

# REPORT

SECOND NATIONAL  
BURDEN OF DISEASE STUDY  
FOR SOUTH AFRICA:  
Cause of death profile



HIV/AIDS & TB 732  
non communicable diseases 696  
other type 1 241  
injuries 116

**FREE STATE PROVINCE 1997 - 2012**



## COPYRIGHT INFORMATION

Copyright 2016, South African Medical Research Council. All materials in this report may be reproduced and copied for non-commercial purposes; citation as to source is required.

## SUGGESTED CITATION

Msemburi W, Pillay-van Wyk V, Dorrington RE, Neethling I, Nannan N, Groenewald P, Laubscher R, Joubert J, Matzopoulos R, Nicol E, Nojilana B, Prinsloo M, Sithole N, Somdyala N and Bradshaw D. Second national burden of disease study for South Africa: Cause-of-death profile for Free State, 1997–2012. Cape Town: South African Medical Research Council, 2016. ISBN: 978-1-928340-10-2.

## ACKNOWLEDGEMENTS

We thank Statistics South Africa for providing cause-of-death data, Anastasia Rossouw, Theo Vos, Krisela Steyn, Naomi Levitt, Eric Bateman, Allan Bryer and Kirsty Bobrow for providing input during analysis, Claudette Garnie and Elmarie van Wyk for editing the reports, Carron Finnan for designing the covers and Elize De Kock, Sulaiman Abrahams and Monique Fourie for administrative support on the SA NBD study. This research and the publication thereof were partly funded by the South African Medical Research Council's Flagships Awards Project (SAMRC-RFA-IFSP-01-2013/SA CRA 2).

A copy of this report and the data are available on the Internet at:

[www.mrc.ac.za/bod/reports.htm](http://www.mrc.ac.za/bod/reports.htm)





## FOREWORD

As the world responds to the challenges of sustainable development, it has developed Sustainable Development Goals (SDGs) to focus countries' attention on the inter-related systems and outcomes essential to advance the quality of human life on the planet. Countries are urged to adopt policies and practices that will ensure the well-being of their inhabitants. Health plays an integral role in the SDGs. Aside from the health related goal (Goal 3), many others goals are indirectly related to health or have a health impact. In particular, food security (Goal 2), water and sanitation (Goal 6) and healthier cities (Goal 11) have an inter-dependent relationship with health.

A good understanding of the historical trends in mortality and their causes is crucial to guide South Africa's response required to meet the challenges of the SDGs. The 2<sup>nd</sup> National Burden of Disease Study led by the SAMRC's Burden of Disease Research Unit presents mortality trends for the period 1997-2012, extending the previous estimates by another 2 years. Using the same methodology together with newer data, the team has unpacked the trends for the country and each province. This work has developed methods to overcome the data quality concerns of vital registration and provide consistent and coherent estimates that can be used by policy makers.

The extended trends highlight the continued decline in mortality for HIV and TB, with non-communicable diseases coming to the forefront and now contributing the highest number of deaths in South Africa. The unfinished agenda of maternal and child health, infectious diseases and injuries persist with some small gains in some aspects.

This report provides estimates of premature mortality, using the age of death to calculate the years of life that have been lost. The profile of causes based on this metric provides each province with information about the conditions that need to be targeted with health promotion and disease prevention initiatives. As the conditions rank differently for each province, provinces are urged to use this information to prioritise activities that will address the upstream causes of disease as well strengthen their health service response and make a contribution towards meeting the SDGs.



**Professor Glenda E. Gray (MBBCH, FCPaed, DSc (*honoris causa*))**  
**President of the South African Medical Research Council (SAMRC)**





# CONTENTS

Acronyms and abbreviations . . . . .	ix
Glossary . . . . .	ix
Background . . . . .	1
Methods . . . . .	1
Demographic profile, 2012 . . . . .	3
Cause-of-death profile, 2012 . . . . .	5
Maternal and child mortality . . . . .	7
Leading causes of death, 2012 . . . . .	9
Leading causes of death by age-standardised death rates (ASDR), 2012 . . . . .	11
Leading causes of premature mortality (YLLs), 2012 . . . . .	13
Leading causes of death by age group, 2012 . . . . .	15
League table of leading causes of death by age group, 2012 . . . . .	17
Broad cause and disease category trends, 1997–2012 . . . . .	18
South Africa provincial comparison, 2012 . . . . .	20
Conclusion and recommendations . . . . .	23

## LIST OF FIGURES

1	Age structure for Free State . . . . .	3
2	Deaths by disease category, 2012 . . . . .	5
3	Deaths by broad cause and age, 2012 . . . . .	5
4	Deaths by disease category, males and females 2012 . . . . .	6
5	Deaths by broad cause and age, males and females 2012 . . . . .	6
6	Trends in maternal deaths from 1997–2012 . . . . .	7
7	Causes of maternal deaths from 2008 to 2012 . . . . .	8
8	Causes of death in children under five years of age, 2012 . . . . .	8
9	Top-10 single causes of death for persons, 2012 . . . . .	9
10	Top-10 single causes of death for males and females, 2012 . . . . .	10
11	Top-10 single causes by ASDR for persons, 2012 . . . . .	11
12	Top-10 single causes by ASDR for males and females, 2012 . . . . .	12
13	Top-10 single causes of years-of-life lost for persons, 2012 . . . . .	13
14	Top-10 single causes of years-of-life lost for males and females, 2012 . . . . .	14
15	Top-10 single causes of death in children, 2012 . . . . .	15
16	Top-10 single causes of death in adults, 2012 . . . . .	16
17	Trends in person deaths and age-standardised death rates by broad cause, 1997–2012 . . . . .	18
18	Trends in person deaths and age-standardised death rates by disease category, 1997–2012 . . . . .	19
19	Provincial broad-cause ASDR, 2012 . . . . .	21



## LIST OF TABLES

1	Free State key demographic indicators . . . . .	4
2	Top-10 single causes of death by sex, 2012 . . . . .	9
3	Top-10 single causes of age-standardised death rates by sex, 2012 . . . . .	11
4	Top-10 single causes of years-of-life lost by sex, 2012 . . . . .	13
5	Top-10 single causes of death by age, 2012 . . . . .	17
6	Provincial comparison of key demographic indicators, 2012 . . . . .	20
7	Top-10 single causes of years-of-life lost for persons by province, 2012 . . . . .	22

## ACRONYMS AND ABBREVIATIONS

---



---

<b>AIDS</b>	acquired immune deficiency syndrome
<b>ASDR</b>	age-standardised death rate
<b>ASSA</b>	Actuarial Society of South Africa
<b>Comm/mat/peri/nutri</b>	other communicable (excluding HIV/AIDS and tuberculosis) diseases, maternal causes, perinatal conditions and nutritional deficiencies
<b>COPD</b>	chronic obstructive pulmonary disease
<b>Endo/nutri/blood/imm</b>	endocrine, nutritional, blood and immune disorders
<b>HIV</b>	human immunodeficiency virus
<b>ICD-10</b>	International Statistical Classification of Disease and Related Health Conditions 10 <sup>th</sup> revision
<b>Inf/para</b>	infectious and parasitic diseases
<b>LRI</b>	lower respiratory infections
<b>NBD</b>	National Burden of Disease Study
<b>Stats SA</b>	Statistics South Africa
<b>TB</b>	tuberculosis
<b>YLLs</b>	years of life lost

---

## GLOSSARY

**Adult mortality ( ${}_{45}q_{15}$ ):** The probability of a 15-year old dying before reaching 60 years of age.

**Age-standardised death rate (ASDR):** The overall mortality rate the population in question would have if it had the age structure of the standard population. It is a summary measure that allows comparison of the level of mortality in populations with different age structures. The World Standard Population was used to calculate age-standardised death rates expressed per 100,000 population.

**Cause-specific rate:** Deaths in a single year from a particular cause divided by the mid-year population. These rates are conventionally expressed per 100,000 population.

**Garbage conditions:** Global Burden of Disease (GBD) experts coined this term for ICD codes for mortality data which do not signify an underlying cause of death. This includes ill-defined signs and symptoms, intermediate causes of death (e.g. septicaemia), mechanisms of death (e.g. cardiac arrest) or partially specified causes (e.g. cancer with unknown site).

**Indirect maternal death:** Deaths resulting from previous existing disease or disease that developed during pregnancy, and which were not due to direct obstetric causes, but which were aggravated by the physiological effects of pregnancy.

**Infant mortality rate:** The number of infant deaths in a period divided by the number of live births in that period expressed per 1,000 live births. It approximates the probability of a live birth dying before reaching one year of age.

**Life expectancy at birth ( $e_0$ ):** The average number of years a person will live after birth, as determined by mortality in a specific population.

**Life expectancy at 60 years ( $e_{60}$ ):** The average number of years a person could expect to live, having survived to age 60, as determined by mortality in a specific population.

**National burden of disease study (NBD):** A comprehensive measure of the health status of the nation by assessing ill-health and causes of death. A burden of disease study attempts to derive consistent and coherent estimates of all causes of ill-health and death for a specific country. This report focuses only on the mortality aspect of the NBD. The analysis of non-fatal outcomes, as well as the contribution of modifiable risk factors, is currently under way.

**Neonatal deaths:** Deaths between birth and 27 days of age.

**Post-neonatal deaths:** Deaths between 1–11 months.

**Underlying cause of death:** The disease or injury that initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence that produced the fatal injury.

**Under-5 mortality rate:** The probability of a live birth dying before reaching five years of age. The result is usually expressed per 1,000 live births.

**Years of life lost (YLLs):** The years of life lost due to premature mortality, compared to a normative standard. This is a measure of the mortality gap.

## BACKGROUND

Cause-of-death statistics are an essential component of the information needed for planning and monitoring health services and responding to the health needs of the population. This information will enable government, both national and provincial, to act in a manner that begins to address and reduce the disease burden, and allocate resources more appropriately in resource-constrained settings instead of being reactive to the pressures placed upon the health system. Despite improvements, analyses of existing vital registration data in South Africa highlighted deficiencies in the death statistics. These deficiencies include under-registration of deaths, misclassification of HIV/AIDS deaths to AIDS-indicator conditions, poor-quality certification of underlying cause of death by medical doctors and headmen (rural areas), and a high proportion of deaths classified as undetermined unnatural causes.<sup>1,2</sup> This makes it difficult to interpret the official death statistics. In addition, the study of death statistics requires population estimates that are demographically consistent with the mortality estimates and the provincial boundary changes in the past decade.

This report estimates consistent and coherent cause-specific death rates for the period 1997–2012 and identifies the leading causes of death and premature mortality in the province, taking into consideration and adjusting for the data deficiencies reported above. This report of empirical mortality trends for Free State is an update of the 1997–2010 cause of deaths profile released in 2014.<sup>3</sup>

## METHODS

The 2<sup>nd</sup> National Burden of Disease Study 2012 used the methodology of the Global Burden of Disease Study 2005.<sup>4</sup> In broad terms, a range of demographic and epidemiological methods were applied in secondary analysis of data obtained from Statistics South Africa (Stats SA) for the period 1997–2012 (including late registrations), the Injury Mortality Survey 2009 (IMS)<sup>5</sup> and National Injury Surveillance System 2000 (NIMSS).<sup>6</sup> The Statistics South Africa data have certain quality challenges that were addressed as follows:

- (a) Adjusting the under-reporting of deaths was done using demographic methods.
- (b) Reallocation of misclassified HIV/AIDS deaths was performed by regressing excess mortality on a lagged indicator HIV prevalence.
- (c) Estimates of the number of non-natural deaths by specific cause were derived using the IMS and NIMSS.
- (d) A strategy was developed for the redistribution of causes of death that were not coded to valid underlying causes of death i.e. causes regarded as garbage and/or ill-defined.

<sup>1</sup>Bradshaw D, Pillay-van Wyk V, Laubscher et al. Cause of death statistics for South Africa: Challenges and possibilities. Cape Town: Medical Research Council; 2012.

<sup>2</sup>Pillay-van Wyk V, Bradshaw D, Groenewald P, Laubscher R. Improving the quality of medical certification of cause of death: the time is now! South African Medical Journal 2011; 101(9): 626.

<sup>3</sup>Msemburi W, Pillay-van Wyk V, Dorrington RE, Neethling I, Nannan N, Groenewald P, Laubscher R, Joubert J, Matzopoulos R, Nicol E, Nojilana B, Prinsloo M, Sithole N, Somdyala N and Bradshaw D. Second national burden of disease study for South Africa: Cause-of-death profile for Free State, 1997–2010. Cape Town: South African Medical Research Council, 2014.

<sup>4</sup>GBD 2005. Operations Manual. Final Draft. January 2009. Harvard University, Institute for Health Metrics and Evaluation at the University of Washington, John Hopkins University, the University of Queensland and the WHO. [http://www.globalburden.org/GBD\\_Study\\_Operations\\_Manual\\_Jan\\_20\\_2009.pdf](http://www.globalburden.org/GBD_Study_Operations_Manual_Jan_20_2009.pdf)

<sup>5</sup>Matzopoulos R, Prinsloo M, Bradshaw D, Pillay-van Wyk V, Gwebushe N, Mathews S, et al. The Injury Mortality Survey: A national study of injury mortality levels and causes in South Africa in 2009. Cape Town: Medical Research Council, 2013.

<sup>6</sup>Burrows S, Bowman B, Matzopoulos R, van Niekerk A. A Profile of Fatal Injuries in South Africa 2000. Cape Town: South African Medical Research Council, 2001.

A National Burden of Disease list was created using the 2000 SA NBD study and the Global Burden of Disease 2005 list.<sup>7</sup> The list was adjusted in the context of the quality of the South African mortality statistics and local public health needs. The 2010 SA NBD list comprises 140 specific causes of death in 24 disease categories and by four broad-cause groups namely:

- **Type 1a:** Communicable diseases (excluding HIV/AIDS & TB), maternal causes, perinatal conditions, and nutritional deficiencies.
- **Type 1b:** HIV/AIDS & TB (HIV and AIDS, as well as all forms of tuberculosis, are combined as a category due to the need to integrate care for these conditions).
- **Type 2:** Non-communicable diseases, including malignant neoplasms, cardiovascular diseases, chronic respiratory diseases, digestive diseases, musculoskeletal and genitourinary conditions, as well as mental disorders and neurological conditions.
- **Type 3:** Intentional and unintentional injuries.

It should be noted that slight discrepancies in the estimated numbers and proportions can be observed as a result of rounding. For example, the total of the male and female estimates compared with the person estimates may differ.

---

<sup>7</sup>Pillay-Van Wyk V, Laubscher R, Msemburi W, Dorrington RE, Groenewald P, Vos T et al, Second South African National Burden of Disease Study: Data cleaning, validation and SA NBD List. Burden of Disease Research Unit. South African Medical Research Council. Cape Town: 2014.

## DEMOGRAPHIC PROFILE, 2012

Free State lies in the centre of South Africa having local borders with the Northern Cape, North West, Gauteng, Mpumalanga, KwaZulu Natal and Eastern Cape, and an international border with Lesotho to the south-east.<sup>8</sup> According to the 2011 census,<sup>9</sup> the province comprises an area of 129,825 km<sup>2</sup>, which covers approximately 10.6% of the land area of the country, an area roughly the size of Nicaragua.

For the year 2012 (Figure 1):

- An estimated 2.7 million<sup>10</sup> people lived in Free State, constituting 5.2% of South Africa's total population. The province accommodated slightly more women than men, with women making up 51.8% of the province's total population.
- Nearly 29.3% of the population were younger than 15 years, and 65.1% were in their economically active years (15–64), while 5.6% were 65 years or older.

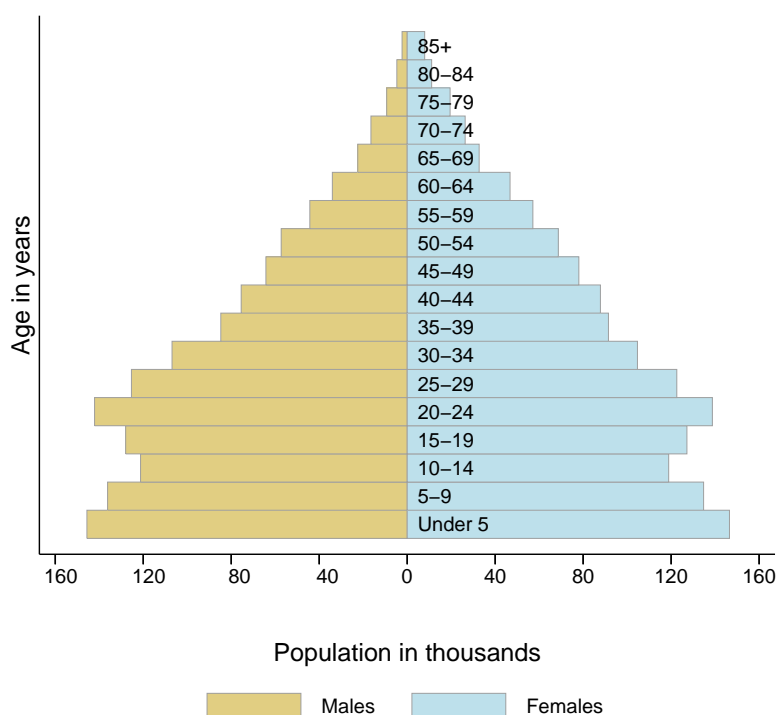


Figure 1: Age structure for Free State population 2012,  $N = 2,741,872$

Key health and development indicators for years 2000, 2005, 2010 and 2012 are presented in Table 1.

- The infant mortality rate (IMR) and under-5 mortality rate (U5MR) increased between 2000 and 2005, thereafter decreasing between 2005 and 2012. The rates peaked in 2005 at 63.8 per 1,000 live births and 96.0 per 1,000 live births, respectively.
- The probability of dying between the ages of 15 and 60 ( ${}_{45}q_{15}$ ) increased from 2000 to 2005 and decreased from 2005 to 2012, peaking in 2005 at 61.6%.

<sup>8</sup><http://www.gcis.gov.za/content/resourcecentre/sa-info/yearbook2012-13>

<sup>9</sup>Census 2011 Statistical release P0301.4. Statistics South Africa, 2012. <http://www.statssa.gov.za/publications/P03014/P030142011.pdf>

<sup>10</sup>Dorrington RE. 2013. Alternative South African mid-year estimates, 2013. Centre for Actuarial Research Monograph 13, University of Cape Town, 2014. [https://www.commerce.uct.ac.za/Research\\_Units/CARE/Monographs/Monographs/Mono13.pdf](https://www.commerce.uct.ac.za/Research_Units/CARE/Monographs/Monographs/Mono13.pdf)

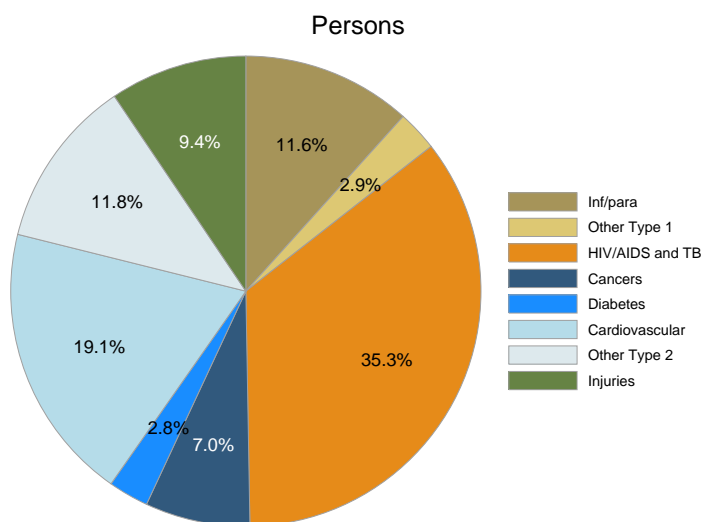
- The life expectancy at birth ( $e_0$ ) decreased from 2000 to 2005, increasing after that. It was at its lowest level of 48.4 years in 2005. The life expectancy at age 60 ( $e_{60}$ ) changed minimally over the period, falling to 16.8 years in 2005 and rising to 17.2 in 2012.

*Table 1: Free State key demographic indicators*

Year	IMR ( ${}_1q_0$ )	U5MR ( ${}_5q_0$ )	${}_{45}q_{15}$	$e_0$	$e_{60}$
2000	57.1	87.0	50.5	53.5	17.3
2005	63.8	96.0	61.6	48.4	16.8
2010	44.6	65.8	53.7	53.4	16.4
2012	30.4	43.0	43.8	59.2	17.2

## CAUSE-OF-DEATH PROFILE, 2012

The Free State mortality profile for the year 2012 is based on an estimated 32,753 total deaths. Of these, 15,457 (47.2%) were females and 17,297 (52.8%) were males. For all persons (males and females together), HIV/AIDS and TB deaths accounted for the highest proportion of provincial deaths (35.3%) followed by cardiovascular deaths, which accounted for 19.1% of deaths (Figure 2). Looking at the other cause of death groupings:



- The infectious and parasitic diseases (inf/para) grouping accounted for the third-highest proportion at 11.6% of deaths.
- Injuries were the fourth-highest cause of death, accounting for 9.4% (3,090) of all Free State deaths in 2012. Intentional injuries, including interpersonal violence, resulted in 43.9% (1,356) and unintentional injuries resulted in 56.1% (1,734) of the total deaths due to injuries.

Figure 2: Deaths by disease category for persons 2012, N = 32,753

As shown in Figure 3, Type 1a conditions, namely, communicable diseases, maternal causes, perinatal conditions and nutritional deficiencies, contributed to most of the deaths in children under-5 years of age (69.5%) followed by HIV/AIDS and TB (13.5%).

In adults 15 years and older (Figure 3):

- HIV/AIDS and TB accounted for 37.1% of all adult deaths.
- Injury-related deaths were high in young adults and constituted 33.6% of deaths in 15–29 year olds.
- Non-communicable diseases dominated the older age cause profile, accounting for 59.3% of deaths in persons older than 45 years of age.

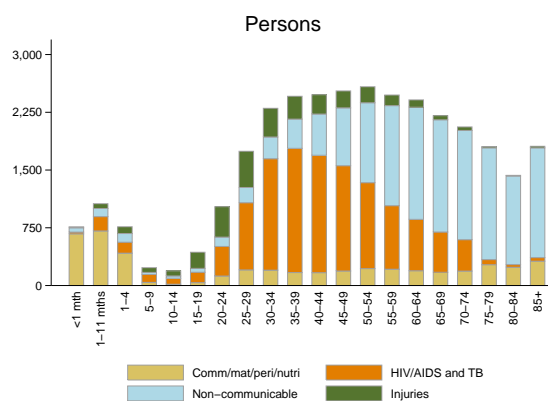


Figure 3: Deaths by broad cause and age for persons 2012, N = 32,753



The proportion of deaths due to injury was 13.8% for males and 4.5% for females, whereas the proportion of deaths due to cardiovascular diseases was 15.7% in males and 23.0% for females (Figure 4). Cancers caused

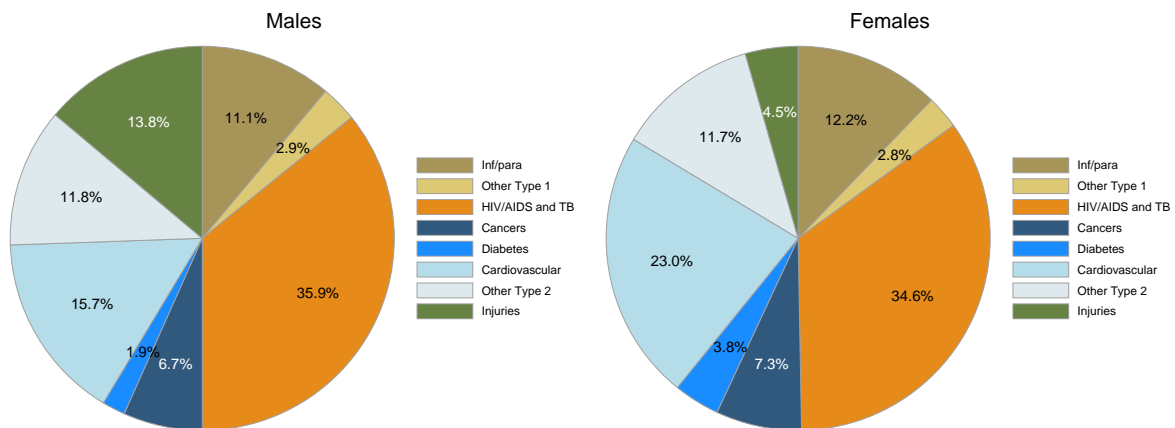


Figure 4: Deaths by disease category for males (N = 17,297) and females (N = 15,457), 2012

approximately 6.7% of the male and 7.3% of the female deaths in 2012. Male and female deaths by broad cause and age group are presented in Figure 5.

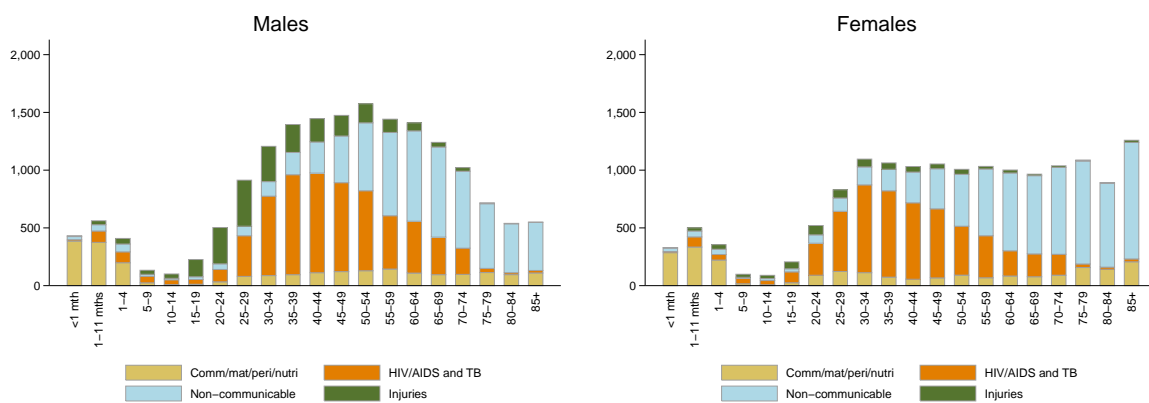


Figure 5: Deaths by broad cause and age group for males (N = 17,297) and females (N = 15,457), 2012

## MATERNAL AND CHILD MORTALITY

Reducing maternal mortality was one of the Millennium Development Goals (MDGs).<sup>11</sup> Trends in the number of Free State maternal deaths for the period 1997 to 2012 are shown in Figure 6. There was a significant increase in the number of indirect maternal deaths, which began in 2001 and peaked in 2007. The timing of the mortality increase is unexpected given that nationally HIV/AIDS mortality among women of child-bearing age peaked between 2005 and 2006. This is pointed out by Bradshaw and Dorrington,<sup>12</sup> who suggest this trend was caused by increasing numbers of women with longer durations of exposure to HIV as the epidemic matured as well as the adverse effects of antiretroviral therapy.

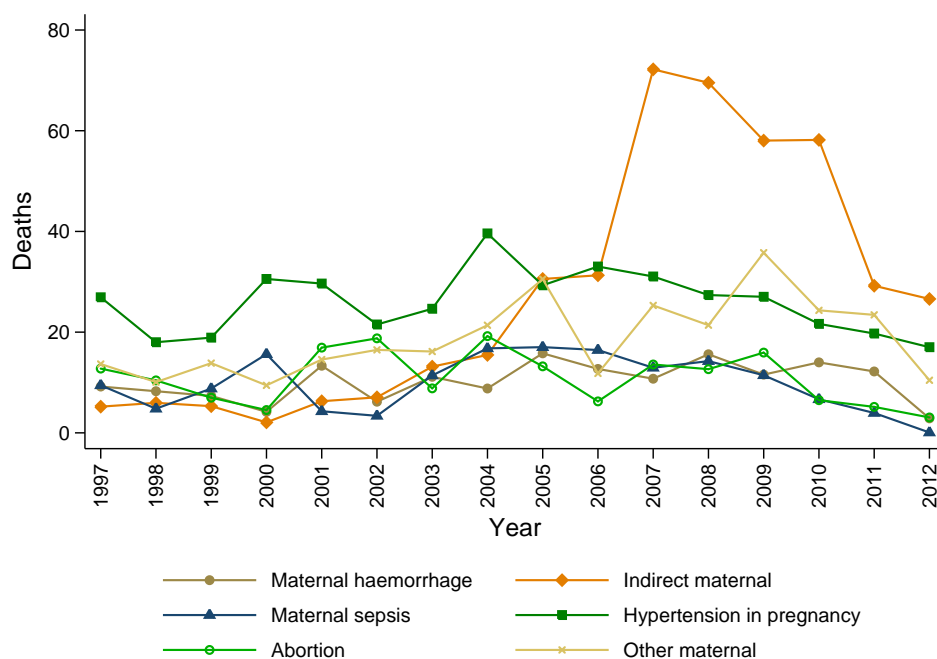


Figure 6: Trends in maternal deaths from 1997–2012

Figure 7 shows the proportion of maternal deaths by cause for the 2008–2012 period pooled together to minimise random fluctuations due to the relative rarity of such events. Free State experienced an estimated 606 maternal deaths over this period. Indirect maternal causes contributed to the largest proportion of these, accounting for 39.9% of maternal deaths. According to the Confidential Enquiry into Maternal Deaths,<sup>13</sup> HIV/AIDS is often the underlying cause behind indirect maternal deaths. Deaths from hypertension-related conditions and haemorrhage are easily preventable through good-quality antenatal and childbirth care, yet they caused 18.6% and 9.3% of maternal deaths, respectively.

<sup>11</sup>United Nations (2001). Road Map Towards the Implementation of the United Nations Millennium Declaration: Report of the Secretary-General. New York: United Nations.

<sup>12</sup>Bradshaw D, Dorrington RE. (2012). Maternal mortality ratio - trends in the vital registration data. South African Journal of Obstetrics and Gynaecology, 18(2), 38-42. doi:10.7196/sajog.515.

<sup>13</sup>Pattinson R, Fawcus S, Moodley J. Ninth interim report on the Confidential Enquiries into Maternal Deaths in South Africa 2011. Pretoria: National Committee for Confidential Enquiries into Maternal Deaths, Department of Health, 2013.

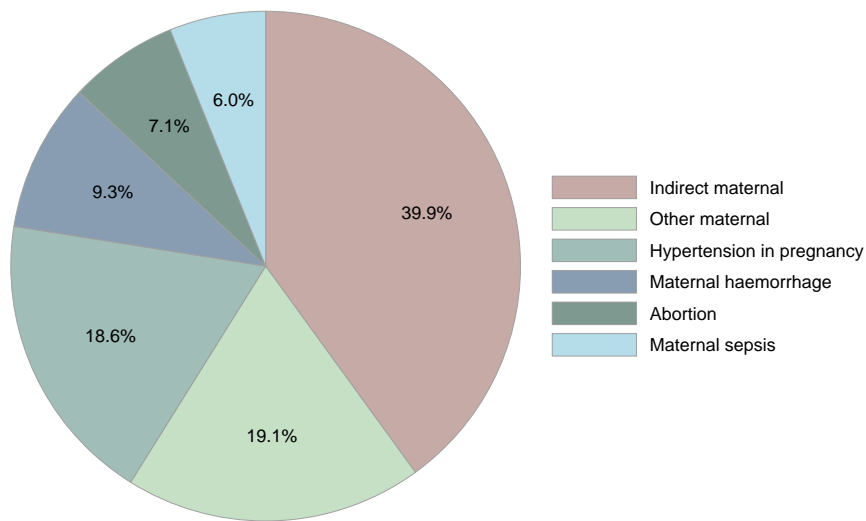


Figure 7: Causes of maternal deaths from 2008 to 2012, N = 606

Reducing under-5 mortality rates was also one of the MDGs. For Free State, there were an estimated 2,589 under-5 deaths in 2012. Deaths from neonatal conditions (Figure 8) accounted for 29.5% of these deaths. Complications from preterm birth complications, birth asphyxia and severe infections are the three main causes of death in this age group. Overall, HIV/AIDS accounted for 11.2% of the under-5 deaths, diarrhoea for 15.4% and lower respiratory infections (pneumonia) for 17.0%. These are aggravated by malnutrition and are all preventable causes of death.

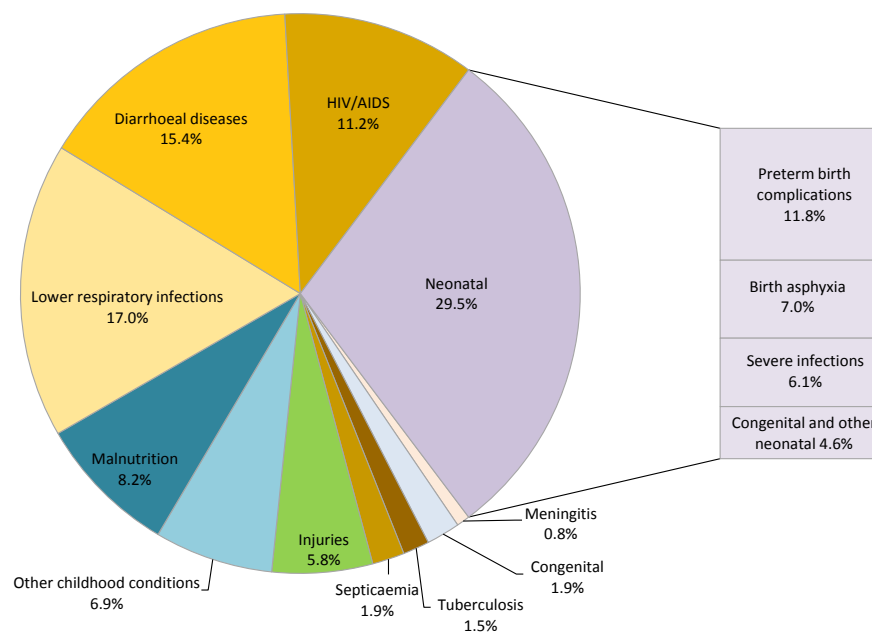


Figure 8: Causes of death in children under five years of age 2012, N = 2,589

## LEADING CAUSES OF DEATH, 2012

For persons in 2012 (Figure 9 and Table 2):

- The leading single cause of death was HIV/AIDS, causing 10,088 deaths and accounting for 30.8% of all deaths.
- This was followed by cerebrovascular disease, lower respiratory infections, ischaemic heart disease and tuberculosis.
- These top-five causes of death accounted for 54.3% of all deaths.

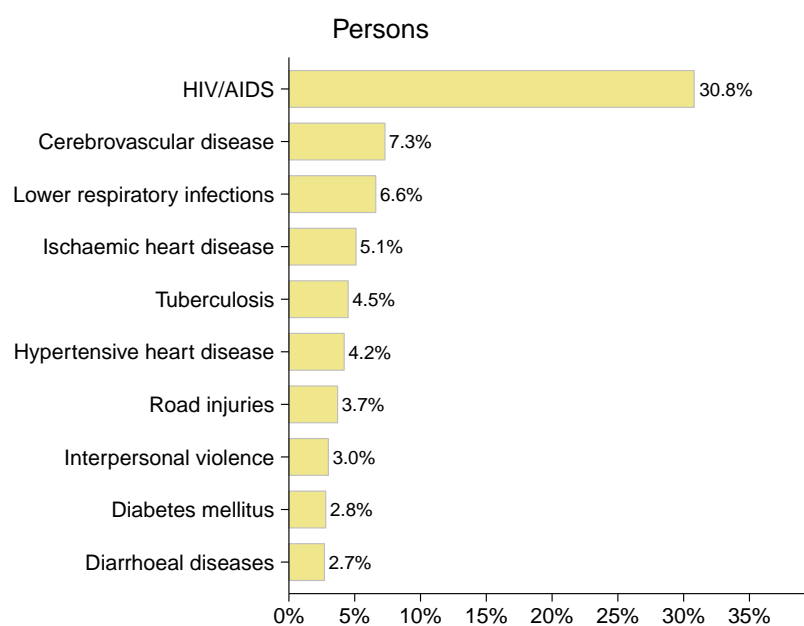


Figure 9: Top-10 single causes of death for persons 2012, N = 32,753

Table 2: Top-10 single causes of death by sex, 2012

Person deaths, N = 32,753		Male deaths, N = 17,297		Female deaths, N = 15,457		
1	HIV/AIDS	10,088	HIV/AIDS	5,194	HIV/AIDS	4,894
2	Cerebrovascular disease	2,393	Lower respiratory infections	1,165	Cerebrovascular disease	1,443
3	Lower respiratory infections	2,167	Tuberculosis	1,022	Lower respiratory infections	1,002
4	Ischaemic heart disease	1,673	Cerebrovascular disease	950	Hypertensive heart disease	860
5	Tuberculosis	1,475	Road injuries	875	Ischaemic heart disease	822
6	Hypertensive heart disease	1,360	Ischaemic heart disease	851	Diabetes mellitus	592
7	Road injuries	1,222	Interpersonal violence	817	Diarrhoeal diseases	478
8	Interpersonal violence	973	Hypertensive heart disease	501	Tuberculosis	453
9	Diabetes mellitus	923	Renal disease	425	Renal disease	391
10	Diarrhoeal diseases	871	Diarrhoeal diseases	393	Road injuries	347

Ranking the causes of male and female deaths in 2012 (Figure 10 and Table 2):

- HIV/AIDS was the leading cause of male deaths, accounting for 30.0% of all male deaths. This was followed by lower respiratory infections, tuberculosis, cerebrovascular disease and road injuries.
- For females, the leading cause was HIV/AIDS, accounting for 31.7% of deaths. This was followed by cerebrovascular disease, lower respiratory infections, hypertensive heart disease and ischaemic heart disease.

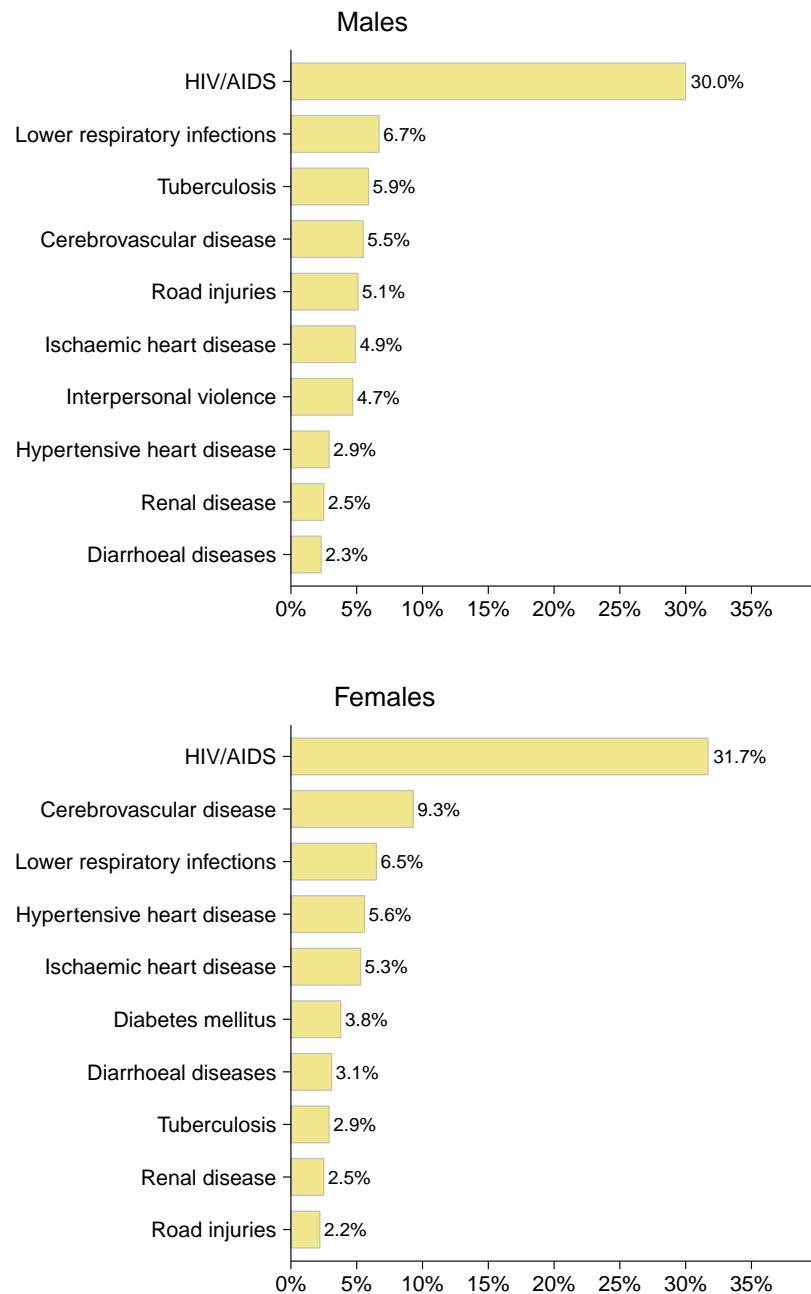


Figure 10: Top-10 single causes of death for males (N = 17,297) and females (N = 15,457), 2012

## LEADING CAUSES OF DEATH BY AGE-STANDARDISED DEATH RATES (ASDR), 2012

Standardising for age removes the effect of the population age structure on the mortality profile. This allows comparison of mortality between populations with different age structures. For persons in 2012 (Figure 11 and Table 3):

- HIV/AIDS was the leading cause of all person age-standardised death rates at 409 deaths per 100,000 population.
- This was followed by cerebrovascular disease, lower respiratory infections, ischaemic heart disease and hypertensive heart disease.

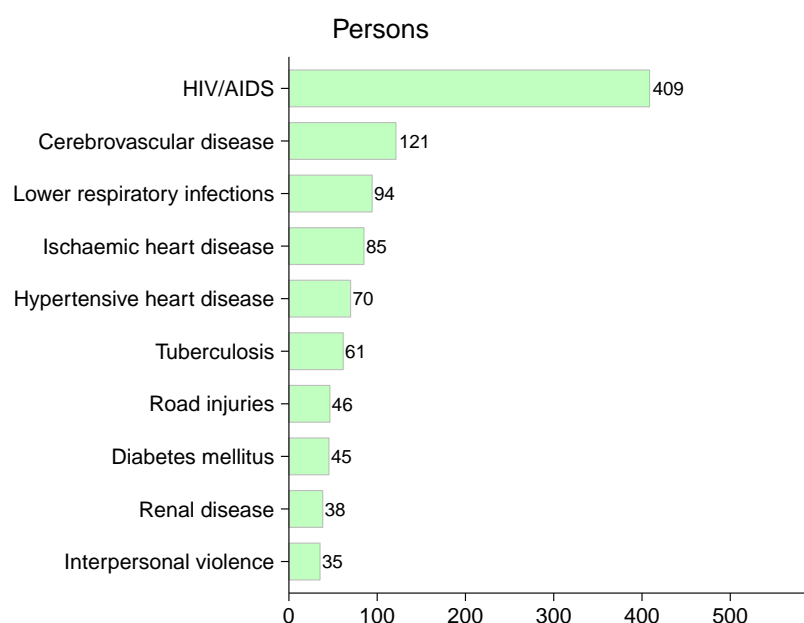


Figure 11: Top-10 single causes by ASDR (per 100,000) for persons, 2012

Table 3: Top-10 single causes of ASDR (per 100,000) by sex, 2012

Person ASDR per 100,000		Male ASDR per 100,000		Female ASDR per 100,000		
1	HIV/AIDS	409	HIV/AIDS	470	HIV/AIDS	366
2	Cerebrovascular disease	121	Lower respiratory infections	131	Cerebrovascular disease	116
3	Lower respiratory infections	94	Cerebrovascular disease	126	Lower respiratory infections	73
4	Ischaemic heart disease	85	Ischaemic heart disease	113	Hypertensive heart disease	69
5	Hypertensive heart disease	70	Tuberculosis	99	Ischaemic heart disease	66
6	Tuberculosis	61	Hypertensive heart disease	72	Diabetes mellitus	48
7	Road injuries	46	Road injuries	71	Diarrhoeal diseases	34
8	Diabetes mellitus	45	Interpersonal violence	61	Tuberculosis	33
9	Renal disease	38	Renal disease	52	Renal disease	31
10	Interpersonal violence	35	COPD	49	Road injuries	25

Ranking the causes for males and females in 2012 (Figure 12 and Table 3):

- HIV/AIDS was the leading cause of male age-standardised death rates at 470 deaths per 100,000 population. This was followed by lower respiratory infections, cerebrovascular disease, ischaemic heart disease and tuberculosis.
- For the females, the leading cause was HIV/AIDS, accounting for 366 deaths per 100,000 population. This was followed by cerebrovascular disease, lower respiratory infections, hypertensive heart disease and ischaemic heart disease.

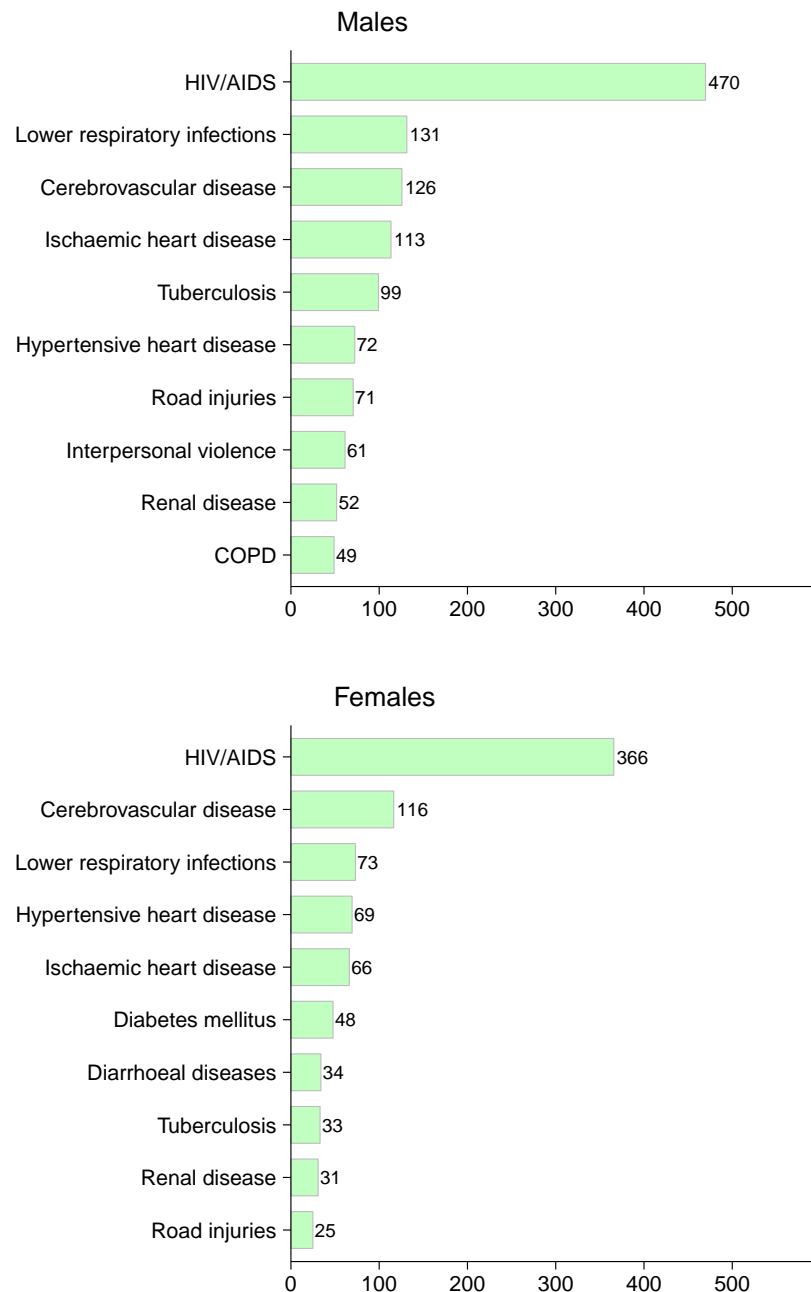


Figure 12: Top-10 single causes by ASDR (per 100,000) for males and females, 2012

## LEADING CAUSES OF PREMATURE MORTALITY (YLLS), 2012

Premature mortality profiles measured by the indicator years-of-life lost (YLLs) are shown in Figures 13 and 14, as well as Table 4 for persons, males and females. These show:

- The leading cause of YLLs was HIV/AIDS, causing 224,335 YLLs, accounting for 36.0% of all YLLs.
- This was followed by lower respiratory infections, cerebrovascular disease, tuberculosis and road injuries.
- These top-five causes of YLLs accounted for 56.8% of all Free State YLLs.

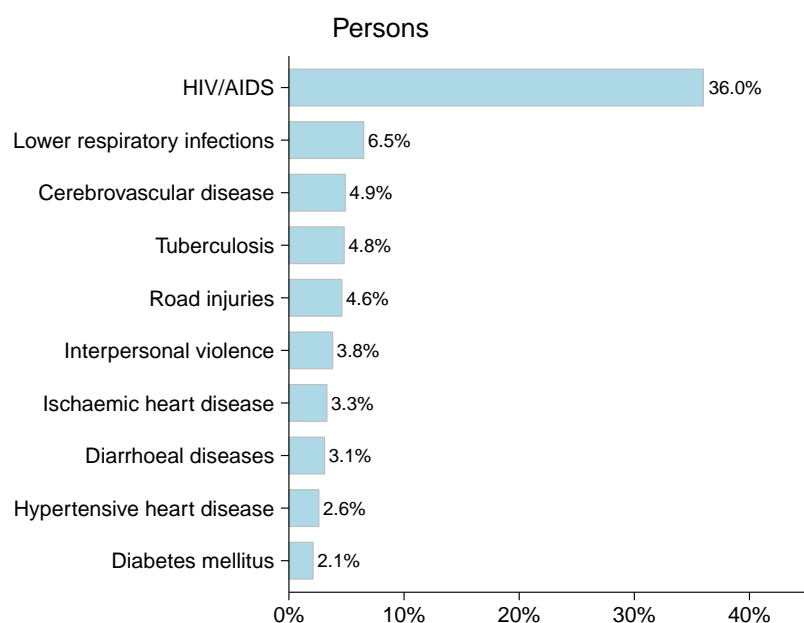


Figure 13: Top-10 single causes of YLLs for persons (YLLs = 624,000), 2012

Table 4: Top-10 single causes of YLLs by sex (in thousands), 2012

Person YLLs, N = 624		Male YLLs, N = 334		Female YLLs, N = 289		
1	HIV/AIDS	224	HIV/AIDS	111	HIV/AIDS	113
2	Lower respiratory infections	41	Lower respiratory infections	22	Lower respiratory infections	19
3	Cerebrovascular disease	30	Road injuries	21	Cerebrovascular disease	17
4	Tuberculosis	30	Tuberculosis	20	Hypertensive heart disease	10
5	Road injuries	29	Interpersonal violence	20	Diarrhoeal diseases	10
6	Interpersonal violence	24	Cerebrovascular disease	13	Tuberculosis	10
7	Ischaemic heart disease	21	Ischaemic heart disease	11	Ischaemic heart disease	9
8	Diarrhoeal diseases	19	Diarrhoeal diseases	9	Diabetes mellitus	8
9	Hypertensive heart disease	16	Self-inflicted injuries	8	Road injuries	8
10	Diabetes mellitus	13	Renal disease	7	Renal disease	6



Considering male and female YLLs in 2012 (Figures 14 and Table 4):

- HIV/AIDS was the leading cause of male YLLs, accounting for 33.2% of all male YLLs. This was followed by lower respiratory infections, road injuries, tuberculosis and interpersonal violence.
- For the females, the leading cause was HIV/AIDS, accounting for 39.2% of YLLs. This was followed by lower respiratory infections, cerebrovascular disease, hypertensive heart disease and diarrhoeal diseases.

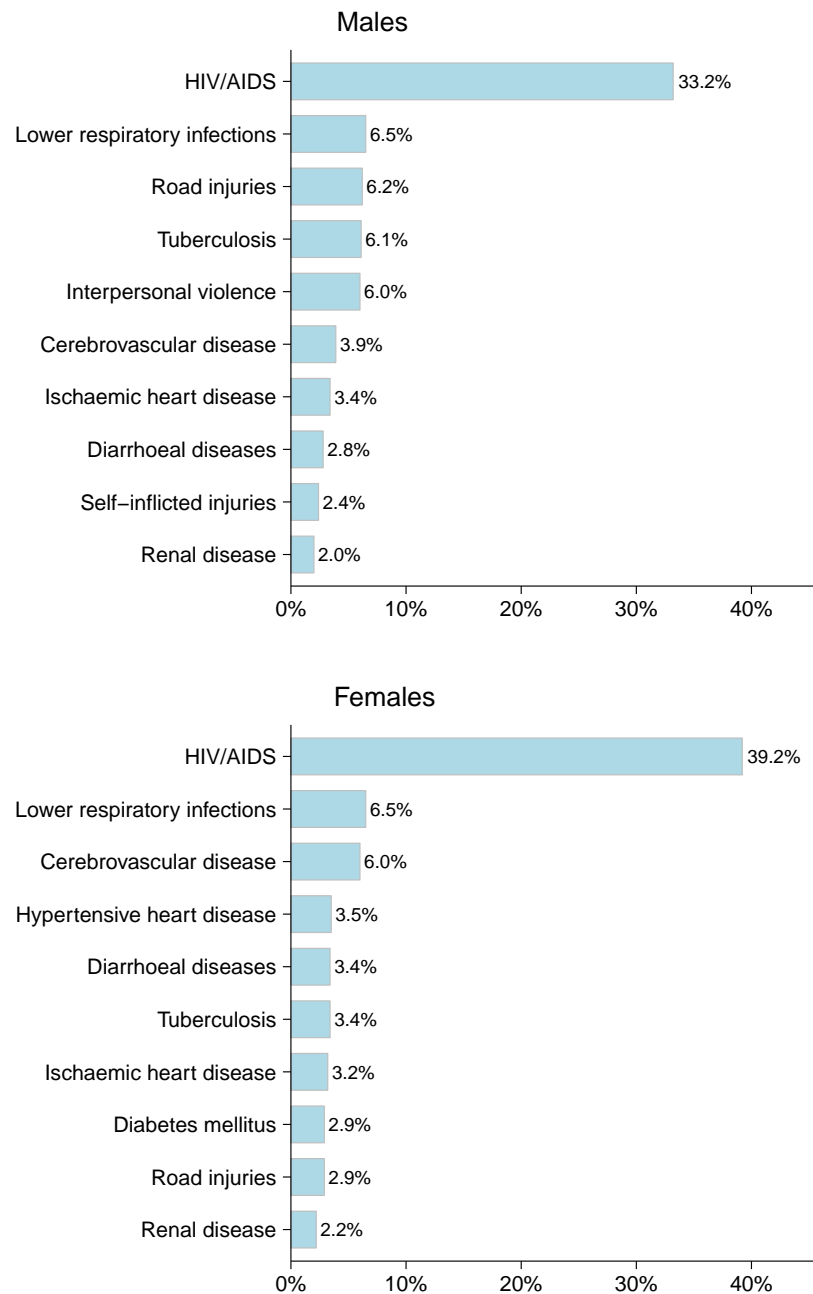


Figure 14: Top-10 single causes of YLLs for males (YLLs = 334,000) and females (YLLs = 289,000), 2012

## LEADING CAUSES OF DEATH BY AGE GROUP, 2012

The leading cause of death in children aged 0–4 years was lower respiratory infections, accounting for 18.5% of deaths (Table 5). This was followed by diarrhoeal diseases, responsible for 15.8% of deaths and HIV/AIDS, causing 12.0% of deaths. The fourth- and fifth-ranked causes were preterm birth complications and protein-energy malnutrition, respectively. These top-five causes accounted for 66.3% of all deaths in this age group.

The leading cause of death in children aged 5–14 was HIV/AIDS, accounting for 40.8% of deaths. The other four causes ranked in the top-five for this age group were road injuries, drowning, meningitis/encephalitis and lower respiratory infections. These top-five causes accounted for 71.5% of all Free State deaths in this age group. Figure 15 shows the top-10 causes of death in children aged 0–4 and children aged 5–14 split by sex.

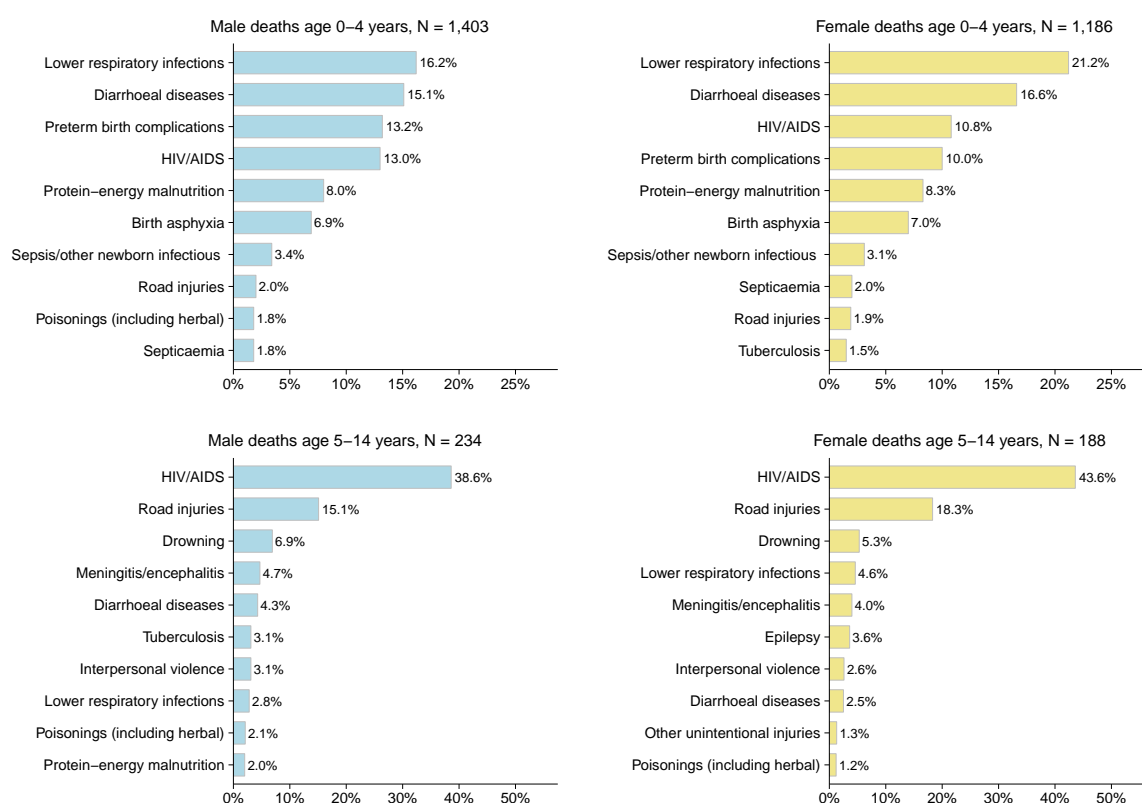


Figure 15: Top-10 single causes of death in children by age group and sex, 2012

For all Free State adults older than 15 years:

- The leading cause of death in adults aged 15–44 years was HIV/AIDS, accounting for 51.3% of deaths. This was followed by interpersonal violence, causing 7.2% of deaths and road injuries, causing 7.0% of deaths. The fourth- and fifth-ranked causes were tuberculosis and lower respiratory infections, respectively. These top-five causes accounted for 75.4% of deaths in this age group.
- The leading cause of death in adults aged 45–59 was HIV/AIDS, accounting for 37.2% of deaths. The other four causes ranked in the top-five for this age group were cerebrovascular disease, tuberculosis, lower respiratory infections and ischaemic heart disease. These top-five causes accounted for 60.0% of all deaths in this age group.
- For persons older than 60, the leading cause of death was cerebrovascular disease, accounting for 14.6% of deaths. The other four causes ranked in the top-five for this age group were HIV/AIDS, ischaemic heart

disease, hypertensive heart disease and lower respiratory infections. These top-five causes accounted for 53.3% of all deaths in this age group.

- Figure 16 shows the top-10 causes of death in adults split by age and sex. Some striking differences can be seen for males and females in the 15-44 and 45-59 year age groups.

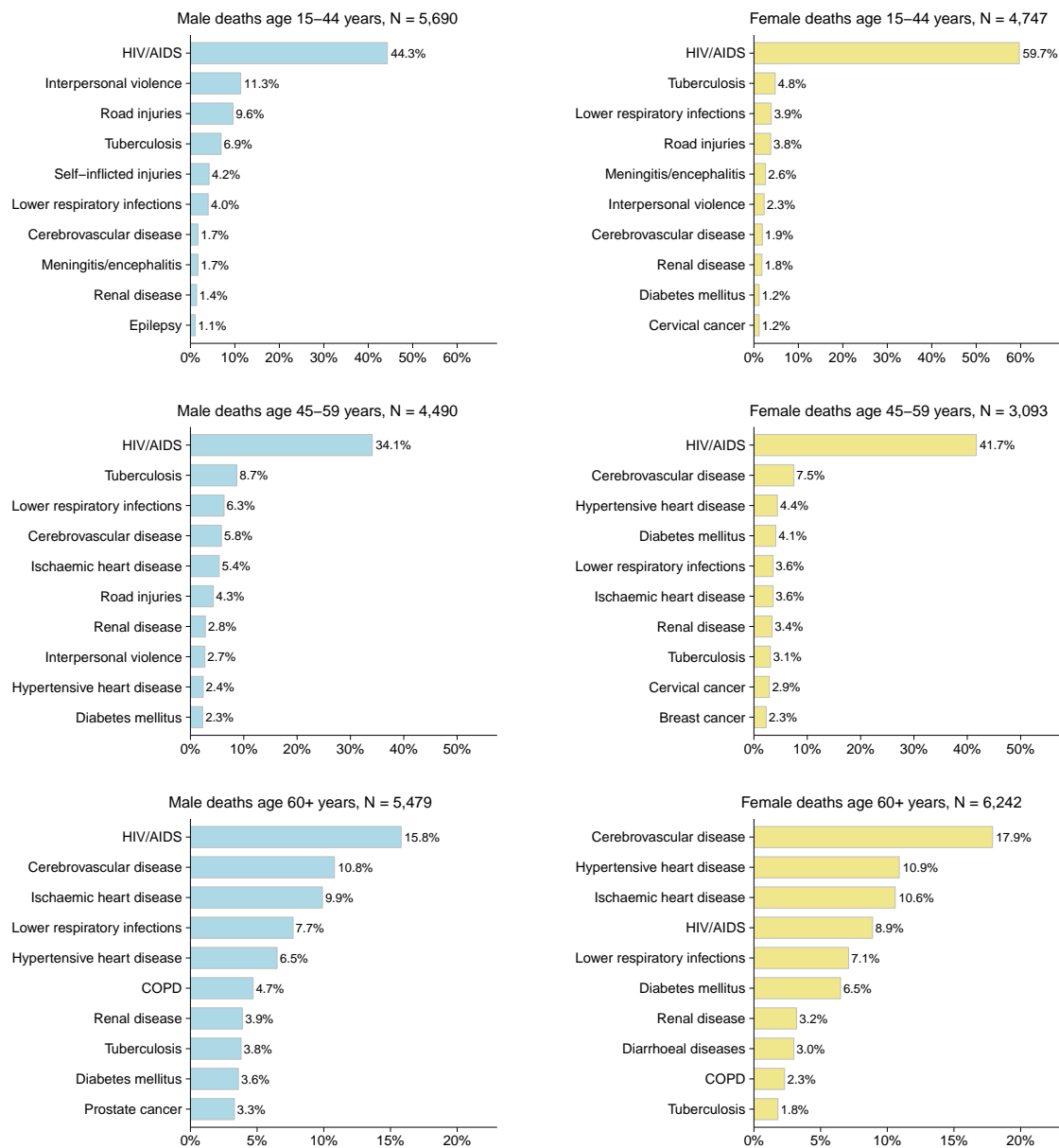


Figure 16: Top-10 single causes of death in adults by age group and sex, 2012

## LEAGUE TABLE OF LEADING CAUSES OF DEATH BY AGE GROUP, 2012

Rank	Age 0–4	Age 5–14	Age 15–44	Age 45–59	Age 60+	All ages
1	Lower respiratory infections (18.5%)	HIV/AIDS (40.8%)	HIV/AIDS (51.3%)	HIV/AIDS (37.2%)	Cerebrovascular disease (14.6%)	HIV/AIDS (30.8%)
2	Diarrhoeal diseases (15.8%)	Road injuries (16.5%)	Interpersonal violence (7.2%)	Cerebrovascular disease (6.5%)	HIV/AIDS (12.2%)	Cerebrovascular disease (7.3%)
3	HIV/AIDS (12.0%)	Drowning (6.2%)	Road injuries (7.0%)	Tuberculosis (6.4%)	Ischaemic heart disease (10.3%)	Lower respiratory infections (6.6%)
4	Preterm birth complications (11.8%)	Meningitis/encephalitis (4.4%)	Tuberculosis (5.9%)	Lower respiratory infections (5.2%)	Hypertensive heart disease (8.8%)	Ischaemic heart disease (5.1%)
5	Protein-energy malnutrition (8.2%)	Lower respiratory infections (3.6%)	Lower respiratory infections (4.0%)	Ischaemic heart disease (4.7%)	Lower respiratory infections (7.4%)	Tuberculosis (4.5%)
6	Birth asphyxia (7.0%)	Diarrhoeal diseases (3.5%)	Self-inflicted injuries (2.7%)	Road injuries (3.3%)	Diabetes mellitus (5.1%)	Hypertensive heart disease (4.2%)
7	Sepsis/other newborn infectious (3.3%)	Interpersonal violence (2.8%)	Meningitis/encephalitis (2.1%)	Hypertensive heart disease (3.2%)	Renal disease (3.5%)	Road injuries (3.7%)
8	Road injuries (2.0%)	Epilepsy (2.4%)	Cerebrovascular disease (1.8%)	Renal disease (3.0%)	COPD (3.4%)	Interpersonal violence (3.0%)
9	Septicaemia (1.9%)	Tuberculosis (2.0%)	Renal disease (1.6%)	Diabetes mellitus (3.0%)	Tuberculosis (2.7%)	Diabetes mellitus (2.8%)
10	Tuberculosis (1.6%)	Poisonings (including herbal) (1.7%)	Ischaemic heart disease (1.1%)	Interpersonal violence (2.0%)	Diarrhoeal diseases (2.4%)	Diarrhoeal diseases (2.7%)

Table 5: Top-10 single causes of death by age, 2012

## BROAD CAUSE AND DISEASE CATEGORY TRENDS, 1997–2012

In general, the trends in the number of deaths and the trends in age-standardised death rates (ASDR) were similar for each of the four broad causes of death (Figure 17). For the non-communicable diseases, there was an increasing trend in the number of deaths up to 2009. The trend for communicable combined with maternal causes, perinatal conditions and nutritional deficiencies, remained fairly stable between 1997 and 2009 and then started to decrease. The trend in HIV/AIDS and TB increased between 1997 and 2006, where it peaked at 1,002 deaths per 100,000 population. The rate then decreased steadily each subsequent year. The ASDR for injuries has declined slightly over this period. In 2012, non-communicable diseases accounted for the highest proportion, 40.7% of deaths, followed by HIV/AIDS and TB with 35.3%, communicable disease combined with maternal causes, perinatal conditions and nutritional deficiencies with 14.5% and injuries causing 9.4% of all deaths.

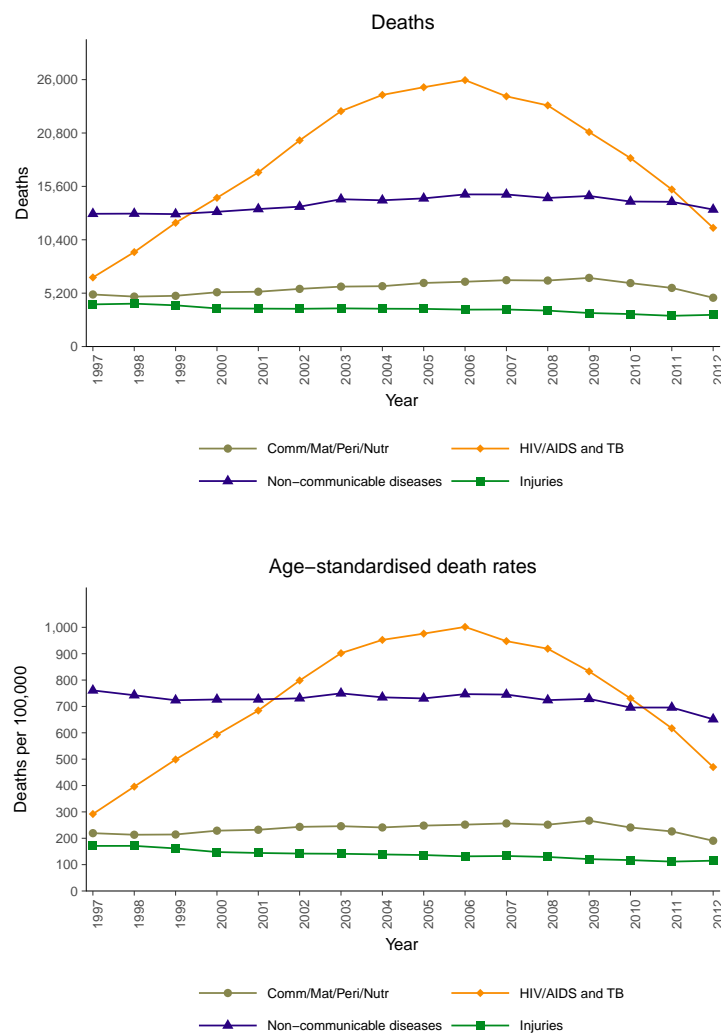


Figure 17: Trends in person deaths and ASDR (per 100,000) by broad cause, 1997–2012

Considering the causes in more detail, the age-standardised death rates by disease category stayed fairly stable between 1997 and 2012 for infectious and parasitic diseases, cancers, diabetes, and intentional and unintentional injuries (Figure 18). There were 6,228 deaths due to cardiovascular diseases in 1997 and 6,272 deaths in 2012, giving estimated ASDR of 376 and 316 deaths per 100,000 population for each of the respective years. There were 6,730 deaths due to HIV/AIDS and TB in 1997, which reached a peak of 25,951 deaths in 2006. Thereafter, deaths due to HIV/AIDS and TB steadily decreased to 11,563 deaths in 2012.

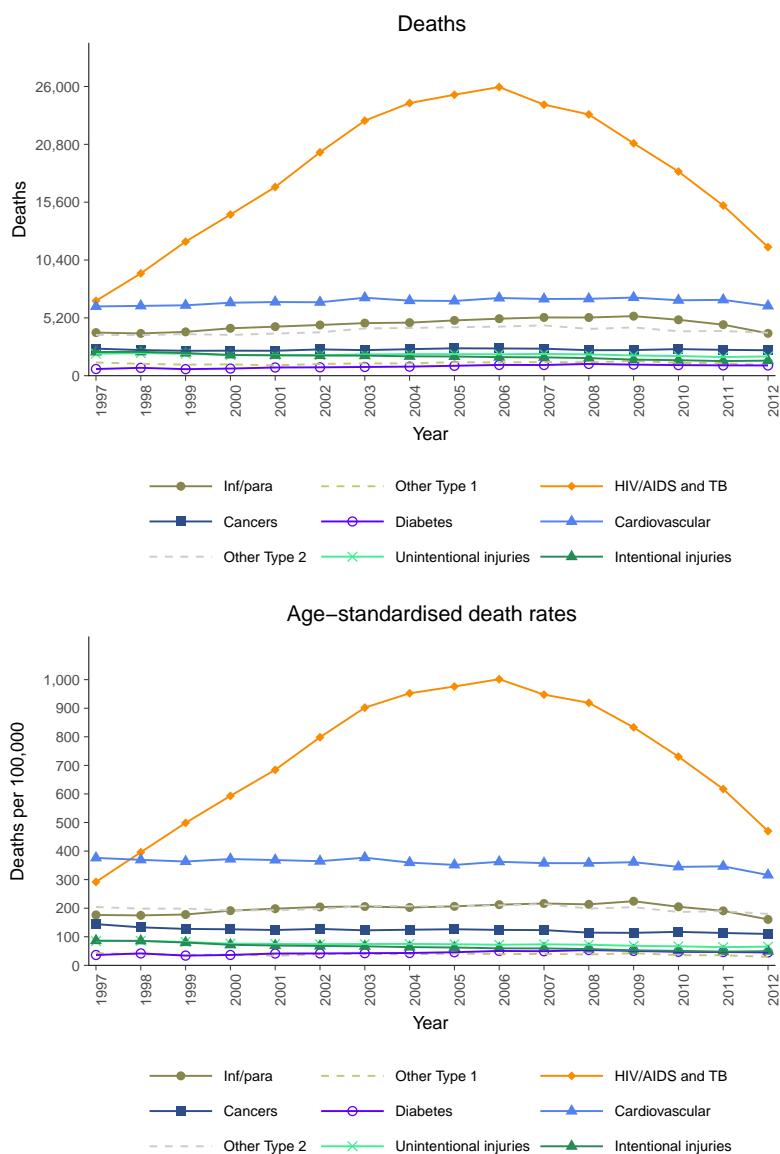


Figure 18: Trends in person deaths and ASDR (per 100,000) by disease category, 1997–2012

## SOUTH AFRICA PROVINCIAL COMPARISON, 2012

The comparison in Table 6 of South Africa's provinces and the national average shows that in 2012:

- KwaZulu-Natal had the highest under-5 mortality rate, which was 2.8 times higher than the lowest under-5 rate observed in Western Cape.
- The estimated life expectancy at birth was highest in Western Cape and Gauteng at 68.4 and 65.6 years, respectively, and lowest in KwaZulu-Natal at 56.6 years.
- The estimated life expectancy at age 60 was highest in Limpopo and Western Cape at 21.3 and 18.9 years, respectively, and lowest in KwaZulu-Natal at 16.5 years.
- Adult mortality ( ${}_{45}q_{15}$  i.e. the probability of a 15-year old dying before age 60 years) was highest in KwaZulu-Natal at 45.1% and lowest for Western Cape at 25.9%.

Table 6: Provincial comparison of key demographic indicators, 2012

Province	IMR ( ${}_1q_0$ )	U5MR ( ${}_5q_0$ )	${}_{45}q_{15}$	$e_0$	$e_{60}$
Western Cape	14.5	20.2	25.9	68.4	18.9
Eastern Cape	29.2	45.0	42.3	59.1	18.0
Northern Cape	27.3	36.5	39.9	61.5	17.8
Free State	30.4	43.0	43.8	59.2	17.2
KwaZulu-Natal	34.5	56.3	45.1	56.6	16.5
North West	26.1	37.1	39.7	61.6	18.3
Gauteng	19.9	30.3	30.2	65.6	18.2
Mpumalanga	31.0	46.3	41.3	60.1	18.4
Limpopo	24.8	39.3	33.9	65.3	21.3
South Africa	26.1	40.2	36.8	62.1	18.2

Ranking South Africa's nine provinces by each of these five demographic indicators, we note that Free State had the:

- third-highest IMR
- fourth-highest U5MR
- second-highest  ${}_{45}q_{15}$
- third-lowest  $e_0$
- second-lowest  $e_{60}$

KwaZulu-Natal province had the highest overall age-standardised death rate with 1,576 deaths per 100,000, compared with the lowest in Western Cape province with 938 deaths per 100,000 people (Figure 19). A quadruple burden of disease is evident in each province, with non-communicable diseases contributing the greatest proportion of the total burden of mortality, albeit with considerable variance between the provinces: 743 per 100,000 in KwaZulu-Natal and 404 per 100,000 in Limpopo. The highest age-standardised death rate due to HIV/AIDS and TB was observed in KwaZulu-Natal with 537 per 100,000 population. The lowest rate was observed in Western Cape with 149 HIV/AIDS and TB deaths per 100,000.

Ranking South Africa's nine provinces by ASDR for each of the four broad causes, we also note that Free State had the:

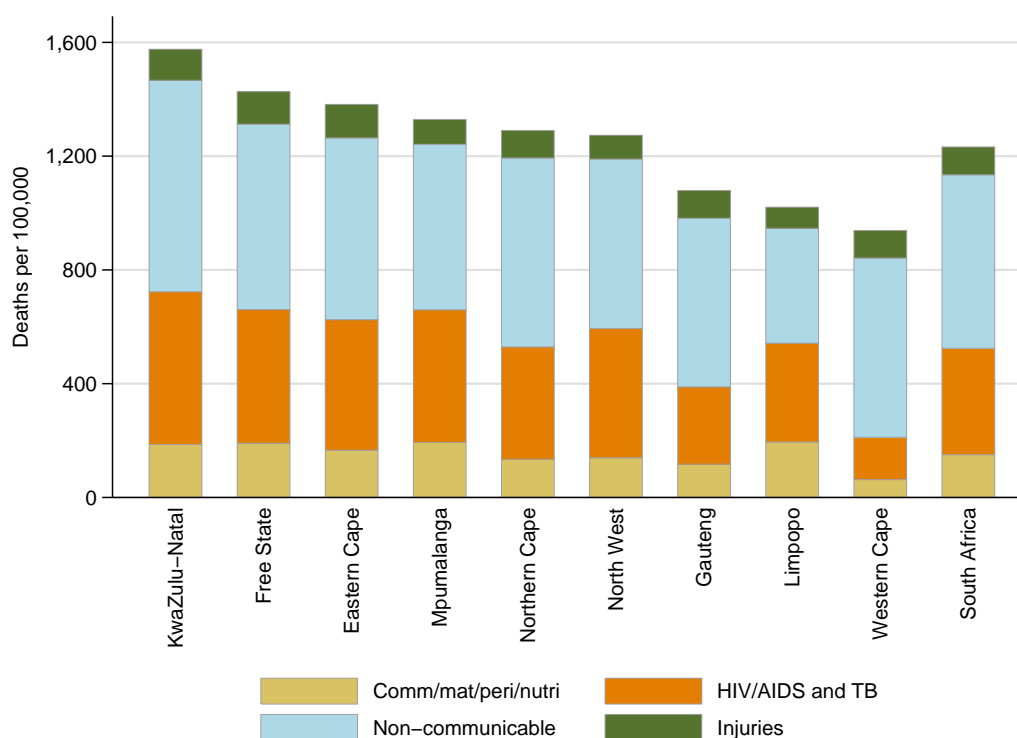


Figure 19: Provincial broad-cause ASDR, 2012

- third-highest ASDR for diseases in the communicable diseases, maternal causes, perinatal conditions and nutritional deficiencies broad cause group
- second-highest ASDR for HIV/AIDS and TB
- third-highest ASDR for non-communicable diseases
- second-highest ASDR for injuries
- second-highest ASDR for overall deaths across all causes

The ranking of South Africa's nine provinces for YLLs is reported in Table 7. These highlight the diseases that are causing premature death i.e. death in young children and young adults. This provides the specific priorities for health promotion and disease prevention for provincial health managers in each province. So, for example, whilst all provinces need to prioritise AIDS awareness and HIV reduction programmes, the Western Cape and Gauteng need to involve other sectors in order to address the mortality of young people due to interpersonal violence. Similarly, in KwaZulu-Natal and North West, interventions aimed at reducing mortality due to cerebrovascular disease are priorities. Attention to screening and managing high blood pressure need to be prioritised in these provinces. Provinces are urged to use the information and identify activities that will affect the upstream causes of disease as well as strengthening the health system response required to reduce premature loss of life.



Rank	Western Cape	Eastern Cape	Northern Cape	Free State	KwaZulu Natal	North West	Gauteng	Mpumalanga	Limpopo	South Africa
1	HIV/AIDS (20.0%)	HIV/AIDS (29.8%)	HIV/AIDS (31.9%)	HIV/AIDS (36.0%)	HIV/AIDS (41.2%)	HIV/AIDS (42.7%)	HIV/AIDS (34.9%)	HIV/AIDS (40.2%)	HIV/AIDS (35.5%)	HIV/AIDS (35.7%)
2	Interpersonal violence (7.3%)	Tuberculosis (9.7%)	Tuberculosis (7.7%)	Lower respiratory infections (6.5%)	Cerebro-vascular disease (5.0%)	Cerebro-vascular disease (4.7%)	Interpersonal violence (5.8%)	Road injuries (5.7%)	Lower respiratory infections (7.6%)	Cerebro-vascular disease (4.8%)
3	Ischaemic heart disease (7.2%)	Interpersonal violence (5.5%)	Interpersonal violence (5.1%)	Cerebro-vascular disease (4.9%)	Interpersonal violence (4.6%)	Lower respiratory infections (4.3%)	Road injuries (5.3%)	Diarrhoeal diseases (5.7%)	Diarrhoeal diseases (6.5%)	Lower respiratory infections (4.6%)
4	Cerebro-vascular disease (5.8%)	Lower respiratory infections (5.4%)	Cerebro-vascular disease (5.1%)	Tuberculosis (4.8%)	Diarrhoeal diseases (4.2%)	Road injuries (4.1%)	Cerebro-vascular disease (4.3%)	Lower respiratory infections (5.5%)	Road injuries (5.4%)	Tuberculosis (4.6%)
5	Road injuries (4.6%)	Cerebro-vascular disease (4.7%)	Lower respiratory infections (4.7%)	Road injuries (4.6%)	Tuberculosis (4.1%)	Hypertensive heart disease (3.4%)	Lower respiratory infections (3.6%)	Cerebro-vascular disease (5.0%)	Tuberculosis (4.4%)	Interpersonal violence (4.6%)
6	Tuberculosis (4.4%)	Diarrhoeal diseases (4.3%)	Ischaemic heart disease (3.8%)	Interpersonal violence (3.8%)	Lower respiratory infections (3.9%)	Diarrhoeal diseases (3.1%)	Ischaemic heart disease (3.5%)	Tuberculosis (3.6%)	Cerebro-vascular disease (3.9%)	Road injuries (4.2%)
7	Trachea/bronchi/lung cancer (3.7%)	Road injuries (3.3%)	Road injuries (3.6%)	Ischaemic heart disease (3.3%)	Road injuries (2.8%)	Tuberculosis (3.0%)	Diabetes mellitus (2.4%)	Diabetes mellitus (2.7%)	Diabetes mellitus (3.3%)	Diarrhoeal diseases (3.7%)
8	COPD (3.5%)	Diabetes mellitus (2.4%)	COPD (2.7%)	Diarrhoeal diseases (3.1%)	Ischaemic heart disease (2.8%)	Interpersonal violence (2.5%)	Renal disease (2.4%)	Ischaemic heart disease (2.5%)	Meningitis/encephalitis (2.6%)	Ischaemic heart disease (3.1%)
9	Diabetes mellitus (2.7%)	Ischaemic heart disease (2.1%)	Diarrhoeal diseases (2.3%)	Hypertensive heart disease (2.6%)	Diabetes mellitus (2.6%)	Diabetes mellitus (2.3%)	Tuberculosis (2.2%)	Hypertensive heart disease (2.3%)	Interpersonal violence (2.4%)	Diabetes mellitus (2.5%)
10	Lower respiratory infections (2.6%)	Hypertensive heart disease (2.0%)	Preterm birth complications (2.2%)	Diabetes mellitus (2.1%)	Renal disease (2.1%)	Ischaemic heart disease (2.2%)	Self-inflicted injuries (2.2%)	Interpersonal violence (1.9%)	Hypertensive heart disease (2.2%)	Hypertensive heart disease (2.1%)

Table 7: Top-10 single causes of YLLs for persons by province, 2012

## CONCLUSION AND RECOMMENDATIONS

- Age-standardised death rates increased to a peak in 2005/2006 and then started to decrease. The substantial decrease in mortality from HIV/AIDS and TB account for the marked changes in mortality and is likely due to the extensive antiretroviral treatment roll out from 2005 amongst adults and the implementation of the prevention of mother-to-child transmission (PMTCT) programme in 2003. Nonetheless, HIV/AIDS remains the leading cause of death, and efforts to provide access to treatment must be sustained and prevention efforts must be strengthened. A sizable proportion of HIV/AIDS deaths were associated with TB. Efforts to strengthen and integrate the TB programme must be addressed.
- There is a considerable burden from non-communicable diseases and concerning signs of an increase in diabetes mortality. Efforts targeting prevention and management of non-communicable diseases and their risk factors need to be scaled up.
- Mortality from other infectious conditions, in particular lower respiratory infections, diarrhoeal disease and septicaemia, still prevail despite such deaths being preventable and/or treatable. Improving living conditions and providing access to quality health care are both needed.
- Interpersonal violence and road injuries are major contributors to the loss of life due to premature mortality and require the development of multi-sectoral prevention strategies.
- Infant and under-5 mortality peaked between 2003/2006 and have declined largely due to a reduction in mortality from HIV/AIDS. To ensure progress in improving child survival, a more focused approach is needed to tackle deaths from neonatal conditions, diarrhoeal disease and lower respiratory infections, while prevention of mother-to-child transmission programmes should be strengthened towards the goal of eliminating paediatric HIV/AIDS.
- This study was unable to estimate the maternal mortality ratio. However, it indicates that reducing maternal deaths requires addressing HIV/AIDS and TB in pregnant women (indirect maternal causes), as well as strengthening health care to prevent hypertension-related conditions and haemorrhage (direct obstetric causes).
- The league table ranking of causes of premature mortality by province provides specific disease priorities for health promotion and disease prevention in each province.





**SECOND NATIONAL BURDEN OF DISEASE STUDY FOR SOUTH AFRICA**

