 4	4017.99	2334.58- 4341.90	3160.05	3825.21	2204.55- 4115.56	178.19	786.35	-18.24- 374.61
	CP	147.49	491.12	146.49- 148.54	132.76	485.93	131.78- 133.81	14.73	51.22	14.11- 14.83
	RP	145.85	206.41	145.63- 146.08	121.04	194.1	120.98- 121.40	24.81	53.2	24.60- 24.72
	TOTAL/ AVE	145.32	291.97		122.77	283.37		22.56	52.81	

In 2009, males had a higher average chronic item cost than females (R156.71 ± R370.76 versus R145.32 ± R291.97). The medical scheme contribution for males was also higher than that for females per chronic item. Interestingly enough, the levies for males per chronic item was slightly lower than that of females (R21.79 ± R58.44 versus R22.56 ± R52.81). There was, however, no statistical or practical significance found between the male and female chronic item costs for the identified providers for either of the study years.

Table 4.68 Average medication item costs according to gender groups per provider in 2010

		$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Males	DD GP	108.49	140.66	107.34- 109.63	88.59	127.7	87.53- 89.61	19.9	43.76	19.55- 20.26
	DDS	141.59	201.83	94.63- 184.68	116.2	178.02	74.34- 153.56	25.39	75.13	8.89- 42.52
	OP	3075.15	3844.33	1665.03- 4485.26	3052.01	3853.05	1638.70- 4465.32	23.13	108	-16.48- 62.75
	CP	166.91	829.09	164.98- 168.94	153.16	812.62	151.25- 155.14	13.75	115.03	13.48- 14.03
	RP	158.71	272.03	158.45- 159.16	133.41	256.9	133.17- 133.84	25.31	58.58	25.23- 25.38
	TOTAL/ AVE	159.61	458.99		137	445.58		22.61	74.97	
Females	DD GP	105.35	122.57	104.51- 106.19	84.25	102.9	83.55- 84.96	21.09	40.92	20.82- 21.38
	DDS	1192.95	3310.6	189.12- 1786.65	1140.62	3263.79	147.88- 1723.24	52.33	81.68	31.12- 73.53
	OP	575.37	1703.31	175.11- 975.63	573.28	1703.92	172.88- 973.68	2.09	10.32	-0.33- 4.51
	CP	153.25	551.6	152.06- 154.47	139.23	545.07	138.05- 140.43	14.02	65.77	13.88- 14.17
	RP	147.24	207.57	147.06- 147.42	122	193.3	121.84- 122.67	25.24	54.79	25.18- 25.30
	TOTAL/ AVE	147.61	307.52		124.68	297.68		22.93	57.07	

Table 4.68 illustrates that in 2010 the average male chronic item cost was once again higher than that of item costs for females. Dispensing GPs had the lowest average item cost for both genders. It was once again found as in 2009, that although the average item cost and medical scheme contribution per item was higher for males, they had a slightly smaller patient levy ($R22.61 \pm R74.97$ for males and $R22.93 \pm R57.07$ for females).

Tables 4.69 and 4.70 explore the trends and differences for gender chronic item cost between retail and courier pharmacies.

Table 4.69: Trends and effect sizes: average total cost per item for gender groups – courier vs. retail 2009

Provider	Males		Females	
	$\bar{x}_{Tcost} (R)$	SD (R)	$\bar{x}_{Tcost} (R)$	SD (R)
Courier Pharmacy	157.71	605.86	147.49	491.12
Retail Pharmacy	157.79	251.74	145.85	206.41
Trend	-0.08		1.64	
d-value	0		0	

In 2009, it was found that item cost was slightly higher for courier pharmacies in females but slightly lower for males. The *d*-values, however, indicate no statistical significance. This is supported by a GLM procedure which indicates that there are no significant differences in average item costs between males and females for courier and retail pharmacies.

Table 4.70: Trends and effect sizes: average total cost per item for gender groups – courier vs. retail 2010

Provider	Males		Females	
	$\bar{x}_{Tcost} (R)$	SD (R)	$\bar{x}_{Tcost} (R)$	SD (R)
Courier Pharmacy	166.91	829.09	153.25	551.6
Retail Pharmacy	158.71	272.03	147.24	207.57
Trend	8.19		6.01	
d-value	0.01		0.01	

In 2010, there was once again no statistical significance between the average chronic item cost for retail and courier pharmacies and items costs were very similar for both pharmacy types in both male and female patients. This is again supported by a GLM procedure on 2010 data indicating that there are no significant differences in average item costs between males and females for courier and retail pharmacies.

Although the total average item costs may be similar, the patient levy is an important part of any cost analysis, as this is the out-of-pocket expense that the scheme members have to pay.

Tables 4.71 and 4.72 investigate the trends in patient levies for retail and courier pharmacies when receiving chronic medication items.

Table 4.71: Average chronic medication levy cost per provider and gender – 2009

Provider	Males		Females	
	$\bar{x}_{\text{Levy}} \text{ (R)}$	SD (R)	$\bar{x}_{\text{Levy}} \text{ (R)}$	SD (R)
Courier Pharmacy	13.75	115.03	14.02	65.77
Retail Pharmacy	25.31	58.58	25.24	54.79
Trend	-11.56		-11.22	
d-value	-0.1		-0.17	

The data from 2009 show that chronic item levies were more at retail pharmacies than courier pharmacies for both genders, although not statistically significant.

Table 4.72: Average chronic medication levy cost per provider and gender – 2010

Provider	Males		Females	
	$\bar{x}_{\text{Levy}} \text{ (R)}$	SD (R)	$\bar{x}_{\text{Levy}} \text{ (R)}$	SD (R)
Courier Pharmacy	14.03	65.45	14.73	51.22
Retail Pharmacy	24.45	55.9	24.81	53.2
Trend	-10.42		-10.08	
d-value	-0.16		-0.2	

In 2010, the average item levies for retail pharmacies were once again more than that of courier pharmacies. For female patients, the levies were statistically significantly higher by a small margin (*d*-value of 0.2). The difference in levy, however, was not practically significant between retail and courier pharmacies.

Now that the item costs per gender have been analysed, the item costs per age group are to follow.

Table 4.73: Average chronic medication item cost elements – age groups per provider: 2009

2009 Items		$\bar{x}_{\text{Tcost}} \text{ (R)}$	SD (R)	95% CI	$\bar{x}_{\text{Scheme}} \text{ (R)}$	SD (R)	95% CI	$\bar{x}_{\text{Levy}} \text{ (R)}$	SD (R)	95% CI
Age group 1	DD GP	102.74	141.65	94.95-108.19	87.51	124.54	80.90-92.60	15.23	35.64	12.96-16.60
	DDS	91.24	79.49	63.75-127.17	82.73	75.18	59.29-106.43	8.51	4.45	4.29-20.90
	OP	6677.48	3298.54	7020.08-8656.53	6288.70	3157.01	6522.93-8146.38	388.78	1143.55	-71.55-1078.84
	CP	299.39	1596.85	316.83-386.44	277.1	1596.28	294.26-363.88	22.3	60.14	21.61-23.52
	RP	278.72	345.21	280.46-285.98	241.09	331.13	242.14-247.50	37.62	90.61	37.75-39.05

	TOTAL/ AVE	281.99	806.39		247.93	800.01		34.06	88.25	
Age group 2	DD GP	88.81	150.82	87.01- 96.98	72.86	136.37	72.72- 81.99	15.96	40.21	13.55- 15.73
	DDS	198.84	397.36	-98.43- 917.78	160.51	310.36	-89.92- 743.60	38.33	90.66	-55.58- 221.26
	OP	420.69	694.22	-2310.38- 3783.20	420.69	694.22	-2310.38- 3783.20	0	0	n/a
	CP	273.32	1075.87	263.35- 286.33	256.52	1071.89	247.28- 270.17	16.8	81.94	15.19- 17.03
	RP	232.04	478.05	240.15- 246.33	199.62	461.77	209.37- 215.32	32.42	89.13	30.35- 31.44
	TOTAL/ AVE	240.26	689.32		212.38	679.8		27.88	86.81	
Age group 3	DD GP	90.2	107.66	92.76- 95.45	72.83	94.08	76.33- 78.71	17.38	38.1	16.13- 17.04
	DDS	243.82	197.77	88.08- 467.09	221.24	186.51	54.06- 434.42	22.59	30.19	5.62- 61.42
	OP	1210.68		n/a	1210.68		n/a	0		n/a
	CP	159.35	516.39	157.83- 161.00	144.93	510.08	144.36- 147.49	14.43	59.19	13.26- 13.70
	RP	156.7	263.23	160.12- 161.32	131.93	251.52	135.48- 136.63	24.77	56.83	24.55- 24.79
	TOTAL/ AVE	155.76	342.49		133.75	333.55		22.01	57.24	
Age group 4	DD GP	111.42	112.47	109.48- 112.55	88.78	96.55	87.84- 90.47	22.64	43.56	21.23- 22.49
	DDS	326.57	684.16	-30.09- 377.53	265.55	666.69	16.58- 120.95	61.02	183.62	-108.16- 318.06
	OP	219.24	224.9	n/a	208.07	226.76	n/a	11.16	46.43	n/a
	CP	129	352.36	133.76- 136.22	115.01	345.57	119.71- 122.10	13.99	55.35	13.85- 14.32
	RP	137.76	150.24	142.66- 143.30	114.46	136.84	119.99- 120.58	23.29	47.05	22.60- 22.79
	TOTAL/ AVE	135.35	212.28		114.14	202.52		21.21	49.12	
Age group 5	DD GP	112.89	109.08	114.42- 119.97	89.48	86.89	91.85- 96.51	23.42	44.28	22.15- 23.88
	DDS	200	32.47	7020.08- 8656.53	177.1	49.51	6522.93- 8146.38	22.9	41.12	-71.55- 1078.84
	OP	29.6	21.66	-165.00- 224.19	25.06	15.24	-111.85- 161.96	4.54	6.42	-53.15- 62.23
	CP	119.93	497	123.98- 137.60	106.67	494.39	111.59- 125.19	13.26	41.28	12.08- 12.73
	RP	130.3	133.8	132.73- 134.06	105.95	116.11	109.69- 110.89	24.35	44.94	22.91- 23.30
	TOTAL/ AVE	128.15	236.77		105.67	227.89		22.47	44.53	

In 2009, age group 5 (80+ years) had the lowest average chronic item cost (R128 ± R236.77) while age group 1 had the highest average item cost (R281.00 ± R806.39). With the exception of dispensing specialists in age group 1, dispensing doctors once again had the lowest average

item costs for all age groups. The age group with the highest patient levy per chronic item was found to be age group 1 (R34.06 ± R88.25) while age group 3 (40-59 years) had the lowest average levy per chronic medication item at R22.01 ± R57.24.

Table 4.74: Average chronic medication item cost elements – age groups per provider: 2010

2010 Items		$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
Age group 1	DD GP	123.82	151.26	117.20-130.43	104.16	131.08	98.43-109.90	19.65	48.22	17.54-21.76
	DDS	108.94	120.96	72.14-138.53	80.75	48.87	65.80-87.42	28.19	85.38	4.75-52.71
	OP	4155.95	4349.3	2120.39-6191.15	4155.95	4349.35	2120.39-6191.15	0	0	0
	CP	310.83	996.58	297.59-324.62	287.96	986.2	274.84-301.59	22.87	157.35	20.76-25.03
	RP	291.46	376.43	289.41-294.25	252.31	360.81	250.40-255.04	39.15	90.23	38.54-39.69
	TOTAL/AVE	292.6	545.15		256.7	533.15		35.91	105.06	
Age group 2	DD GP	94.98	226.41	89.79-100.17	78.07	214.07	73.16-82.97	19.65	48.22	15.84-18.00
	DDS	2906.81	5756.2	-685.07-4735.65	2844.95	5662.34	-695.02-4637.32	28.19	85.38	5.80-102.48
	OP	466.41	1705.3	-170.36-1103.17	466.38	1705.30	-170.39-1103.15	0	0	-0.03-0.08
	CP	333.43	1869.7	321.42-345.21	319.22	1851.29	307.33-330.88	22.87	157.35	13.32-14.80
	RP	236.17	488.27	234.55-238.90	203.91	466.59	202.37-205.75	39.15	90.23	31.94-32.59
	TOTAL/AVE	257.08	1010.9		229.45	995.31		27.63	89.55	
Age group 3	DD GP	95.33	112.27	94.37-96.28	77.43	99.78	76.57-78.27	17.9	37.1	17.59-18.22
	DDS	522.57	780.77	177.83-799.87	485.81	788.89	136.26-763.86	36.76	58.43	2.53-65.05
	OP	1195.06	2232.2	-41.09-2431.20	1187.22	2236.05	-51.06-2425.51	7.83	20.62	-3.59-19.25
	CP	164.9	578.53	163.38-166.44	151.73	570.58	150.22-153.25	13.17	88	12.94-13.41
	RP	158.44	274.69	158.10-158.91	133.28	261.5	132.96-133.73	25.16	58.57	25.07-25.24
	TOTAL/AVE	158.52	365.96		136.29	355.7		22.24	66.36	
Age group 4	DD GP	115.07	129.62	114.00-116.16	92.6	111.43	91.68-93.53	22.47	43.54	22.11-22.84
	DDS	320.37	541.36	147.05-540.48	279.25	538.08	108.96-501.66	41.12	73.98	16.61-60.31
	OP	400.81	780.32	136.79-664.83	381.52	746.29	129.01-634.02	19.3	100.16	-14.59-53.18
	CP	133.94	480.27	132.83-135.11	119.8	462.83	118.72-120.92	14.14	96.39	13.92-14.38

	RP	138.44	164.66	138.28-138.68	114.3	149.49	114.16-114.52	24.14	50.25	24.08-24.20
	TOTAL/AVE	137.12	262.23		115.07	248.21		22.06	62.62	
Age group 5	DD GP	115.53	124.45	113.82-117.21	91.63	98.77	90.27-92.96	23.9	47.13	23.26-24.54
	DDS	20	0	0	20	0	0	0	0	0
	OP	3644.99	5077.4	-41973.33-49263.31	3617.62	5116.08	-42348.54-49583.77	27.38	38.71	-320.46-375.21
	CP	118.55	250.79	117.20-119.94	104.55	239.81	103.26-105.88	13.99	58.26	13.68-14.32
	RP	131.52	134.11	131.23-131.86	106.66	113.76	106.41-106.95	24.86	47.54	24.75-24.97
	TOTAL/AVE	129.15	157.74		105.98	140.52		23.18	49.48	

Similar to 2009, age group 1 once again had the highest chronic average item cost (R292.60 ± R545.15) and levy (R35.91± R105.06). Age group 5 had the lowest average item cost at R129.15 ± R157.74. Age group 4 had the lowest average chronic item levy (R22.06±R62.62). Dispensing GPs again had the lowest chronic item costs of all the providers.

The majority of chronic items in this study population were dispensed by courier and retail pharmacies and therefore item cost difference between these two providers will be analysed further.

Table 4.75: Trend and effect sizes: average total item cost differences per age group for 2009: retail vs. courier pharmacy

Provider	Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier Pharmacy	299.39	1596.85	273.32	1075.87	159.35	516.39	129	352.36	119.93	497
Retail Pharmacy	278.72	345.21	232.04	478.05	156.7	263.23	137.76	150.24	130.3	133.8
Trend	20.68		41.28		2.65		-8.76		-10.37	
d-value	0.01		0.04		0.01		-0.02		-0.02	

For age groups 1 to 3, retail pharmacy chronic items were slightly less expensive than that of courier pharmacies. For age groups 4 and 5, however, courier pharmacies dispensed chronic medication items at a lower average cost. When studying the *d*-values, no significance is found in these variances. In 2009, there were only slight variances between the average costs per age group for courier pharmacies. Only age group 5 and 1 (*d*=0.33) and age group 4 and 1 (*d*= 0.31)

indicated statistically significant variances. For retail pharmacies, statistically significant average item cost differences were found between age groups 1 and 3, 1 and 4, 1 and 5, 2 and 3, 3 and 4 and 2 and 5. No values were practically significant.

Table 4.76: Trend and effect sizes: average total item cost differences per age group for 2010: retail vs. courier pharmacy

	Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)	$\bar{x}_{Tcost}$ (R)	SD (R)
Courier Pharmacy	310.83	996.58	333.43	1869.68	164.9	578.53	133.94	480.27	118.55	250.79
Retail Pharmacy	291.46	376.43	236.17	488.27	158.44	274.69	138.44	164.66	131.52	134.11
Trend	19.36		97.26		6.45		-4.5		-12.98	
d-value	0.02		0.05		0.01		-0.01		-0.05	

The same characteristics were displayed in 2010 as in 2009, with retail pharmacy chronic items being slightly less expensive than courier pharmacy for age groups 1-3. For age groups 4 and 5, however, courier pharmacies dispensed chronic medication items at a lower average cost. The *d*-values again indicated no practical significance. It can therefore be assumed that the average chronic item cost was much the same for all age groups for retail and courier pharmacies. In 2010, the only statistically significant item cost difference were between age groups 2 and 4 (*d* =0.31) for courier pharmacies. For retail pharmacies, the trend was exactly the same as in 2009, with the age group variances with a *d*-value of greater than 0.3 observed in age groups 1 and 3, 1 and 4, 1 and 5, 2 and 3, 3 and 4 and 2 and 5.

Tables 4.77 and 4.78 analyse the difference in item levy cost for chronic medication when received from a courier pharmacy versus a retail pharmacy for each age group.

Table 4.77: Trend and effect sizes: average item levy cost differences per age group for 2009 – retail vs. courier pharmacy

Provider	Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
	$\bar{x}_{Levy}$ (R)	SD (R)	$\bar{x}_{Levy}$ (R)	SD (R)	$\bar{x}_{Levy}$ (R)	SD (R)	$\bar{x}_{Levy}$ (R)	SD (R)	$\bar{x}_{Levy}$ (R)	SD (R)
Courier Pharmacy	22.3	60.14	16.8	81.94	14.43	59.19	13.99	55.35	13.26	41.28
Retail Pharmacy	37.62	90.61	32.42	89.13	24.77	56.83	23.29	47.05	24.35	44.94
Trend	15.32		15.62		10.34		9.3		11.09	
d-value	0.25		0.19		0.17		0.17		0.27	

Table 4.77 illustrates that 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

significantly more expensive to receive a chronic medication item from a retail pharmacy than a courier pharmacy in terms of levy paid by the patient. When comparing the various age groups receiving medication from a courier pharmacy with a GLM procedure, it is found that although there is statistical significance between the levy costs of all age groups, no practical significance was determined. When doing the same test for retail pharmacies, a small statistical significance can be seen between age groups 1 and 4 ($d=0.26$) and age groups 1 and 5 ($d=0.28$).

Table 4.78: Trend and effect sizes: average item levy cost differences per age group for 2010: retail vs. courier pharmacy

Provider	Age group 1		Age group 2		Age group 3		Age group 4		Age group 5	
	$\bar{x}_{\text{Levy}} (R)$	SD (R)	$\bar{x}_{\text{Levy}} (R)$	SD (R)	$\bar{x}_{\text{Levy}} (R)$	SD (R)	$\bar{x}_{\text{Levy}} (R)$	SD (R)	$\bar{x}_{\text{Levy}} (R)$	SD (R)
Courier Pharmacy	22.87	157.4	22.87	157.35	13.17	88	14.14	96.39	13.99	58.26
Retail Pharmacy	39.15	90.23	39.15	90.23	25.16	58.6	24.14	50.25	24.86	47.54
Trend	16.28		16.28		11.99		10		10.87	
d-value	0.1		0.1		0.14		0.1		0.19	

As in 2009, patient levies were lower at courier pharmacies than at retail pharmacies for all age groups. For 2010, however, these differences were of no statistical significance. When comparing the various age groups receiving medication from a courier pharmacy with a GLM procedure, it is found that although there is statistical significance within the levy costs between age groups 1 and 2, 1 and 4, 1 and 5 and 1 and 3, no practical significance was determined. When doing the same test for retail pharmacies, a small statistical significance can be seen between age groups 1 and 3 ($d=0.26$), age groups 1 and 4 ($d=0.29$) as well as 1 and 5 ($d=0.29$).

Table 4.79 compares difference between the average item costs of the various providers for 2009 and 2010.

Table 4.79: Trends and effect sizes: average chronic prescription item costs per provider for 2009 and 2010

Year	Provider	$\bar{x}_{\text{Tcost}} (R)$		$\bar{x}_{\text{Scheme}} (R)$		$\bar{x}_{\text{Levy}} (R)$	
		Trend	d-value	Trend	d-value	Trend	d-value
2009-2010	DD GP	4.97	0.04	4.48	0.04	0.48	0.01
	DDS	452.02	0.19	443.98	0.19	8.05	0.08
	OP	2672.58	0.53	2451.47	0.63	221.10	0.25
	CP	7.37	0.01	7.89	0.01	0.53	0.01
	RP	1.28	0.01	0.67	0.00	0.61	0.01
	AVE	2.61	0.01	2.05	0.01	0.57	0.01

It can be deduced that, as the *d*-values are of non-significant size, the average item costs for 2009 and 2010 were similar for both of these providers.

The number of chronic prescriptions and items as well as the cost of chronic prescriptions and items have now been discussed. One of the factors influencing the cost of medication could be the type of medication (e.g. originator or generic medication). Tables 4.81 to 4.82 describe the trends for different types of chronic medication dispensed per provider. Table 4.80 recaps the abbreviations used to describe the type of medication dispensed, as set out in the introduction of this chapter.

Table 4.80: Key to medication type

M	Innovator medicine items with valid patents and available generic substitutes
N	Innovator medicine items with no available generic products
O	Innovator medicine items with available generic products
Y	Generic products

Table 4.81: Type of medication dispensed per provider type in 2009

2009	Type of medication	N _{Items}	As % of total	T _{cost}	As % of total	$\bar{x}_{Tcost} (R)$	SD	95% CI
DD GP	M	64	0%	34859.43	0%	544.68	318.49	456.12-624.23
	N	30548	21%	5627017.73	38%	184.2	174.23	182.43-186.27
	O	23037	16%	2507278.83	17%	108.84	108.79	108.00-110.76
	Y	91105	63%	6550176.44	45%	71.9	63.29	71.41-72.22
	TOTAL/AVE	144754	100%	14719332.43	100%	101.69	113.78	
DDS	M	1	1%	544.64	2%	544.64		n/a
	N	78	52%	24421.82	79%	313.1	523.75	214.66-428.73
	O	19	13%	1780.63	6%	93.72	106.04	40.44-133.95
	Y	51	34%	4345.26	14%	85.2	74.31	64.03-104.31
	TOTAL/AVE	149	100%	31092.35	100%	208.67	399.26	
OP	M	0	0%	0	0%	0	0	n/a
	N	93	95%	391617.34	100%	4210.94	4053.18	3376.20-5045.68
	O	3	3%	341.08	0%	113.69	179.15	-331.35-558.73
	Y	2	2%	71.7	0%	35.85	12.81	-79.27-150.97

	TOTAL/AVE	98	100%	392030.12	100%	4000.31	4051.65	
CP	M	1143	0%	741590	0%	648.81	294.44	631.72-665.90
	N	391104	24%	127591895	52%	326.24	1074.57	322.69-329.41
	O	212576	13%	23747224	10%	111.71	130.43	111.26-112.37
	Y	996194	62%	91428074	38%	91.78	75.02	91.67-91.97
	TOTAL/AVE	1601017	100%	243508784	100%	152.1	545.86	
RP	M	4400	0%	2418739	0%	549.71	365.87	542.24-563.62
	N	1571806	30%	379319728	48%	241.33	363.77	240.64-241.76
	O	1014093	19%	127094884	16%	125.33	145.65	125.34-125.90
	Y	2680712	51%	285732195	36%	106.59	86.41	106.55-106.75
	TOTAL/AVE	5271011	100%	794565546	100%	150.74	226.15	

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 this percentage was 51% at retail pharmacies. Dispensing specialists mostly dispensed originator products with no generic equivalent (52%). The average price per item for generic products was the lowest for all the providers, with a narrow confidence interval for all of these values. Other providers are not being discussed as they do not represent a large portion of the patient population.

Table 4.82: Type of medication dispensed per provider type in 2010

2010	Type of medication	N _{items}	As % of total	T _{cost}	As % of total	$\bar{x}_{Tcost}(R)$	SD	95% CI
DD GP	M	165	0%	109175.35	1%	661.67	330.23	610.91-712.43
	N	23590	17%	5396713.08	36%	228.77	222.06	225.94-231.60
	O	26981	19%	2770820.26	19%	102.7	106.83	101.42-103.97
	Y	88300	64%	6551777.39	44%	74.2	65.48	73.76-74.63
	TOTAL/AVE	139036	100%	14828486.08	100%	106.65	130.39	
DDS	M	0	0%	0	0%	0	0	n/a
	N	92	58%	99654.73	94%	1083.2	3079.66	218.12-1395.18
	O	13	8%	2033.73	2%	156.44	196.7	14.99-257.58

	Y	55	34%	4023.04	4%	73.15	42.82	66.06-89.71
	TOTAL/AVE	160	100%	105711.5	100%	660.7	2382.26	
OP	M	1	1%	125.58	0%	125.58		n/a
	N	71	69%	126430.2	92%	1780.71	3143.86	1036.57-2524.85
	O	2	2%	3.63	0%	1.82	0.15	0.48-3.15
	Y	29	28%	10196.79	7%	351.61	1278.09	-134.55-837.77
	TOTAL/AVE	103	100%	136756.2	100%	1327.73	2773.77	
CP	M	2235	0%	1411244.84	1%	631.43	277.76	619.91-642.95
	N	278580	19%	123816827.7	53%	444.46	1542.19	438.66-450.10
	O	250719	17%	25415472.14	11%	101.37	140.56	100.86-101.96
	Y	937885	64%	83672932.56	36%	89.21	86.55	89.05-89.40
	TOTAL/AVE	1469419	100%	234316477.2	100%	159.46	691.83	
RP	M	8064	0%	5332622.56	1%	661.29	343.22	653.76-668.73
	N	1265756	23%	370355621.2	45%	292.6	412.45	292.00-293.43
	O	1280038	24%	146106911.7	18%	114.14	148.9	113.93-114.44
	Y	2865941	53%	302116783.9	37%	105.42	90.87	105.34-105.55
	TOTAL/AVE	5419799	100%	823911939.5	100%	152.02	236.63	

In 2010, the average item costs for generics were once again lower than the originator products for all providers (except for other providers), with narrow confidence intervals to support this data. Dispensing GPs again dispensed the most generics (64%) of all chronic medication dispensed by them. Of all chronic medication dispensed by courier pharmacies, 64% were generics, while this percentage was 53% at retail pharmacies. Dispensing specialists again mostly dispensed originator products with no generic equivalent (58%). When looking at retail and courier pharmacies specifically, it is seen that where generics were dispensed, the associated medication costs were also less. 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.

Table 4.83: Cost breakdown: types of medication dispensed by courier and retail pharmacies in 2009

2009	Type of medication	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
CP	M	648.81	294.44	631.72-665.90	643.44	298.87	626.09-660.78	5.37	26.74	3.82-6.93
	N	326.24	1074.57	322.69-329.41	301.22	1068.49	297.73-304.41	25.02	100.27	24.67-25.29
	O	111.71	130.43	111.26-112.37	85.15	108.02	84.76-85.68	26.57	58.55	26.35-26.85
	Y	91.78	75.02	91.67-91.97	84.11	70.36	84.01-84.29	7.67	24.88	7.61-7.12
	TOTAL/AVE	152.1	545.86		137.68	540.79		14.42	58.07	
RP	M	549.71	365.87	542.24-563.62	520.01	359	511.36-532.22	29.7	79.79	28.76-33.52
	N	241.33	363.77	240.64-241.76	207.46	351.7	207.11-208.20	33.86	73.87	33.44-33.66
	O	125.33	145.65	125.34-125.90	92.46	117.74	92.41-92.86	32.87	61.81	32.87-33.10
	Y	106.59	86.41	106.55-106.75	90.44	77.04	90.54-90.73	16.15	31.6	15.98-16.05
	TOTAL/AVE	150.74	226.15		126.08	213.65		24.66	54.32	

For courier and retail pharmacies, the average item costs and also the lowest patient levy were 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 practically significant difference.

When testing the statistical and practical significance of the difference between average costs of various types of medication, a GLM procedure highlighted the results as portrayed in Tables 4.84 (courier pharmacy) and 4.85 (retail pharmacy).

Table 4.84: Average costs for types of chronic medication in 2009 – courier pharmacies

Compared medication groups	Statistically significant? ($p \leq 0.001$)	d-value	Practically significant?	Size of significance
M-N	Yes	0.40	No	n/a
M-O	Yes	0.91	Yes	Large
M-Y	Yes	0.94	Yes	Large
N-M	Yes	-0.40	No	n/a
N-O	Yes	0.50	No	n/a
N-Y	Yes	0.53	No	n/a
O-Y	Yes	0.03	No	n/a

Table 4.84 indicates that the largest practical significance was found between the average cost of originator medication with patent and available generics and generics ($d=0.94$). When receiving medication from a courier pharmacy, it seems that there is no practically significant difference in cost between originators with available generics and generics ($d=0.03$). This could be due to the fact that “old” or off-patent originator drugs are often priced lower than their originator counterparts where the patent is still in place.

Table 4.85: Average costs for types of chronic medication in 2009 – retail pharmacies

Compared medication groups	Statistically significant? ($p \leq 0.001$)	d-value	Practically significant?	Size of significance
M-N	Yes	1.57	Yes	Large
M-O	Yes	2.33	Yes	Large
M-Y	Yes	2.39	Yes	Large
N-M	Yes	-1.57	Yes	Large
N-O	Yes	0.76	No	n/a
N-Y	Yes	0.83	Yes	Large
O-Y	Yes	0.06	No	n/a

Table 4.85 shows that, as with courier pharmacies, there is no practical significance in the difference of the costs of originators without patents and generics ($d=0.06$). The largest practical significance was once again noted for originators on patent compared to generic drugs ($d=2.39$). Originators with patent were also significantly more costly than off-patent originators with generics ($d=2.33$).

Table 4.86: Cost breakdown: types of medication dispensed by courier and retail pharmacies in 2010

2010	Type of medication	$\bar{x}_{Tcost}$ (R)	SD (R)	95% CI	$\bar{x}_{Scheme}$ (R)	SD (R)	95% CI	$\bar{x}_{Levy}$ (R)	SD (R)	95% CI
CP	M	631.43	277.76	619.91-642.95	626.07	275.01	614.66-637.47	5.36	61.82	2.80-7.93
	N	444.46	1542.19	438.66-450.10	415.91	1520.56	410.18-421.46	28.54	193.65	27.84-29.28
	O	101.37	140.56	100.86-101.96	78.83	117.98	78.40-79.32	22.54	56.59	22.32-22.77
	Y	89.21	86.55	89.05-89.40	81.96	79.6	81.81-82.13	7.25	31.52	7.19-7.32
	TOTAL/AVE	159.46	691.83		145.57	680.02		13.89	91.53	
RP	M	661.29	343.22	653.76-668.73	635.83	333.34	628.54-643.09	25.46	77.35	23.75-27.12
	N	292.6	412.45	292.00-293.43	252.1	398.95	251.54-252.93	40.5	81.5	40.34-40.63
	O	114.14	148.9	113.93-114.44	83.63	119.16	83.47-83.88	30.52	63.49	30.41-30.62
	Y	105.42	90.87	105.34-105.55	89.22	80.14	89.16-89.34	16.19	32.67	16.15-16.23
	TOTAL/AVE	152.02	236.63		126.75	222.09		25.27	56.4	

In 2010, innovator medicine items with valid patents and available generic substitutes were again the most costly for both providers. Retail pharmacy again had a non-significantly lower average item cost (d -value 0.01) and courier pharmacy had non-significantly lower patient co-payments (d -value 0.12). Based on the trends of 2009 and 2010, it is seen that although courier pharmacies have higher average item costs, the average patient levies are lower than in retail pharmacies for chronic medication. A possible reason could be that courier pharmacies utilise the correct chronic medication as per scheme authorization. This will result in lower patient co-payments because the scheme reimburses bigger portions of these drugs.

Tables 4.87 and 4.88 give the results of a GLM procedure testing the statistical and practical significance of the difference between average costs of various types of chronic medication for courier and retail pharmacies respectively.

Table 4.87 shows that there were no practically significant results from comparing the various medication groups with one another. This may be due to less medication of high values (typically M or N-class) being dispensed.

Table 4.87: Average costs for types of chronic medication in 2010: courier pharmacies

Compared medication groups	Statistically significant? ($p \leq 0.001$)	<i>d</i> -value	Practically significant?	Size of significance
M-N	Yes	0.14	No	n/a
M-O	Yes	0.63	No	n/a
M-Y	Yes	0.66	No	n/a
N-M	Yes	-0.14	No	n/a
N-O	Yes	0.49	No	n/a
N-Y	Yes	0.52	No	n/a
O-Y	Yes	0.03	No	n/a

Table 4.88: Average costs for types of chronic medication in 2010: retail pharmacies

Compared medication groups	Statistically significant? ($p \leq 0.001$)	<i>d</i> -value	Practically significant?	Size of significance
M-N	Yes	1.30	Yes	Large
M-O	Yes	2.15	Yes	Large
M-Y	Yes	2.22	Yes	Large
N-M	Yes	-1.30	Yes	Large
N-O	Yes	0.85	Yes	Large
N-Y	Yes	0.92	Yes	Large
O-Y	Yes	0.07	No	n/a

For retail pharmacies, there were large variances (practically significant *d*-values of ≥ 0.8) between the average cost of all of the medication groups compared, except for older innovator drugs (O) and generics (Y).

When reviewing Tables 4.84 to 4.88, the following conclusions can 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 (off-patent originators with available generics).

- The cost differences are the highest between originators still on patent (with no available generics) and generic medications.
- 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 finding is in line with the idea 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, while courier pharmacies dispensed 62% (2009) and 64% (2010) generics.

4.8. Chronic medication possession ratios

The last section of this chapter concentrates on the medication possession ratios (MPRs) of patients for the top-five utilised medication classes.

The chronic MPRs were determined for the top-five medication categories most frequently dispensed. For courier pharmacies, the top pharmacological categories dispensed (as classified by the MIMS) are displayed in Table 4.89.

Table 4.89: Top pharmacological categories dispensed – courier pharmacies

MIMS Code	Pharmacological categories	n	%
7.3.8	ACE Inhibitors	365704	11.89
7.7.2	Statins	309173	10.06
16.1.1	Diuretics	242769	7.90
19.1.2	Oral antidiabetics	240095	7.81
19.3.1	Thyroid	158834	5.17
8.4.1	Platelet aggregation inhibitors	132059	4.30

Table 4.90 depicts the most frequently dispensed pharmacological groups for retail pharmacies.

Table 4.90: Top pharmacological categories dispensed – retail pharmacies

MIMS Code	Pharmacological categories	n	%
7.3.8	ACE Inhibitors	1245728	11.52
7.7.2	Statins	1140550	10.55
16.1.1	Diuretics	719901	6.66
19.3.1	Thyroid	662556	6.13

19.1.2	Oral antidiabetics	645796	5.97
8.4.1	Platelet aggregation inhibitors	564572	5.22

As can be seen from Tables 4.89 and 4.90, the top-five dispensed medication categories for both courier and retail pharmacies are ACE inhibitors, statins, diuretics, thyroid medication and oral antidiabetics.

The chronic MPRs for these five product groups will be further analysed in sections 4.8.1 to 4.8.5.

4.8.1. Possession ratios of ACE inhibitors

ACE inhibitors represented 11.89% of all courier pharmacy and 11.52% of all retail pharmacy prescriptions dispensed. According to Brunton *et.al.* (2006:804), inhibition of angiotensin-converting enzyme (ACE) lowers systemic vascular resistance and blood pressure in various hypertensive states. This is achieved by inhibiting the conversion of angiotensin I to angiotensin II. Examples of ACE inhibitors are captopril, enalapril, lisinopril, quinapril, ramipril, moexipril and perindopril (Brunton *et al.*, 2006:802-804). The ACE inhibitors sold in South Africa are Benazepril, Captopril, Cilazapril, Enalapril, Fosinopril, Lisinopril, Moexipril, Perindopril, Quinapril, Ramipril and Trandolapril (Snyman *et al.*, 2013).

ACE inhibitors used by patients from 1 January 2009 to 31 December 2010 for more than four months consecutively were analysed. The number of patients per provider is supplied in Table 4.91

Table 4.91: Unique patients utilising ACE inhibitors

Provider type	n	%
Dispensing Dr - GP	3142	2.88
Courier pharmacy	22337	20.50
Retail pharmacy	83494	76.62

It is clear that that most patients using ACE inhibitors on a chronic basis received their medication from retail pharmacies (76.62%) followed by courier pharmacies (20.50%) and dispensing GPs (2.88%).

For the purpose of this study, the focus is on courier and retail pharmacies only, and numbers relating to dispensing GPs are noted but not discussed in further detail. MPR as indication of patient compliance in this study is divided into three categories (refer to Table 2.36). MPR is considered to be acceptable if $\geq 80\%$ but $\leq 110\%$. If it is less than 80%, it indicates refill gaps

and is considered unacceptable low (undersupply). An MPR greater than 110% is considered unacceptably high (oversupply). For the ACE inhibitor category, the MPRs were as follows for retail and courier pharmacies from 1 January 2009 to 31 December 2010.

Table 4.92: Medication possession ratios for ACE inhibitors according to different provider types

Medication Possession ratio	Data Description	Provider Type			
		DDGP	CP	RP	Total
<80%	n	3434	3054	32607	39095
	%	2.72	2.42	25.85	31.00
	% _{Row}	8.78	7.81	83.40	
	% _{Column}	94.19	11.99	33.61	
≥ 80%-≤ 110%	n	206	14054	60567	74827
	%	0.16	11.14	48.02	59.33
	% _{Row}	0.28	18.78	80.94	
	% _{Column}	5.65	55.20	62.43	
>110%	n	6	8353	3844	12203
	%	0.00	6.62	3.05	9.68
	% _{Row}	0.05	68.45	31.50	
	% _{Column}	0.16	32.81	3.96	
Total	N	3646	25461	97018	126125
	%	2.89	20.19	76.92	100.00

Table 4.92 shows that 59.33% of all ACE inhibitors fall within the acceptable MPR band and only 9.68% fall within the oversupply band. Of ACE inhibitors supplied by courier pharmacies, 32.81% fell within the oversupply range whilst only 3.96% of retail pharmacies oversupplied ACE inhibitors to their patients. Of ACE inhibitors provided by retail pharmacies, 25.85% were undersupplied, whilst only 2.42% of ACE inhibitors provided by courier pharmacies were underprovided. The Chi-square test (χ^2) indicated a medium statistical significance for the association between MPR within the different provider types ($p < 0.001$, Cramer's $V = 0.3306$).

Table 4.93: Average medication possession ratios for ACE inhibitors for courier and retail pharmacies

Courier Pharmacy: MPR					
n	Mean %	SD %	SE	Lower 95% CL for Mean	Upper 95% CL for Mean
25461.00	103.08	25.90	0.16	102.76	103.40
Retail Pharmacy: MPR					
n	Mean %	SD %	SE	Lower 95% CL for Mean	Upper 95% CL for Mean
97018.00	82.40	25.43	0.08	82.24	82.56

It can be seen that both retail and courier pharmacies' average MPRs are within the $\geq 80\%$ and $\leq 110\%$ band, with courier pharmacy at an average compliance rate of 103.08 ± 25.89 (95% CI 102.76 – 103.40) and retail pharmacy at 82.40 ± 25.43 (95% CI 82.24 – 82.56).

When comparing the MPRs of courier versus retail pharmacies, there is a statistically and practically significant difference in the MPRs within the ACE inhibitor class. The *d*-value is 0.81, which can be considered a high and practical significance, indicating that the MPRs for courier pharmacies are significantly higher than that of retail pharmacies. Patients who receive their ACE inhibitors from a courier pharmacy are therefore more likely to have adequate medication on hand than patients receiving their ACE inhibitors from retail pharmacies. Of these patients, 31.5% possess more than 110% of the medication needed.

Table 4.94: Gender comparison for ACE inhibitor possession ratios within courier pharmacies

MPR Courier Pharmacies		F	M	Total
<80%	n	1485	1569	3054
	%	5.83	6.16	11.99
80%-110%	n	6871	7183	14054
	%	26.99	28.21	55.2
>110%	n	4148	4205	8353
	%	16.29	16.52	32.81
Total	n	12504	12957	25461
	%	49.11	50.89	100

The Chi-square test (χ^2) indicated no statistical and practical association ($p = 0.4569$, Cramer's $V = 0.0078$) between the medication possession categories of ACE inhibitors and the gender of patients for courier pharmacies. This means that there is no difference in the medicine possession categories between males and females for ACE inhibitors.

Table 4.95 indicates the gender adherences within retail pharmacies.

Table 4.95: Gender comparison for ACE inhibitor possession ratios within retail pharmacies

MPR Retail Pharmacies		F	M	Total
<80%	n	15948	16659	32607
	%	16.44	17.17	33.61
80%-110%	n	30948	29619	60567
	%	31.9	30.53	62.43
>110%	n	1757	2087	3844
	%	1.81	2.15	3.96

Total	n	48653	48365	97018
	%	50.15	49.85	100

The Chi-square test (χ^2) revealed no practically significant association between MPR categories and the different genders within retail pharmacies ($p < 0.0001$; Cramer's $V = 0.00273$). This means that the gender of patients did not have an influence on the medicine possession ratio of ACE inhibitors within retail pharmacies either.

Table 4.96 illustrates MPRs within courier pharmacies and highlights the differences in possession between the different age groups.

Table 4.96: Age comparison for ACE inhibitor possession ratios within courier pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	12	186	1473	1170	213	3054
	%	0.05	0.73	5.79	4.6	0.84	11.99
80%-110%	n	24	719	5827	6370	1114	14054
	%	0.09	2.82	22.89	25.02	4.38	55.2
>110%	n	10	417	3320	3970	636	8353
	%	0.04	1.64	13.04	15.59	2.5	32.81
Total	n	46	1322	10620	11510	1963	25461
	%	0.18	5.19	41.71	45.21	7.71	100

No practically significant association was found between the MPR categories of ACE inhibitors and the different age groups within courier pharmacies ($p < 0.0001$, Cramer's $V = 0.0441$). This indicates that the age group of the patient was also not a predictor of patient compliance with ACE inhibitors as indicated by the MPR categories.

Table 4.97 illustrates MPRs within retail pharmacies and highlights the differences in possession between the different age groups.

Table 4.97: Age comparison for ACE inhibitor possession ratios within retail pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	67	2373	15135	11923	3109	32607
	%	0.07	2.45	15.6	12.29	3.2	33.61
≥80%-	n	39	2221	21216	29590	7501	60567

<110%	%	0.04	2.29	21.87	30.5	7.73	62.43
≥110%	n	3	196	1472	1866	307	3844
	%	0	0.2	1.52	1.92	0.32	3.96
Total	n	109	4790	37823	43379	10917	97018
	%	0.11	4.94	38.99	44.71	11.25	100

For retail pharmacies, Cramer's V was found to be 0.1070 ($p < 0.0001$), indicating that there was no practically significant association between the medication possessions of the various age groups for ACE inhibitors.

4.8.1.1. Costs associated with medication possession – ACE Inhibitors

When calculating oversupply and undersupply within the ACE inhibitor class, the formula to determine the cost of oversupply that has been developed in this study is as follows (also refer to section 3.8.4.1):

The cost of over- and undersupply of medication can be calculated using MPR data. The calculation is based on three components:

1. 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)
2. Average cost per day = final cost / total days' supply
3. 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:

$$\begin{aligned}\text{Cost oversupply} &= \text{R}100(120-100) \\ &= \text{R}2000\end{aligned}$$

Table 4.98 Oversupply per provider type – ACE inhibitors

Provider type	N	Mean (R)	SD (R)	Total Cost (R)	SE (R)	Lower 95% CL for Mean (R)	Upper 95% CL for Mean (R)
Dispensing Dr - GP	6	610.8163	636.03	3664.90	259.66	-56.66	1278.29
Courier pharmacy	8353	340.51	411.25	2844266.00	4.50	331.69	349.33
Retail pharmacy	3844	501.45	406.62	1927590.00	6.56	488.60	514.31

Table 4.98, which summarises the cost of oversupply for ACE inhibitors, illustrates that courier pharmacies' total oversupply cost over the two-year study period was R2 844 266. This was higher than that of retail pharmacies (R1 927 590). To place these values into perspective, the cost of oversupply is divided into the total cost of ACE inhibitors provided by each of the providers in Table 4.99.

Table 4.99: Oversupply as a percentage of total medication cost

	Courier Pharmacies	Retail Pharmacies
Cost of oversupply ACE inhibitors (R)	2 844 265.50	1927589.65
Total cost ACE inhibitors (R)	32976567.18	144400360.10
Oversupply as percentage of total cost	9%	1%

According to Table 4.99, 9% of the total medicine cost spent on ACE inhibitors at courier pharmacies is spent on unnecessary medication (ACE inhibitors that have been oversupplied), and 1% of all medicine cost related to ACE inhibitors at retail pharmacies were spent on oversupply of medication.

4.8.2. Medication possession ratios of statins

Statins represented 10.06% of all prescriptions dispensed by courier pharmacies and 10.55% of those by retail pharmacies. According to Brunton *et.al.* (2006:948), statins (or HMG-CoA reductase inhibitors) are the most effective and best tolerated agents for treating dyslipidaemia and examples include fluvastatin, simvastatin, lovastatin, pravastatin, atorvastatin, rosuvastatin and mevastatin (Brunton *et.al.*, 2006:949). Snyman *et al.* (2013) list the statins utilised in South Africa as lovastatin, pravastatin, atorvastatin, rosuvastatin, fluvastatin and simvastatin.

The number of patients per provider who utilised statins during the study period are depicted in Table 4.100:

Table 4.100: Unique patients utilising statins

Provider type	n	%
Dispensing Dr - GP	2913	2.66
Dispensing Dr - specialist	38	0.03
Other providers	21	0.02
Pharmacy courier	19012	17.37
Pharmacy retail	87446	79.91

It can be seen that most patients using statins on a chronic basis received their medication from retail pharmacies (79.91%) followed by courier pharmacies (17.37%) and dispensing GPs (2.66%).

For the purpose of this study, the focus will be on courier and retail pharmacies only and dispensing GPs, dispensing specialists and other providers will not be discussed in further detail. MPRs in this study are divided into three categories as described in section 2.8.1 (also refer to Table 2.36 in Chapter 2). For the Statin category, the MPRs were as follows for retail and courier pharmacies over 2009 and 2010.

Table 4.101: Medication possession ratios for statins within retail and courier pharmacies

MPR	Data Description	Provider Type					
		DDGP	DD SP	OP	CP	RP	Total
<80% ≥80%- <110%	n	3234	39	33	2956	41173	47435
	%	2.46	0.03	0.03	2.25	31.32	36.08
	% _{Row}	6.82	0.08	0.07	6.23	86.80	
	% _{Column}	95.74	100.00	100.00	13.28	38.93	
≥110% <80%	n	139	0	0	12071	60478	72688
	%	0.11	0.00	0.00	9.18	46.01	55.29
	% _{Row}	0.19	0.00	0.00	16.61	83.20	
	% _{Column}	4.11	0.00	0.00	54.25	57.19	
≥80%- <110%	n	5	0	0	7225	4104	11334
	%	0.00	0.00	0.00	5.50	3.12	8.62
	% _{Row}	0.04	0.00	0.00	63.75	36.21	
	% _{Column}	0.15	0.00	0.00	32.47	3.88	
Total	N	3378	39	33	22252	105755	131457
	%	2.57	0.03	0.03	16.93	80.45	100.00

Table 4.101 illustrates that 55.29% of all statins analysed fell within the 80%-110% adherence cohort, 36.08% of statins were undersupplied and 8.62% oversupplied. When analysing only courier and retail pharmacies, it becomes evident that 32.47% of all courier-dispensed statins fell within the oversupply range (7225 out of 22252) whereas 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) and only 13.28% undersupply occurred in courier pharmacies. The Chi-square test (χ^2) indicated that there was an association of medium significance ($p < 0.0001$ and Cramer's $V = 0.3162$) between the MPRs of the different providers.

Table 4.102 supports this finding by indicating that the average MPR for statins is 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.

Table 4.102: Statin Medication possession ratios: courier and retail pharmacies

Courier Pharmacy: MPR					
N	Mean %	SD %	SE	Lower 95% CL for Mean	Upper 95% CL for Mean
22252.00	103.43	30.03	0.20	103.03	103.82
Retail Pharmacy: MPR					
N	Mean %	SD %	SE	Lower 95% CL for Mean	Upper 95% CL for Mean
105755.00	78.54	28.44	0.09	78.37	78.71

When comparing the MPRs of statins for courier pharmacies ($103.43 \pm 30.03\%$, CI = 103.03-103.82%) versus that for retail pharmacies ($78.54 \pm 28.44\%$, CI= 78.37-78.71%), there is a practically significant difference in the possession ratios. The d -value is 0.87 which can be considered a high and meaningful significance. It is therefore deduced that MPR is significantly higher in courier pharmacies than in retail pharmacies for the statin group.

Table 4.103: Gender comparison of medication possession ratio within courier pharmacies

MPR: Courier Pharmacy		F	M	Total
<80%	n	1422	1534	2956
	%	6.39	6.89	13.28
≥80%-<110%	n	5616	6455	12071
	%	25.24	29.01	54.25
≥110%	n	3508	3717	7225
	%	15.76	16.7	32.47

Total	N	10546	11706	22252
	%	47.39	52.61	100

When performing a Chi-square test (χ^2) to determine the association between gender possession ratios within courier pharmacies ($p = 0.0169$, Cramer's $V = 0.0191$), no practical significance was found. This means that there is no difference between the medication possession of statins between males and females within courier pharmacies.

The gender possession ratios within retail pharmacy are captured in Table 4.104.

Table 4.104: Gender comparison of statin possession ratio within retail pharmacies

MPR: Retail Pharmacy		F	M	Total
<80%	n	20327	20846	41173
	%	19.22	19.71	38.93
≥80%- <110%	n	28937	31541	60478
	%	27.36	29.82	57.19
≥110%	n	1865	2239	4104
	%	1.76	2.12	3.88
Total	N	51129	54626	105755
	%	48.35	51.65	100

When again performing a Chi-square test (χ^2) to determine the association between gender possession ratios within retail pharmacies ($p < 0.001$ and Cramer's $V = 0.0187$), the results were of practical insignificance. There is therefore practically no difference between the medication possession ratios of statins between males and females.

Table 4.105 illustrates MPRs within courier pharmacies and highlights the differences in possession between the different age groups.

Table 4.105: Age group comparison of statin possession ratios within courier pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	5	137	1136	1471	207	2956
	%	0.02	0.62	5.11	6.61	0.93	13.28
≥80%- <110%	n	17	339	4261	6577	877	12071
	%	0.08	1.52	19.15	29.56	3.94	54.25
≥110%	n	5	214	2532	3940	534	7225
	%	0.02	0.96	11.38	17.71	2.4	32.47

Total	N	27	690	7929	11988	1618	22252
	%	0.12	3.1	35.63	53.87	7.27	100

In determining the association of the MPRs between the different age groups, Cramer's V was found to be 0.0327 ($p < 0.001$), indicating that the medication possession trends were alike for all age groups receiving statins from courier pharmacies.

Table 4.106: Age group comparison of statin possession ratios within retail pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	296	2914	16509	18125	3329	41173
	%	0.28	2.76	15.61	17.14	3.15	38.93
80%-110%	n	53	1596	20104	32692	6033	60478
	%	0.05	1.51	19.01	30.91	5.7	57.19
>110%	n	4	138	1592	2074	296	4104
	%	0	0.13	1.51	1.96	0.28	3.88
Total	N	353	4648	38205	52891	9658	105755
	%	0.33	4.4	36.13	50.01	9.13	100

Cramer's V was found to be 0.1052 ($p < 0.001$), indicating that the medication possession trends were alike for all age groups receiving statins from retail pharmacies.

4.8.2.1. Costs associated with medication possession ratios of statins

When calculating oversupply and undersupply within the statin class, the same formula was used as described in section 4.8.1. The total cost of oversupply as calculated by the formula discussed is summarised in Table 4.107

Table 4.107: Oversupply per provider type – statins

Cost of oversupply							
Provider Type	N	Mean (R)	SD (R)	Sum (R)	SE(R)	Lower 95% CL for Mean (R)	Upper 95% CL for Mean (R)
Dispensing Dr - GP	5	572.74	250.90	2863.68	112.20	261.21	884.26
Pharmacy Courier	7225	487.63	2107.23	3523133.20	24.79	439.03	536.23
Pharmacy Retail	4104	530.66	473.72	2177834.80	7.39	516.16	545.16

Table 4.107 illustrates that courier pharmacies' total oversupply cost over the two-year period is R3 523 133.20. The cost of oversupply in retail pharmacies was R2 177 834.80.

Table 4.108: Oversupply as a percentage of total medication cost

	Courier Pharmacy	Retail Pharmacy
Cost of oversupply Statins	3523133.17	2177834.82
Total cost Statins	34768610.16	160595707.1
Oversupply as percentage of total cost	10%	1%

According to Table 4.108, 10% spent on statins at courier pharmacies was spent on unnecessary and possibly unused medication and 1% of all cost related to statins at retail pharmacies were spent on oversupply of medication.

4.8.3. Medication possession ratios of diuretics

The third most frequently dispensed chronic medication group was diuretics, at 7.9% of all prescriptions dispensed at courier pharmacies and 6.66% at retail pharmacies. According to Brunton *et.al.* (2006:737), a diuretic is any drug that elevates the rate of urination and sodium excretion, thus providing a means of forced diuresis. There are several categories of diuretics. All diuretics increase the excretion of water from bodies, although each class does so in a different way (Brunton *et al.*, 2006:737).

Diuretics act by diminishing sodium chloride reabsorption at different sites in the nephron, thereby increasing urinary sodium chloride and water losses. Loop diuretics act in the thick ascending limb of the loop of Henle. According to Brunton *et al.* (2006:737-742):

- Thiazide-type diuretics act in the distal tubule and connecting segment (and perhaps the early cortical collecting tubule)
- Potassium-sparing diuretics act in the aldosterone-sensitive principal cells in the cortical collecting tubule.

Table 4.109, which supplies the number of patients per provider for diuretics, indicates that the majority of patients using diuretics on a chronic basis received their medication from retail pharmacies (74.98%) followed by courier pharmacies (20.00%) and dispensing GPs (4.99%).

Table 4.109: Unique patients utilising diuretics

Provider type	n	%
Dispensing Dr - GP	3440	4.99
Dispensing Dr - Specialist	22	0.03
Pharmacy courier	13782	20.00
Pharmacy retail	51680	74.98

The MPRs of diuretics over 2009 and 2010 are given below.

Table 4.110: Medication possession ratios for diuretics within various providers

MPR	Data Description	Provider type				
		DD GP	DD SP	CP	RP	Total
<80%	n	4137	24	2962	31798	38921
	%	4.61	0.03	3.30	35.43	43.37
	% _{Row}	10.63	0.06	7.61	81.70	
	% _{Column}	95.59	100.00	16.41	47.22	
≥80% - <110%	n	187	0	9060	33510	42757
	%	0.21	0.00	10.10	37.34	47.65
	% _{Row}	0.44	0.00	21.19	78.37	
	% _{Column}	4.32	0.00	50.21	49.76	
≥110%	n	4	0	6023	2034	8061
	%	0.00	0.00	6.71	2.27	8.98
	% _{Row}	0.05	0.00	74.72	25.23	
	% _{Column}	0.09	0.00	33.38	3.02	
Total	N	4328	24	18045	67342	89739
	%	4.82	0.03	20.11	75.04	100.00

Table 4.1110 illustrates that 47.65% of all diuretics analysed fell within the 80%-110% adherence cohort, 43.37% of diuretics were undersupplied and 8.98% oversupplied. When analysing only courier and retail pharmacy, it is seen that 33.38% of all courier-dispensed diuretics fell within the oversupply range (6023 out of 18045) whereas only 3.02% of retail-dispensed diuretics were oversupplied (2034 out of 67342). It should also be noted that 47.22% of all diuretics were undersupplied by retail pharmacies and only 16.41% of diuretics were undersupplied by courier pharmacies.

Tables 4.111 supports this finding by indicating that the average compliance rate for diuretics are 101.84 ± 29.85 for courier (95% CI of 101.40%-102.28%) and 73.68 ± 29.43 (95% CI of 73.45%-73.90%) for retail pharmacies. As the lowest parameter for sufficient supply is 80%, it can be stated that, on average, retail pharmacies undersupply diuretics to their patients.

Table 4.111: Medication possession ratios for diuretics – courier and retail pharmacies

Courier Pharmacy: MPR					
N	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
18045	101.84	29.85	0.22	101.40	102.28
Retail Pharmacy: MPR					
N	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
67342	73.68	29.43	0.11	73.45	73.90

When comparing the MPRs of diuretics for courier pharmacies versus that of retail pharmacies, there is a practically significant difference. The *d*-value is 0.96 which can be considered a high and practical significance. It is therefore deduced that medication possession is significantly higher in courier pharmacies than in retail pharmacies for diuretics.

Table 4.112: Gender comparison of diuretic possession ratio within courier pharmacies

MPR Courier Pharmacies		F	M	Total
<80%	n	1755	1207	2962
	%	9.73	6.69	16.41
≥80% - <110%	n	5367	3693	9060
	%	29.74	20.47	50.21
≥110%	n	3607	2416	6023
	%	19.99	13.39	33.38
Total	n	10729	7316	18045
	%	59.46	40.54	100

There was no difference between the MPRs of diuretics for males and females within courier pharmacies. When performing a Chi-square (χ^2) test to determine the association between gender possession ratios within courier pharmacies, Cramer's V was 0.0062 ($p= 0.7067$), which is of no practical significance.

Table 4.113 indicates the gender possession ratios within retail pharmacies.

Table 4.113: Gender comparison of diuretic possession ratios within retail pharmacies

MPR Retail pharmacies		F	M	Total
<80%	n	20901	10897	31798
	%	31.04	16.18	47.22
≥80% - <110%	n	21635	11875	33510
	%	32.13	17.63	49.76

≥110%	n	1212	822	2034
	%	1.8	1.22	3.02
Total	n	43748	23594	67342
	%	64.96	35.04	100

When again performing a Chi-square test (χ^2) in order to determine the association between gender possessions rates within retail pharmacies (Cramer's V = 0.0233, $p < 0.0001$), the result indicated practical insignificance. This means that there is practically no difference between the MPRs of diuretics between males and females within retail pharmacies.

Table 4.114 illustrates MPRS within courier pharmacies and highlights the differences in possession between the different age groups.

Table 4.114: Age group comparison of diuretic possession ratios within courier pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	9	108	1200	1308	337	2962
	%	0.05	0.6	6.65	7.25	1.87	16.41
≥80% - <110%	n	9	263	3608	4123	1057	9060
	%	0.05	1.46	19.99	22.85	5.86	50.21
≥110%	n	4	190	2241	2872	716	6023
	%	0.02	1.05	12.42	15.92	3.97	33.38
Total	n	22	561	7049	8303	2110	18045
	%	0.12	3.11	39.06	46.01	11.69	100

In determining the association of the MPRs between the different age groups, Cramer's V was found to be 0.0284 ($p = 0.0003$), indicating that the medication possession trends were alike for all age groups receiving diuretics from courier pharmacies.

Table 4.115: Age group comparison of diuretic possession ratios within retail pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	87	1209	11209	13285	6008	31798
	%	0.13	1.8	16.64	19.73	8.92	47.22
≥80% - <110%	n	42	707	9322	16591	6848	33510
	%	0.06	1.05	13.84	24.64	10.17	49.76
≥110%	n	5	50	662	1004	313	2034
	%	0.01	0.07	0.98	1.49	0.46	3.02
Total	n	134	1966	21193	30880	13169	67342

	%	0.2	2.92	31.47	45.86	19.56	100
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Medication possession trends were also alike for all age groups receiving diuretics from retail pharmacies (Cramer's $V = 0.0733$, $p < 0.0001$).

4.8.3.1. Costs associated with medication possession ratios – diuretics

When calculating oversupply and undersupply within the diuretics class, the same formula was used as described in section 4.8.1.

The cost of oversupply for diuretics is summarised in Table 4.116.

Table 4.116: Oversupply per provider type-diuretics

Provider Type	N	Mean (R)	SD (R)	Sum (R)	SE (R)	Lower 95% CI	Upper 95%CI
Dispensing Dr - GP	4	403.82	357.47	1615.30	178.73	-164.99	972.64
Courier pharmacy	6023	157.15	387.83	946525.26	5.00	147.36	166.95
Retail pharmacy	2034	208.44	396.90	423972.96	8.80	191.18	225.70

Table 4.116 illustrates that the cost of oversupply by courier pharmacies over the two-year period is R946 525.26 and that of retail pharmacies is R423 972.96.

Table 4.117: Oversupply as a percentage of total medication cost

	Courier Pharmacy	Retail Pharmacy
Cost of oversupply of diuretics (R)	946525.26	423972.96
Total cost of diuretics (R)	8412984.93	34865643
Oversupply as percentage of total cost (R)	11%	1%

According to Table 4.117, 11% spent on diuretics at courier pharmacies was spent on unnecessary medication (diuretics that have been oversupplied), and 1% of all cost related to diuretics at retail pharmacies was spent on oversupply of medication.

4.8.4. Medication possession ratios of thyroid medication

The fourth most frequently dispensed chronic medication group was thyroid medication, at 5.17% of all prescriptions dispensed by courier pharmacies and 6.13% by retail pharmacies. The thyroid hormones thyroxine (T_4) and triiodothyronine (T_3) are tyrosine-based hormones produced by the thyroid gland. An important component in the synthesis of thyroid hormones is

iodine. The major form of thyroid hormone in the blood is thyroxine (T_4), which has a longer half life than T_3 . The ratio of T_4 to T_3 released in the blood is roughly 20 to 1. Thyroxine is converted to the active T_3 (three to four times more potent than T_4) within cells by deiodinases (5'-iodinase). These are further processed by decarboxylation and deiodination to produce iodothyronamine (T_{1a}) and thyronamine (T_{0a}) (Brunton *et al.*, 2006: 1511).

Treatment for hypothyroidism includes daily use of the synthetic thyroid hormone levothyroxine. This oral medication restores adequate hormone levels, reversing the signs and symptoms of hypothyroidism (The American Thyroid Association 2011). Synthetic thyroid hormones are used for replacement therapy where there are insufficient thyroid levels (hypothyroidism), an example being levothyroxine (Brunton *et al.*, 2006:1524).

The number of patients per provider who claimed thyroid medication from 1 January 2009 to 31 December 2010 for more than four months consecutively is supplied in Table 4.118.

Table 4.118: Unique patients utilising thyroid medication

Provider Type	n	%
Dispensing Dr - GP	906	1.76
Dispensing Dr - Specialist	2	0.00
Pharmacy Courier	7983	15.49
Pharmacy Retail	42645	82.75

According to Table 4.118, retail pharmacies supplied the most thyroid medication (82.75%) followed by courier pharmacies (15.49%) and dispensing GPs (1.76%).

For the thyroid medication category, the MPRs were as follows for retail and courier pharmacies over 2009 and 2010.

Table 4.119: Medication possession ratios for thyroid medication within various providers

MPR	Data Description	PROVIDER TYPE				
		DD GP	DD SP	CP	RP	Total
<80%	n	1004	2	889	20450	22345
	%	1.59	0.00	1.41	32.47	35.48
	% _{Row}	4.49	0.01	3.98	91.52	
	% _{Column}	93.40	100.00	9.17	39.17	
≥ 80% -≤ 110%	n	64	0	5349	30035	35448
	%	0.10	0.00	8.49	47.69	56.29
	% _{Row}	0.18	0.00	15.09	84.73	

	% _{Column}	5.95	0.00	55.16	57.54	
>110%	n	7	0	3460	1718	5185
	%	0.01	0.00	5.49	2.73	8.23
	% _{Row}	0.14	0.00	66.73	33.13	
	% _{Column}	0.65	0.00	35.68	3.29	
Total	N	1075	2	9698	52203	62978
	%	1.71	0.00	15.40	82.89	100.00

Table 4.119 illustrates that 56.29% of all thyroid medication analysed fell within the 80%-110% adherence cohort, 35.48% was undersupplied and 8.23% oversupplied. When analysing only courier and retail pharmacies, it is seen that 55.16% of all courier-dispensed and 57.54 % of all retail-dispensed thyroid medication fell within the accepted norm of 80-110%. Thyroid medication oversupply was 35.68% for courier pharmacies but only 3.29% of the thyroid medication group was oversupplied in retail pharmacies.

Table 4.120 illustrates that the average compliance rate for thyroid medications is 106.44 ± 25.32 for courier and 78.86 ± 26.51 for retail pharmacies. As the lowest acceptable ratio for sufficient supply is 80%, it can be concluded that, on average, retail pharmacies undersupply thyroid medication to their patients.

Table 4.120: Thyroid medication possession ratios – courier and retail pharmacies

Courier Pharmacy: MPR					
n	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
9698	106.44	25.32	0.26	105.93	106.94
Retail Pharmacy: MPR					
n	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
52203	78.86	26.51	0.12	78.63	79.08

When comparing the MPRs of courier pharmacies with that of retail pharmacies, there is a practically significant difference in the possession ratios of thyroid medication. The *d*-value is 1.05 which can be considered a practical significance. It is therefore deduced that thyroid medication possession is significantly higher in courier pharmacies than in retail pharmacies. A possible explanation could be that patients do not collect their medication from community/retail pharmacies frequently enough, as opposed to courier pharmacies that send them their medication on a monthly basis. The lack of collecting medication may be due to the perceived effect of continued wellbeing, as the effect of thyroid medication is long-term. Possible detrimental effects of underuse cannot be felt immediately and patients may not collect their

medication if they feel healthy. Chronic medication is often stopped because patients feel alright (Kotwani, 2010:127-128).

Table 4.121: Gender comparison of thyroid medication possession ratios within courier pharmacies

MPR Courier Pharmacies				
		F	M	Total
<80%	n	761	128	889
	%	7.85	1.32	9.17
≥80%- ≤110%	n	4526	823	5349
	%	46.67	8.49	55.16
>110%	n	2989	471	3460
	%	30.82	4.86	35.68
Total	n	8276	1422	9698
	%	85.34	14.66	100

A Chi-square test (χ^2) to determine the association between gender possession ratios within courier pharmacies revealed that Cramer's $V=0.0235$, $p=0.069$, which is of practical insignificance. This means that there is no difference between the medication possession of thyroid medication between males and females within courier pharmacies.

Table 4.122 indicates the gender possession ratios for thyroid medication within retail pharmacies.

Table 4.122: Gender comparison of thyroid medication possession ratios within retail pharmacies

MPR Retail Pharmacies				
		F	M	Total
<80%	n	17908	2542	20450
	%	34.3	4.87	39.17
≥80%- ≤110%	n	26202	3833	30035
	%	50.19	7.34	57.54
>110%	n	1452	266	1718
	%	2.78	0.51	3.29
Total	n	45562	6641	52203
	%	87.28	12.72	100

When again performing a Chi-square test (χ^2) to determine the association between gender possessions rates within retail pharmacies, the result indicated practical insignificance

(Cramer's $V=0.0160$, $p=0.0012$). This means that there is practically no difference between the medication possession ratios of thyroid medication between males and females.

Table 4.123 illustrates medication possession ratios within courier pharmacies and highlights the differences in possession between the different age groups.

Table 4.123: Age group comparison of thyroid medication possession ratios within courier pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	7	101	384	326	71	889
	%	0.07	1.04	3.96	3.36	0.73	9.17
≥80%- ≤110%	n	27	349	2052	2478	443	5349
	%	0.28	3.6	21.16	25.55	4.57	55.16
>110%	n	12	208	1202	1713	325	3460
	%	0.12	2.14	12.39	17.66	3.35	35.68
Total	n	46	658	3638	4517	839	9698
	%	0.47	6.78	37.51	46.58	8.65	100

Cramer's V was found to be 0.0637 ($p<0.0001$), indicating that the thyroid medication possession trends were alike for all age groups receiving this medication from courier pharmacies

Table 4.124: Age group comparison of thyroid medication possession ratios within retail pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	259	2920	8671	6853	1747	20450
	%	0.5	5.59	16.61	13.13	3.35	39.17
≥80%- ≤110%	n	143	1959	10648	13893	3392	30035
	%	0.27	3.75	20.4	26.61	6.5	57.54
>110%	n	8	133	708	739	130	1718
	%	0.02	0.25	1.36	1.42	0.25	3.29
Total	n	410	5012	20027	21485	5269	52203
	%	0.79	9.6	38.36	41.16	10.09	100

In describing the association of the MPR between the different age groups, Cramer's V was found to be 0.1241 ($p<0.0001$). Although this association is higher than the age groups

receiving medication from courier pharmacies, the medication possession trends were still very similar for all age groups receiving diuretics from retail pharmacies.

4.8.4.1. Costs associated with medication possession ratio – thyroid medication

The cost of oversupply is summarised in table 4.125.

Table 4.125 Oversupply per provider type – thyroid medication

Cost of oversupply							
Provider Type	N	Mean (R)	SD (R)	Total Cost (R)	SE (R)	Lower 95% CI for Mean	Upper 95% CI for Mean
Dispensing Dr - GP	7	239.62	148.65	1677.37	56.19	102.14	377.11
Pharmacy Courier	3460	187.03	192.82	647121.67	3.28	180.60	193.46
Pharmacy Retail	1718	175.56	199.97	301608.35	4.82	166.10	185.02

Table 4.125 illustrates that courier pharmacies' total oversupply cost over the two-year period is R647121.67, which is higher than that of retail pharmacies (R301608.35). To describe these values as a portion of the total cost per provider, Table 4.126 gives the cost of oversupply divided into the total cost of each of the providers.

Table 4.126: Oversupply as a percentage of total medication cost

	Courier Pharmacy	Retail Pharmacy
Cost of oversupply of thyroid medication (R)	647121.67	301608.35
Total cost of thyroid medication (R)	6357120.23	29750975
Oversupply as percentage of total cost (R)	10%	1%

According to Table 4.126, 10% of the total Rand value spent on thyroid medication at courier pharmacies was spent on unnecessary/unused medication (oversupply), and 1% of all cost related to thyroid medication at retail pharmacies was spent on oversupply of medication.

4.8.5. Medication possession ratios of oral antidiabetics

The fifth most frequently dispensed chronic medication group was oral antidiabetics, at 7.81% of all prescriptions dispensed at courier pharmacies and 5.97% of all retail pharmacy prescriptions dispensed.

Oral antidiabetic medications are antihyperglycemic and not hypoglycaemic. They therefore do not cause insulin release from the pancreas and do not cause hypoglycaemia. An example is

metformin (Brunton *et.al*, 2006:1638). According to Snyman *et al.* (2013), the oral antidiabetic agents sold in South Africa are metformin, pioglitazone, gliclazide, glimepiride, glibenclamide, and acarbose.

The number of oral antidiabetic patients per provider is supplied in Table 4.127.

Table 4.127: Unique patients utilising antidiabetic medication

Provider Type	n	%
Dispensing Dr - GP	1616	3.25
Pharmacy Courier	10096	20.28
Pharmacy Retail	38061	76.47

According to Table 4.127, retail pharmacies dispense the most oral antidiabetics (76.47%) followed by courier pharmacies (20.28%) and dispensing GPs (3.25%). For oral antidiabetics, MPRs were as follows for retail and courier pharmacies over 2009 and 2010.

Table 4.128: Medication possession ratios for oral antidiabetic medication within various providers

MPR	Data Description	Provider type			
		DD GP	CP	RP	Total
<80%	n	2886	3382	25785	32053
	%	3.53	4.14	31.57	39.24
	%Row	9	10.55	80.44	
	%Column	94.62	19.03	42.37	
≥ 80%- ≤110%	n	154	8764	32643	41561
	%	0.19	10.73	39.97	50.89
	%Row	0.37	21.09	78.54	
	%Column	5.05	49.32	53.64	
>110%	n	10	5623	2429	8062
	%	0.01	6.88	2.97	9.87
	%Row	0.12	69.75	30.13	
	%Column	0.33	31.64	3.99	
Total	n	3050	17769	60857	81676
	%	3.73	21.76	74.51	100

Table 4.128 illustrates that 50.89% of all oral antidiabetics analysed fell within the 80%-110% possession ratio group, 39.24% were undersupplied and 9.87% were oversupplied. When analysing only courier and retail pharmacy, it is seen that 49.32% of all courier-dispensed antidiabetics fell within the acceptable possession ratios, and 53.64% of the antidiabetics dispensed in retail were also within acceptable possession ratios. In courier pharmacies,

31.64% of antidiabetic medication was oversupplied, but only 3.99% was oversupplied in retail pharmacies.

Table 4.129 further highlights that the average compliance rate for oral antidiabetics was 99.58 ± 29.55 (95% CI 99.15-100.02) for courier and 77.70 ± 27.56 (95% CI 77.49-77.92) for retail pharmacies. On average, retail pharmacies undersupplied antidiabetic medication, as the average compliance ratio is less than 80%. Courier pharmacies had acceptable average medication supply.

Table 4.129: Oral antidiabetic medication possession ratios – courier and retail pharmacies

Courier Pharmacy: MPR					
n	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
17769	99.58502	29.55	0.22	99.15	100.019
Retail Pharmacy: MPR					
n	Mean %	SD %	SE %	Lower 95% CL for Mean	Upper 95% CL for Mean
60857	77.7	27.56	0.11	77.49	77.92

When comparing the MPRs of courier pharmacies versus that of retail pharmacies, there is no practical significance. The *d*-value is 0.79, which can be considered a high statistical significance but not practically significant. It is therefore deduced that oral antidiabetic MPRs are similar in courier and retail pharmacies.

Table 4.130: Gender comparison of oral antidiabetic medication possession ratios within courier pharmacies

MPR Courier pharmacies:				
		F	M	Total
<80%	n	1510	1872	3382
	%	8.5	10.54	19.03
≥80%- ≤110%	n	3746	5018	8764
	%	21.08	28.24	49.32
>110%	n	2474	3149	5623
	%	13.92	17.72	31.64
Total	n	7730	10039	17769
	%	43.5	56.5	100

The Chi-square test (Cramer's V of 0.0158 and $p = 0.1095$) indicated practical insignificance. This means that there is no difference between the medication possession of diuretics for males and females within courier pharmacies.

Table 4.131 contains the gender possession ratios within retail pharmacies.

Table 4.131: Gender comparison of oral antidiabetic medication possession ratios within retail pharmacies

MPR: Retail Pharmacies				
		F	M	Total
<80%	n	12111	13674	25785
	%	19.9	22.47	42.37
≥80%- ≤110%	n	14382	18261	32643
	%	23.63	30.01	53.64
>110%	n	1016	1413	2429
	%	1.67	2.32	3.99
Total	n	27509	33348	60857
	%	45.2	54.8	100

A Chi-square test (χ^2) illustrates the association between gender possessions rates within retail pharmacies. Cramer's V was found to be 0.0316 ($p < 0.0001$) which indicates practical insignificance. This means that there is also practically no difference between the MPRs of thyroid medication for males and females within retail pharmacies.

Table 4.132 portrays the MPRs within courier pharmacies and highlights the differences in possession between the different age groups.

Table 4.132: Age group comparison of oral antidiabetic medication possession ratios within courier pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	8	180	1849	1188	157	3382
	%	0.05	1.01	10.41	6.69	0.88	19.03
≥80%- ≤110%	n	11	386	4445	3565	357	8764
	%	0.06	2.17	25.02	20.06	2.01	49.32
>110%	n	7	248	2648	2433	287	5623
	%	0.04	1.4	14.9	13.69	1.62	31.64
Total	n	26	814	8942	7186	801	17769
	%	0.15	4.58	50.32	40.44	4.51	100

In determining the association of the MPRs between the different age groups, Cramer's V was found to be 0.0460 ($p < 0.001$), indicating that the oral antidiabetic possession trends were alike for all age groups receiving this medication from courier pharmacies.

Table 4.133: Age group comparison of oral antidiabetic medication possession ratios within retail pharmacies

MPR	Data Description	Age groups					
		1	2	3	4	5	Total
<80%	n	157	2525	13364	8325	1414	25785
	%	0.26	4.15	21.96	13.68	2.32	42.37
≥80%-≤110%	n	56	1440	13377	15322	2448	32643
	%	0.09	2.37	21.98	25.18	4.02	53.64
>110%	n	5	118	1044	1142	120	2429
	%	0.01	0.19	1.72	1.88	0.2	3.99
Total	n	218	4083	27785	24789	3982	60857
	%	0.36	6.71	45.66	40.73	6.54	100

The Chi-square test showed a Cramer's V of 0.1273 ($p < 0.0001$). The medication possession trends were therefore similar for all age groups receiving oral antidiabetics from retail pharmacies.

4.8.5.1. Costs associated with medication possession ratios – oral antidiabetics

The cost of oversupply of oral antidiabetics based on the MPR is summarised in Table 4.134.

Table 4.134: Oversupply per provider type – oral antidiabetic medication

Provider Type	N	Mean (R)	SD (R)	Total Cost (R)	SE (R)	Lower 95% CI for Mean	Upper 95% CI for Mean
Dispensing Dr - GP	10	322.94	271.91	3229.37	85.99	128.42	517.45
Courier Pharmacy	5623	199.61	308.58	1122413.17	4.12	191.54	207.68
Retail Pharmacy	2429	258.92	304.67	628918.73	6.18	246.80	271.04

Table 4.134 illustrates that courier pharmacies' total oversupply cost over the two-year period was R1 122 413.17 and the cost of oversupply in retail pharmacies was R628 918.73.

Table 4.135: Oversupply as a percentage of total medication cost

	Courier Pharmacy	Retail Pharmacy
Cost of oversupply Oral Antidiabetics (R)	1122413.2	628918.73
Total cost Oral Antidiabetics (R)	11714984	44025597
Oversupply as percentage of total cost (R)	10%	1%

According to Table 4.135, 10% spent on oral antidiabetic medication at courier pharmacies was spent on unnecessary/unused medication (oversupply), and 1% of all cost related to oral antidiabetic medication at retail pharmacies was spent on oversupply of medication.

4.8.6. Summary

In this chapter general medication as well as chronic medication was analysed according to gender, age, province, cost and provider type. Chronic medication was also analysed in terms of medication type (e.g. originator or generic). Lastly, medication possession ratios were determined for the top-five chronic medication groups as dispensed in the study period. Chapter 5 will conclude the results and recommend further actions based on the findings in Chapters 1-4.