A snapshot of noncommunicable disease profiles and their prescription costs at ten primary healthcare facilities in the in the western half of the Cape Town Metropole

Isaacs AA,[1,2] MBChB, MFamMed, Senior Family Physician and Senior Lecturer; **Manga N,**[2] PhD, Research Officer
Le Grange C,[2] MBChB, Lecturer; **Hellenberg DA,**[2] MBChB, MFamMed, FCFP(SA), Associate Professor and Divisional Head
Titus V,[1] BPharm, Pharmacist; **Sayed R,**[2] MSc, Specialist Scientist/Biometrician
[1]Metro District Health Services, Western Cape, Cape Town
[2]Division of Family Medicine, Faculty of Health Sciences, University of Cape Town, Cape Town
Correspondence to: Abdul Isaacs, e-mail: aaisaacs@westerncape.gov.za
Keywords: noncommunicable diseases, prescriptions, primary health care, costs, co-morbidity

Abstract

Objectives: There has been a rapid increase in the prevalence of noncommunicable diseases globally. It is thought that this increase will have the greatest impact on developing countries, such as South Africa, where it will adversely affect quality of life and increase healthcare costs. This research was conducted to determine the disease profile and cost of treating patients at 10 facilities in the western half of the Cape Town Metropole.

Design: An analytical, cross-sectional study was carried out in order to interpret the cost of the medication in relation to the patient disease profile.

Setting and subjects: Data were collected from 10 facilities in the western half of the Cape Town Metropole over a three-month period.

Outcome measure: The outcome measure was the disease profile of patients attending the facilities and the cost of prescriptions for these patients.

Results: Most patient visits to the community health centres were to treat chronic diseases (82%). The disease profile of patients was as follows: 58.96% had hypertension, 19.67% diabetes, 12.14% asthma and chronic obstructive pulmonary disease, and 21.80% arthritis. It was found that 65% of patients with a chronic condition had co-morbidities. The cost of prescriptions was significantly higher (p-value < 0.001) for chronic conditions than for acute conditions. The number of co-morbidities per patient also influenced the cost of the prescriptions.

Conclusion: The results indicated that most of the adults attending public sector facilities in the western half of the Cape Town Metropole have chronic diseases and that the cost of treating these conditions is significantly greater than that of treating acute conditions. An integrated approach to the management of chronic diseases is important in low-resource settings for the efficient utilisation of limited resources.

Introduction

A World Health Organization (WHO) report[1] suggests that there will be a rapid increase in noncommunicable diseases (NCDs) over the next seven years, which includes sub-Saharan Africa. In 2005, the WHO estimated that NCDs caused an estimated 35-million deaths, which represents 60% of all deaths globally. Eight per cent of deaths were due to NCDs in low- and middle-income countries, including South Africa. The WHO has also projected that over the next 10 years, the largest increase in deaths from cardiovascular disease (CVD), cancer, respiratory disease and diabetes will occur in developing countries.[1]

The burden of NCDs is increasing in both rural and urban areas of South Africa, and is foremost in poor people living in urban areas.[2] Mayosi et al identified risk factors that contribute to the increase in NCDs, including demographic changes (the increase in the number of older people in the population who are at greater risk of developing NCDs), lifestyle choices (tobacco use, inactivity and unhealthy diets), changes in dietary intake (the shift in diets in the developed world, i.e. that are high in refined sugar and flour) and genetic predisposition.[2] Urbanisation and the rising prevalence of NCDs place greater demands on the public health sector, the main provider of health care to poor people.

In 2009, the Medical Research Council in the Western Cape mortality profile indicated that NCDs were the main cause of mortality in all regions in the province.[3] According to the Western Cape Burden of Disease Study, in 2004, diabetes, strokes and ischaemic heart disease were among the leading causes of premature mortality. Diabetes moved up from eighth place in 2001 to fifth place in 2004.[4] The study also found strokes to be a major cause of death. CVD was the leading cause of death in men and women in the Western Cape province, accounting for 25% of deaths.[4] The prevalence of overweight and obesity was high in the province in women (57.1%), and was the highest in men (38.4%) in all of the provinces. Similar results were also found in other developing countries. The prevalence of hypertension in India was 164.18 per 1 000 (16.1%) adults in urban areas, and 157.44 per 1 000 (15.7%) adults in rural areas.[5]

Prior to the development of the Western Cape Chronic Disease Management (CDM) Policy Framework in 2009, NCDs were not prioritised in terms of resource allocation and had to compete with other priorities, such as human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS), tuberculosis and trauma.[6] The CMD policy aims to develop and implement a comprehensive strategy for chronic disease management. Second to human resources (57%), the cost of medicine (19% or R132 million) is the biggest expenditure item at Metropole District Health Services primary healthcare level.[7]

The study aimed to determine disease profile and prescription costs at 10 primary healthcare facilities in the western half of the Cape Town Metropole.

The objectives of the study were as follows:
• To describe and quantify the disease profile of patients with chronic diseases attending 10 community health centres (CHCs).
• To determine the average cost of acute and chronic prescriptions per patient at the CHCs.

Method

Study design

An analytical, cross-sectional study was conducted in order to interpret the cost of the medication in relation to the patient disease profileand facility type over a three-month period.

Setting

Data were collected over a three-month period at the five 24-hour CHCs in the in the western half of the Cape Town Metropole, i.e. Mitchell's Plain, Hanover Park, Gugulethu, Vanguard and Retreat; three medium-sized eight-hour facilities, i.e. Crossroads, Dr Abdurahman and Lotus River (served by three or more doctors); and two smaller facilities, i.e. Inzama Zabantu and Hout Bay (served by one doctor).

Sampling

Systematic sampling was used. Patients older than 18 years of age attending the facilities during the week of the study were eligible for inclusion in the study. The duration of sample collection was one week at each CHC. Twenty per cent of the sample was collected on each week day. Estimates of the number of daily consultations per clinic were obtained from monthly prescription numbers per CHC retrieved from the 2010 South African National Department of Health routine monthly report of primary healthcare facilities.

Sample size

A sample size of folders (n = 370) was required from each CHC for this study. The sample size was based on a desired precision of 2% and a 95% confidence interval for this proportion of varying chronic conditions in the patients. Four hundred folders were sampled in order to account for potential missing data or ineligible folders. Therefore, at least 80 folders were selected per day per facility for five consecutive week days.

Patients who received medication, i.e. either consulted by a clinician or collected a prescription refill, were eligible for inclusion in the study. HIV-positive patients received medication from a separate budget according to specific guidelines, and were thus excluded from the study.

Patient folders were reviewed over five week days in each clinic. The folders of patients attending on the study days were collected at the pharmacy and were reviewed the following day, and data from the prescription charts and medical records extracted. Recorded data included the type of visit (acute or chronic prescription) and chronic disease diagnosis. The number of folders selected for review was systematically selected based on the sample size calculated from the pilot study. Data were collected by one of the researchers (a pharmacist) and a research assistant. A standardised data collection tool was used and piloted at one of the study centres to ensure validity and reliability.

The cost of the prescriptions was calculated according to the Cape Medical Depot price list (Cape Medical Depot 2012, personal communication, March 15).[8]

Definitions were as follows:
• *Acute script or condition:* Any condition requiring medication for a short period (less than one month) with no repeat prescriptions.
• *Chronic script or condition:* Any condition requiring long-term (more than one month) medication with repeat prescriptions.

- *Specific chronic disease categories:* Specific identified chronic disease categories were diabetes, hypertension, asthma/chronic obstructive pulmonary disease (COPD), epilepsy, arthritis (rheumatoid, osteoarthritis or gout), mental health (schizophrenia, depression, anxiety and psychosis), miscellaneous (any other condition, e.g. eczema, systemic lupus erythematosus and glaucoma).
- *Co-morbid script or conditions:* Two or more chronic conditions.

Ethical considerations and reporting of results

Ethical approval for the study was obtained from the Ethics and Research Committee, Faculty of Health Sciences of the University of Cape Town (HREC Ref 161/2011). The Provincial Research Committee, directors of the substructures and the facility managers of the selected CHCs approved the study. Individual patients were not identified and confidentiality of the records was assured by extraction of the data from the folders at the CHCs where the records were held. Patient identities were not captured.

Data analysis

Data were collected from the folders using a standardised template and then captured into Microsoft® Excel® and Stata® IC version 10.1, in which all analyses were performed.

Results

Table I lists the demographic profile of patients attending the 10 CHCs.

Four thousand one hundred and eighty-four patients were included in the study, of whom 64.7% were female and 35.04% male. This ratio was comparable at all the CHCs. Retreat CHC had the most males (39.14%) and Crossroads CHC the least (30.43). The age of the patients ranged from 18-101 years. The age distribution was skewed towards older patients. Therefore, patients were arbitrarily categorised as being older or younger than 35 years of age. Overall, 84.39% of patients were older than 35 years and 15.61% younger. The CHCs with the least number of patients younger than 35 years of age were Dr Abdurahman (7.38%), Mitchell's Plain (9.05%) and Lotus River (9.35%). Most young patients were at Inzama Zabantu (29.43%), Hout Bay (28.55%) and Crossroads (24.16%).

The disease profile of patients with chronic diseases

Table II lists the proportion of patients with chronic and acute conditions, and the disease profile of patients with chronic diseases.

Hypertension was the most prevalent chronic condition (58.96%) across the 10 CHCs, followed by arthritis (21.8%) and diabetes (19.67%). Diabetes and hypertension were most prevalent at Mitchell's Plain CHC (28.4% and 69.1%, respectively), Dr Abdurahman CHC (26.4% and 66.5%, respectively) and Lotus River CHC (26% and 68.7%, respectively). The centres with the lowest load for these two conditions were Inzama Zabantu CHC (14.4% and 52.2%, respectively), Hanover Park CHC (15.1% and 52%, respectively) and Hout Bay CHC (15.7% and 51.4%, respectively). Gugulethu CHC also had a low diabetic load (15%) and Crossroads CHC a low hypertension load (51%). The low prevalence of mental health patients at Inzama Zabantu CHC could be explained by the fact that they are seen at Crossroads CHC.

Mitchell's Plain (18.5%) and Inzama Zabantu (5%) were the two CHCs with extremes for the prevalence of asthma and COPD. We found a relatively high number of patients with epilepsy (11.01%) at Gugulethu CHC when compared with the other centres. The most patients with arthritis were at

Table I: The demographic profile of patients attending the ten community health centres

Facility (CHCs)	Gender (%)*		Age							
	Male	**Female**	**< 24 (%)**	**25-34 (%)**	**35-44 (%)**	**45-54 (%)**	**55-64 (%)**	**> 65 (%)**	**Min (years)**	**Max (years)**
Gugulethu	37.24	62.53	7.04	11.74	16.2	23.94	21.13	19.95	18	93
Hanover Park	34.39	65.61	5.37	9.76	16.34	20.98	22.2	25.37	18	89
Mitchell's Plain	32.84	66.67	3.02	6.03	10.55	27.89	30.4	22.11	18	91
Retreat	39.14	60.86	4.53	6.44	15.27	18.38	26.73	28.64	18	93
Vanguard	37.12	61.94	2.37	7.11	18.96	24.64	27.01	19.91	19	93
Dr Abdurahman	35.15	64.61	1.9	5.48	9.29	18.57	30.95	33.81	18	88
Crossroads	30.43	69.32	8.21	13.53	19.08	25.85	20.77	12.56	18	95
Lotus River	34.13	65.87	1.68	7.67	13.67	20.86	24.46	31.65	18	98
HoutBay	33.41	66.36	7.03	19.44	24.82	22.25	15.69	10.77	18	101
Inzama Zabantu	36.36	63.4	10.07	17.27	22.54	27.1	17.03	6	18	95
Median age	35.04	64.7	5.13	10.48	16.71	23.02	23.6	21.06	18	101

CHCs: community health centres, max: maximum, min: minimum

*: Missing data (0.26%)

Table II: Proportion of patients with chronic and acute conditions, and the disease profile of patients with chronic diseases (percentage)

Facility (CHCs)	Visit (%)		Chronic disease (% of all visits)						
	Acute	Chronic	Diabetes	Hypertension	Asthma/ COPD	Epilepsy	Arthritis	Mental health	Other
Gugulethu	20.37	79.63	14.99	58.55	10.54	11.01	27.63	5.85	34.19
Hanover Park	22.68	77.32	15.12	51.95	16.34	2.93	13.41	6.1	42.93
Mitchell's Plain	5.19	94.81	28.4	69.14	18.52	4.69	35.8	5.19*	49.63
Retreat	10.02	89.98	19.09	63.25	12.89	4.06	14.8	10.5	46.54
Vanguard	15.13	84.87	19.62	57.45	14.89	6.62	34.99	8.75	46.1
Dr Abdurahman	9.26	90.74	26.37	66.51	10.69	3.8	27.55	5.23	60.33
Crossroads	25.36	74.64	17.39	50.72	8.45	6.04	13.04	9.66	14.49
Lotus River	6.92	93.08	26.01	68.74	15.27	5.25	23.87	8.83	60.38
Hout Bay	34.81	65.19	15.65	51.4	9.11	3.74	16.12	5.84	25
Inzama Zabantu	26.08	73.92	14.35	52.15	5.02	6.46	10.77	0.72*	21.05
Total	17.64	82.36	19.67	58.96	12.14	5.47	21.8	6.67	40.03

CHCs: community health centres, COPD: chronic obstructive pulmonary disease

*: Inzama Zabantu Community Health Centre mental health patients are seen at Crossroads Community Health Centre. A large number of the Mitchells Plain mental health patients attend the Westridge Psychiatric Clinic

Table III: Proportion of patients with co-morbidities

Facility (CHCs)	Number of patients with chronic conditions (%)	Number of patients with chronic conditions* (%)	Number of chronic diseases per patient (% of co-morbidities)				
			1	2	3	4 or more	Total
Gugulethu	340 (79.63)	234 (54.8)	106 (24.82)	133 (31.15)	84 (19.67)	17 (3.98)	427 (100)
Hanover Park	317 (77.32)	206 (50.24)	111 (27.07)	126 (30.73)	75 (18.29)	5 (1.22)	410 (100)
Mitchell's Plain	384 (94.81)	289 (71.35)	95 (23.46)	154 (38.02)	98 (24.2)	37 (9.13)	405 (100)
Retreat	377 (89.98)	225 (53.7)	152 (36.28)	128 (30.55)	88 (21)	9 (2.15)	419 (100)
Vanguard	359 (84.87)	265 (62.65)	94 (22.22)	136 (32.15)	98 (23.17)	31 (7.33)	423 (100)
Dr Abdurahman	382 (90.74)	296 (70.31)	86 (20.43)	157 (37.29)	114 (27.08)	25 (5.94)	421 (100)
Crossroads	309 (74.64)	147 (35.5)	162 (39.13)	112 (27.05)	33 (7.97)	2 (0.48)	414 (100)
Lotus River	390 (93.08)	292 (69.7)	98 (23.39)	143 (34.13)	113 (26.97)	36 (8.6)	419 (100)
Hout Bay	279 (65.19)	173 (40.42)	106 (24.77)	103 (24.07)	55 (12.85)	15 (3.5)	428 (100)
Inzama Zabantu	309 (73.92)	129 (30.87)	180 (43.06)	111 (26.56)	16 (3.83)	2 (0.48)	418 (100)
Total	**3 446 (82.36)**	**953 (53.91)**	**1 190 (28.44)**	**1 303 (31.14)**	**774 (18.5)**	**179 (4.27)**	**4 184 (100)**

*: with co-morbidities

Vanguard CHC (34.9%) and Mitchell's Plain CHC (35.8%). The fewest in this regard were at Inzama Zabantu CHC (10.7%) and Crossroads CHC (13%). Retreat CHC had the most mental health patients (10.5%), and Inzama Zabantu the fewest (0.7%).

Table III details the proportion of patients with co-morbidities.

Co-morbidities were highest at Mitchell's Plain CHC (71.35%), Dr Abdurahman CHC (70.31%) and Lotus River CHC (69.7%). They were lowest at Inzama Zabantu CHC (30.87%) and Crossroads CHC (35.5%). The proportion of patients with four or more conditions was highest at Mitchell's Plain CHC (9.13%), Lotus River CHC (8.6%) and Vanguard CHC (7.33%).

Table IV lists the differences in prescription costs for patients with acute and chronic conditions.

The average cost per script was similar at Mitchell's Plain, Retreat, Vanguard, Dr Abdurahman and Lotus River CHCs, ranging from R59.79-66.10. Costs were lower at Hanover Park, Gugulethu Crossroads and Hout Bay CHCs, i.e. R41.49-49.19, and significantly lower at Inzama Zabantu CHC at R26.04 (Table IV).When considering the cost of scripts for acute conditions only, Lotus River CHC was the most expensive with an average cost of R23.99. The lowest average costs for prescriptions for acute conditions were found at Hanover Park, Retreat Crossroads and Inzama Zabantu CHCs, i.e. R11.25-14.06. The upper range of average costs for the scripts for chronic conditions was R66.96-71.22 at Mitchell's Plain, Retreat, Vanguard, Abdurahman, Lotus River and Hout Bay CHCs. The lower range of average prescription costs was R49.62-59.48 at Hanover Park, Gugulethu and Crossroads CHCs. It was much less at Inzama Zabantu CHC (R30). The average cost

Table IV: Differences in prescription costs for patients with acute and chronic conditions (in rands)

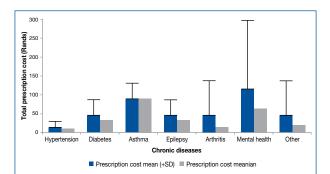| Facility (CHCs)	All prescriptions		Patients with acute conditions		Patients with chronic conditions		p-value*
	Average (SD)	Median	Average (SD)	Median	Average (SD)	Median	
Gugulethu	43.23 (61.20)	24.55	18.26 (29.96)	10.46	49.62 (66.34)	30.02	< 0.001
Hanover Park	49.12 (62.44)	25.2	13.81 (16.59)	7.25	59.48 (67.02)	34.41	< 0.001
Mitchell's Plain	64.88 (87.18)	35.23	16.48 (27.95)	6.46	67.52 (88.55)	37.05	< 0.001
Retreat	65.17 (103.85)	32.56	12.93 (17.24)	7.79	70.99 (107.78)	39.03	< 0.001
Vanguard	59.79 (80.19)	31.5	19.17 (32.62)	10.57	67.04 (83.94)	37.84	< 0.001
Dr Abdurahman	66.10 (91.47)	35.49	15.88 (14.85)	10.06	71.22 (94.43)	38.65	< 0.001
Crossroads	41.49 (81.88)	19.91	11.25 (9.87)	7.74	51.77 (92.41)	27.4	< 0.001
Lotus River	65.01 (69.25)	37.62	23.99 (25.87)	19.82	68.06 (70.49)	40.83	< 0.001
Hout Bay	49.18 (83.20)	22.75	15.88 (14.44)	10.98	66.96 (98.03)	33.3	< 0.001
Inzame Zabantu	26.04 (27.99)	15.5	14.06 (15.72)	8.24	30.22 (30.07)	18.7	< 0.001
Overall	52.98 (78.51)	27.62	15.43 (20.13)	8.99	61.01 (83.84)	33.82	< 0.001

SD: standard deviation

*: A comparison was made between the median of acute prescription costs and the median of chronic prescription costs

Table V: The cost (in rands) of prescriptions for a differing number of chronic diseases

Number of chronic diseases per patient	n	Prescription cost				
		Mean	SD	Median	Minimum	Maximum
Acute diseases	737	15.43	20.13	8.99	0.34	241.76
1	1 190	45.90	88.53	20.22	0.83	1 403.56
2	1 303	53.95	73.73	31.62	2.16	1 035.84
3	774	82.16	81.15	53.18	5.57	1 052
4	155	117.51	89.57	97.48	12.36	521.29
5	19	138.99	76.45	116.79	15.30	291.04
6	5	175.74	85.19	177.02	70.71	292.71
Total	4 183	52.98	78.51	27.62	0.34	1 403.56

SD: standard deviation

SD: standard deviation

Figure 1: Average (+ standard deviation) and median prescription costs (in rands) in cases where patients have one chronic disease

Figure 2: The correlation between prescription costs (in rands) and the number of chronic disease

of a script for an acute condition was significantly cheaper than that of a script for a chronic condition at all of the facilities (Table IV).

Figure 1 shows the cost of specific chronic conditions when they occurred without other co-morbidities. The average cost of a prescription for diabetes mellitus was twice that of hypertension, but half that of asthma.

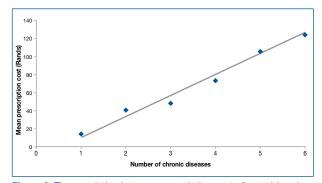The cost per prescription increased with the number of co-morbidities (Table V).

Figure 2 demonstrates a strong correlation between the number of co-morbid chronic diseases and the increased cost of the prescriptions (r = 0.9, p-value < 0.001).

Discussion

The increase in the prevalence of NCDs globally and in South Africa highlights the need to gauge the extent of the problem and to address it in an appropriate manner. The aim of this study was to determine the disease profile of patients

attending 10 CHCs in the Western half of the Cape Town Metropole and the treatment costs of NCDs at primary care level. The results could be used for resource allocation in an equitable manner in response to the disease burden.

Slightly less than two thirds of the study sample was female (Table I). This corresponds with the ratio of patients who attended health services in 2003.[8] A 2000 USA study found that 65% of its diabetic sample was female and 30% were older than 65 years of age.[9] This is in line with a global report on the prevalence of diabetes which stated that the most important demographic change was an increase in the proportion of patients who were older than 65 years of age.[10] The prevalence of diabetes is slightly higher in men than it is in women. This could be because the prevalence of diabetes increases with age, and there are more elderly women than men in most populations.[10,11] Overall, in this study, 83% of the patients were older than 35 years of age, and the prevalence of diabetes mellitus tended to be lower at Crossroads, Inzama Zabantu, Hout Bay and Gugulethu CHCs. The number of visits to treat chronic conditions, as well as co-morbidities in patients, was also lower at these sites.

The ratio of visits for chronic conditions to those for acute conditions was 82%:18%, and was even higher at Mitchells Plain, Dr Abdurahaman, Retreat and Lotus River CHCs. The 2003 South African Demographics and Health Survey found that the most frequently prescribed drugs were for hypertension (52 %), asthma and COPD (16%), and diabetes and arthritis (just less than 12% each).[8] These figures were 58.5% for hypertension, 19.4% for diabetes, 14.1% for asthma and COPD, and 21.8% for arthritis (Table II) in our study sample. The higher prevalence of arthritis observed at Mitchells Plan and Vanguard CHCs could be owing to the rheumatology services that are offered at the CHCs, referrals from other CHCs and down referrals from hospitals.

In our study, it was found that 65% of patients with chronic conditions had co-morbidities and other chronic diseases (Table III). This level of co-morbidity was much higher than that in a 2002 study which was conducted in the Netherlands and which found that in people over the age of 65 years, 23% had more than one chronic disease.[12] Patients with osteoarthritis and diabetes mellitus had the highest rates of co-morbidity. In 2006, a Swedish study found that the variation in individual patient costs was substantially different within different age groups, as well as within different co-morbidity groups.[13] 37.7% of individual patient costs in the Swedish study could be explained by co-morbidities, while age and gender accounted for an additional 0.8%.

The cost of prescriptions for chronic diseases was significantly higher than the cost for acute conditions at all 10 facilities (Table IV). The costs of specific chronic conditions were difficult to quantify because of the frequent occurrence of co-morbidities. Figure 1 represents the cost of specific chronic conditions when they occurred without any other co-morbidity. The cost per prescription increased with the number of co-morbidities (Table V). The 2011 World Bank report[14] recommended that in order to implement effective NCD interventions, primary care needs to be reshaped from an acute to a chronic care model, while retaining a strong focus on prevention.

Conclusion

The study findings indicate that most adults attending public sector facilities in the western half of the Cape Town Metropole had chronic conditions, and that the cost of treating these conditions was significantly greater than that of treating acute conditions. It must be understood that interventions in single-disease intervention studies may not be effective in our setting because of the high degree of co-morbidity in patients with chronic conditions.

An integrated approach to the management of chronic conditions is important in low-resource settings for the efficient utilisation of limited resources. Further research is needed to analyse the cost of prescriptions in relation to quality-of-care indicators, and to compare prescription patterns for specific chronic conditions with prescription patterns advocated by national guidelines.

Limitations

Systematic sampling was used at all of the CHCs, and this worked well at the eight-hour facilities. However, there could have been an underestimation of the number of acute cases from trauma after hours at the 24-hour facilities. This may have skewed the data, giving an overestimation of chronic conditions.

Sampling was carried out on five consecutive days at each clinic. If specialist clinics were operational during this time, the prescriptions would not reflect the norm. For, example, at Inzama Zabantu CHC, an eye clinic resulted in an increase in the number of eyedrops being prescribed that day. Monthly or weekly psychiatry clinics during the data collection period could also have resulted in more psychiatric prescriptions being recorded, thus skewing the data.

Conflict of interest

The research investigators report no conflict of interest.

Declaration

Acknowledgements

References

1. World Health Organization. Package of essential noncommunical (PEN) disease interventions for primary health care in low-resource settings. 2010. c2010. WHO [homepage on the Internet]. Available from: http://whqlibdoc.who.int/publications/2010/9789241598996_eng.pdf

2. Mayosi BM, Flisher AJ, Lalloo UG, Sitas F, et al. The burden of non-communicable diseases in South Africa. Lancet. 2009;374(9693):934-947.

3. Groenewald P, Bradshaw D, Msemburi W, et al. Western Cape mortality profile 2009. Cape Town: Medical Research Council, 2012.

4. Myers J, Naledi T. Western Cape Burden of Disease Reduction Project. Western Cape Government [homepage on the Internet]. 2007. c2010. Available from: http://www.capegateway.gov.za/Text/2007/10/cd_volume_1_overview_and_executive_summaries180907.pdf

5. Indian Council of Medical Research. Assessment of burden of non-communicable diseases in India. Final report of project WR/SE IND RPC 001 RB 02. SE/02/419575. New Delhi: Indian Council of Medical Research; 2004.

6. Provincial Government of the Western Cape, Department of Health. Adult chronic disease management policy. A strategy for the five key conditions. Cape Town; Western Cape Department of Health; 2009.

7. District health expenditure review 2008/2009, Western Cape. Cape Town: Western Cape Department of Health; 2008.

8. South Africa Demographic and Health Survey. Medical Research Council [homepage on the Internet]. 2003. c2010. Available from: http://www.measuredhs.com/pubs/pdf/FR206/FR206.pdf

9. Chin MH, Auerbach SB, Cook S, et al. Quality of diabetes care in community health centers. Am J Public Health. 2000;90(3):431-434.

10. Wild S, Roglic G, Green A, et al. Global prevalence of diabetes. Diabetes Care. 2004;27(5):1047-1053.

11. Yang W, Lu J, Weng J, et al. Prevalence of diabetes among men and women in China. New Engl J Med. 2010;362(12):1090-1101.

12. Schellevis FG, van der Velden J, van de Lisdonk E, et al. Comorbidity of chronic diseases in general practice. J Clin Epidemiol. 1993;46(5):469-473.

13. Engstrom SG, Carlsson L, Ostgren CJ, et al. The importance of comorbidity in analyzing patient costs in Swedish primary care. BMC Public Health [homepage on the Internet]. 2006. c2010. Available from: http://www.biomedcentral.com/1471-2458/6/36

14. The World Bank. Human development network. The growing danger of non-communicable diseases. Acting now to reverse course. World Bank [homepage on the Internet]. 2011. c2011. Available from: http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/Peer-Reviewed-Publications/WBDeepeningCrisis.pdf