

## ABSTRACT

Mortality and morbidity trends in South Africa have been dominated by the HIV epidemic. Despite imperfect health statistics, it has been possible to observe a substantial increase in mortality of young adults during the last decade that has severely affected women aged 20 to 44 years and men in a wider age band. HIV-related diseases are by far the leading cause of death among young women as well as non-HIV-related TB and pneumonia together with homicide and road traffic accidents. Women in the slightly older age group of 45-54 years are more affected by chronic diseases such as stroke, diabetes mellitus, hypertensive heart disease, ischemic heart disease and cervical cancer. In 1998 there were indications that the maternal mortality ratio for South Africa was relatively high. Indications are that this has been exacerbated by the HIV epidemic. Mortality rates do not reflect some important aspects of health such as mental health problems. A review of available data suggest that a sizable burden of mental health problems also affect women in this age range.

While it is estimated that HIV has increased child mortality rates in South Africa, reliable data for this essential indicator are completely lacking. Government is urged to improve the situation and collect good quality data that will provide accurate statistics on this critical indicator, a key indicator to monitor the Millennium Development Goals.

Provincial variations in the mortality of children and women allude to much larger inequalities in health status that are masked by the average mortality rates presented in this chapter. Health managers at all levels of health care are urged to consider the health status of the population in their planning of programmes and services. This will require extensive improvements to the current health information system.

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## INTRODUCTION

The Millennium Development Goals (MDGs), adopted by the United Nations, provide a global road map to reducing poverty.<sup>1</sup> Explicit health goals have been included acknowledging the important role of health in promoting development. The health related goals are to improve child nutritional status, reduce child mortality, reduce maternal mortality and reduce diseases with a high burden such as malaria, TB and HIV-related diseases. Child mortality trends and mortality among women of reproductive age are particularly relevant to these goals.

Reviews of the health status in South Africa (SA) in the mid-1990s showed that a health transition was well underway.<sup>2</sup> Declining levels of child mortality was shifting attention to the importance of adult health problems. Evidence of a protracted bipolar transition showed in the cause of death profile through the simultaneous occurrence of diseases related to under-development, such as diarrhoea and other infections, with the occurrence of chronic diseases of lifestyle associated with diet that is high in fat and refined carbohydrates, smoking, physical inactivity and obesity. The additional injury burden that was uniquely high in SA resulted in the profile being described as a triple burden.

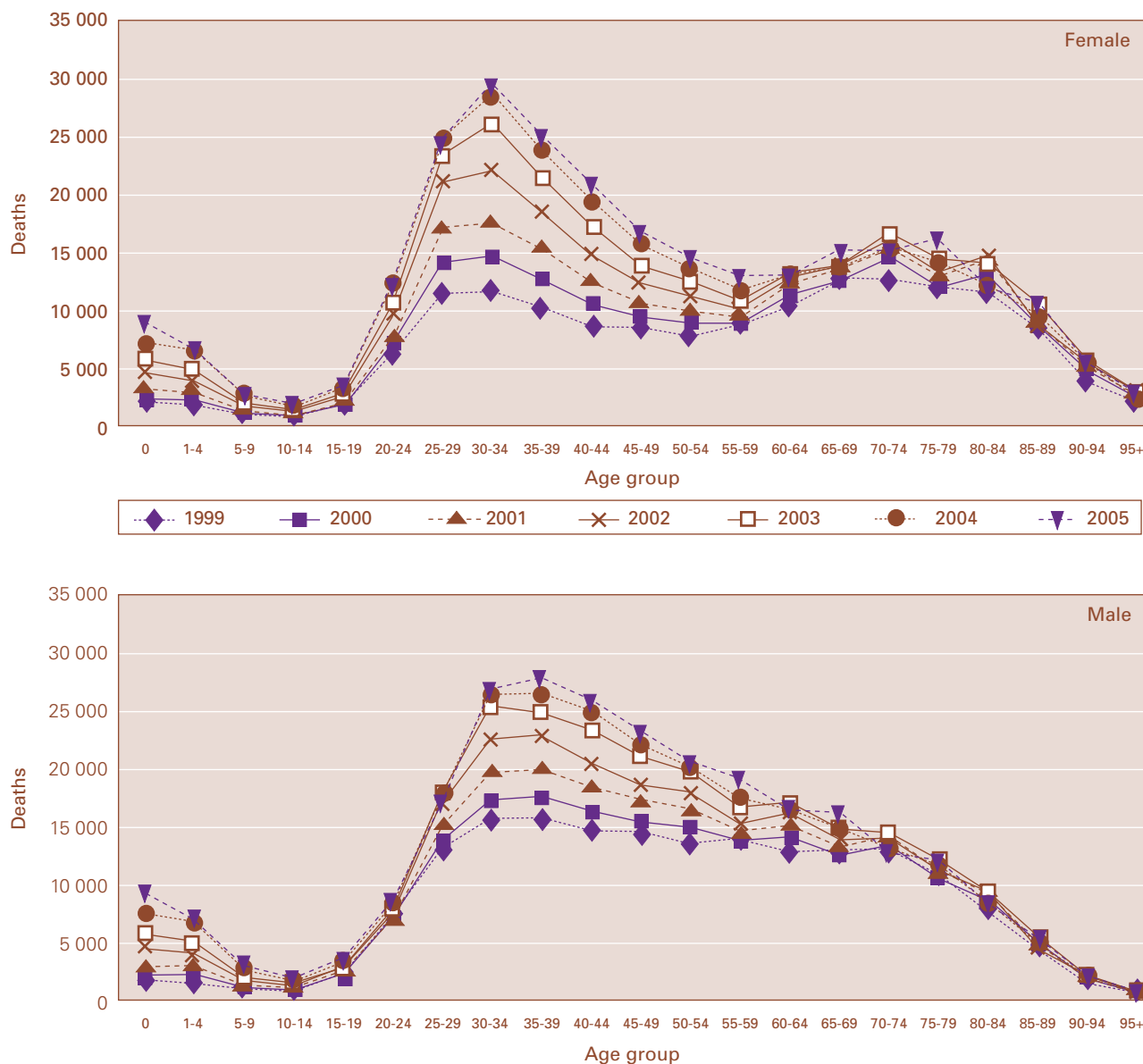
Strides have been made in improving the statistical systems in SA but they are still in the process of evolving into appropriate and reliable resources to monitor population health. While the basic foundations are in place – census, vital registration, population health surveys and disease surveillance – they all remain compromised in terms of providing timely and accurate statistics – making it essential to assess data quality and through careful analysis, estimate broad trends. In the face of incomplete mortality data, the Initial South Africa Burden of Disease Study (SA NBD) set out to develop consistent and coherent estimates of the levels and underlying causes of mortality.<sup>3</sup> The study highlighted the quadruple burden with the additional impact of HIV on mortality profile. This chapter will attempt to review the mortality profile for children and women making use of the initial national burden of disease study in the context of the new cause of death data and projections.

## TRENDS

The latter part of the 1990s was dominated by an extremely rapid change in the cause of death profile resulting from the HIV epidemic that was first identified by monitoring population register data<sup>4,5</sup> and subsequently by the full cause of death data.<sup>6,7,8</sup> There has been a rapid increase in the number of deaths with marked changes in the age pattern. Figure 1 shows the changes in the number of deaths by age and sex from the population register. As can be seen, from Figure 2, the latest report from Statistics SA (StatsSA) based on the death notifications reflects the same rapid change in the age distribution of the deaths.<sup>8</sup> The increase in young adult deaths is particularly pronounced in young women.

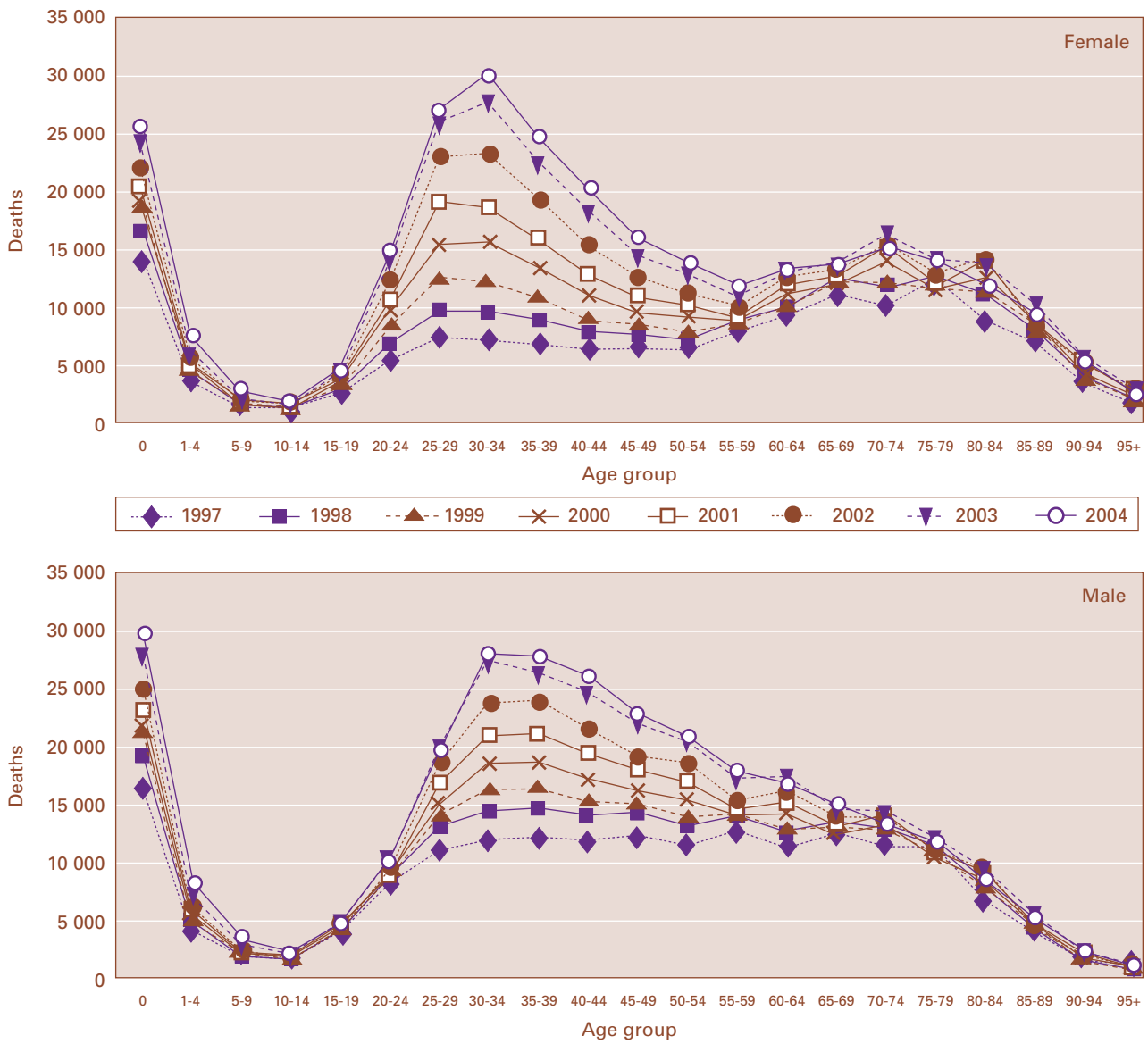


FIGURE 1:  
Trend in deaths on the population register by sex, 1999-2005



Source: Bradshaw D, data from Department of Home Affairs.

FIGURE 2:  
Trend in deaths from death notifications, 1997-2004



Source: Bradshaw D, calculations from StatsSA data.

The unambiguous increase in young adult mortality rates is accompanied by a disturbing lack of knowledge about the trends in child mortality during the same period. While there was uncertainty about the level of child mortality before 1994,<sup>9</sup> it has been possible to derive plausible estimates of the levels and trends in child mortality for the period 1977-1998 by analysing data from both the 1996 census and the 1998 South Africa Demographic and Health Survey (SADHS) and building on the strengths of each.<sup>10</sup> This analysis

indicated that the levels of child mortality declined until about 1992 after which there was a reversal in the trends. As the 2001 census does not yield usable data for child mortality<sup>11</sup> and the 2003 SADHS<sup>12</sup> has implausible levels of child mortality, there is enormous uncertainty about the current level and recent trends in child mortality. There has been a steady increase in the number of registered child deaths.<sup>8</sup> However, it is difficult to know how much of the increase has resulted from improved registration.



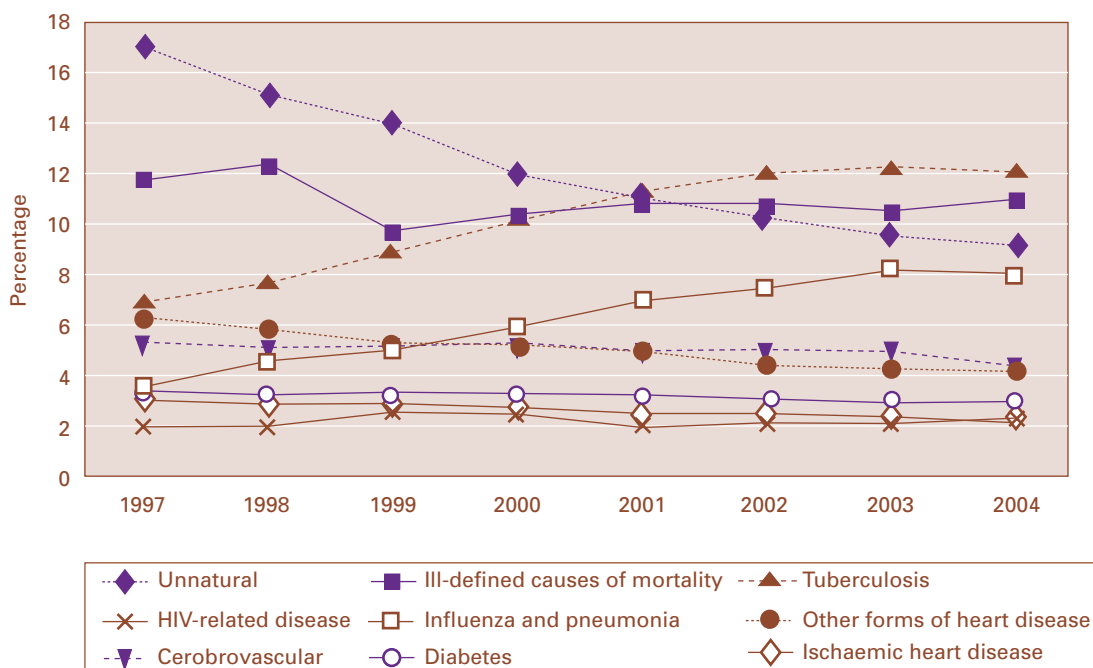
## CAUSES OF DEATH

The South African cause of death profile has changed rapidly since 1995. Early signs of this were identified in a comparison of the death statistics in 1995 with those in 1994 which showed the beginning of an increase in TB mortality rates, pre-empting the HIV epidemic.<sup>13</sup> However, reported cause of death data based on the death notifications, are difficult to interpret as a result of extensive mis-classification and under-registration. Detailed analysis of data for the years 2000 and 2001 found a clear trend that HIV-related deaths were often classified to the indicator conditions related to HIV-related diseases without reference to HIV.<sup>14,15</sup> This is not surprising in the context where there is a relatively high degree of general mis-classification compounded by the stigma surrounding HIV and the fact that in some cases the doctor certifying the cause of death might not have access to a full medical record. Not only are about 12% of the deaths classified to ill-defined

signs and symptoms but a study has shown that there is incorrect specification of the cause on a sample of TB patients who died.<sup>16</sup>

Figure 3 shows the trend in the leading causes of death from the death notifications from the StatsSA data from 1997-2004.<sup>8</sup> The graph shows the proportion of deaths in that year that are attributed to each cause. In the case of the unnatural deaths (i.e. external causes/injuries), all the causes have been combined. Apart from the proportion of ill-defined causes remaining fairly level at 11%, the data reflect a very rapid change in the cause of death profile for the period 1997 to 2004. The proportion of deaths resulting from injuries has dropped from 17% to 9%, an observation that was noted by Bah.<sup>17</sup> Marked increases have been observed in TB and pneumonia, in keeping with the HIV epidemic.

FIGURE 3:  
Trend in proportion of deaths resulting from leading causes, 1992-2004

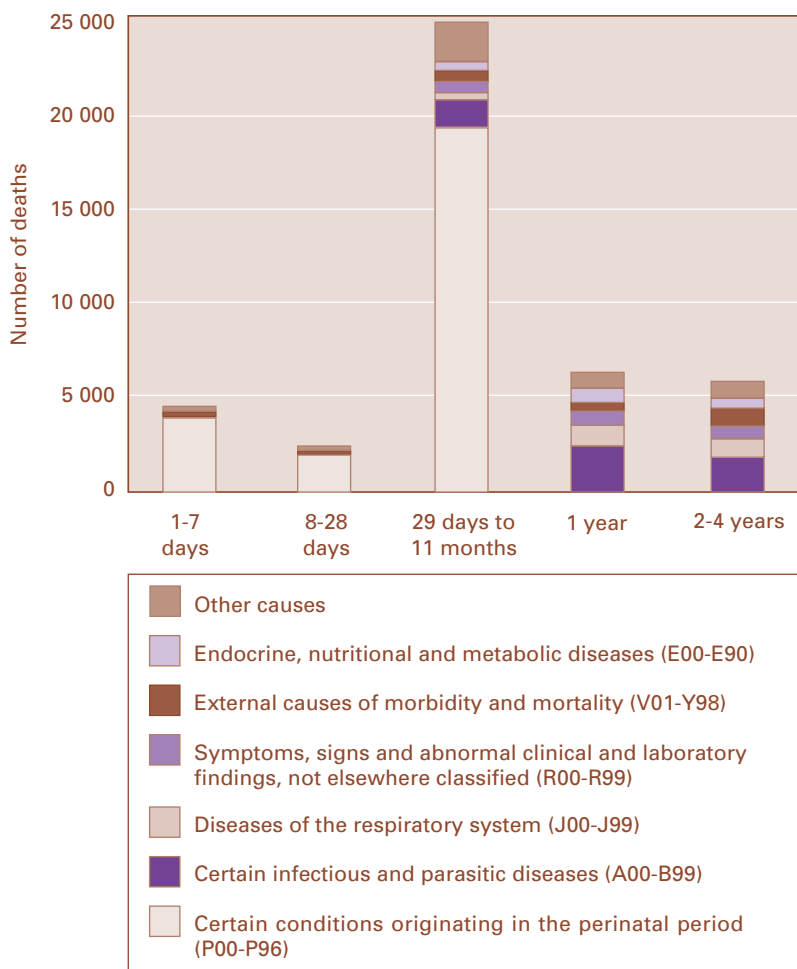


Source: Bradshaw D, calculations from data from StatsSA.

Discerning the actual trends in death rates by cause from the StatsSA data alone is difficult as both the under-registration of deaths and the mis-classification need to be taken into account. Using the newly coded cause of death data for children under-1 years of age is going to be particularly challenging. Analysis of the child deaths for 2002 shows that there has been a systematic coding to perinatal conditions among infants. Figure 4 shows the number of deaths in age categories by International Classification of Diseases (ICD) chapter. While it would be expected that the majority of cases in the 1-7 week age group and a proportion of the deaths in the 8-28 day age group would result from conditions originating in the perinatal period, it would not be the case for the age group 29 days-11 months. This is the result of incorrect coding which does not appear to have been rectified in the production of the report that includes data for 2003 and 2004.

SA has 3 sites in rural areas where there is an ongoing collection of data about vital events among the population of the area. These demographic surveillance sites provide useful information on the cause of death profile in these settings. The oldest surveillance site is situated in Agincourt. In a study that contrasted the cause of death pattern in this area with that in a rural area in West Africa and historical data from France in 1951, it was observed that the profile in Agincourt in the early 1990s had outstandingly high levels of injury deaths including homicide, road traffic accidents, suicide and other accidents.<sup>18</sup> HIV-related illnesses, tuberculosis and diarrhoea as well as selected cancers, gastrointestinal haemorrhage, maternal mortality, epilepsy, acute rheumatic fever, pneumoconiosis and malnutrition of young children (kwashiorkor) were also high in Agincourt.

FIGURE 4:  
Causes of under-5 year old deaths by age group in 2002, StatsSA



Source: Tables provided by StatsSA.



Respiratory diseases had lower mortality than expected as well as other cancers, vaccine preventable diseases and marasmus. A strong reversal in the overall trend of mortality attributed to the impact of HIV and TB was observed between 1992 and 1995.<sup>19</sup> Kahn et al.<sup>20</sup> note the high death rates from kwashiorkor and violence, the emerging impact of HIV-related illnesses and pulmonary tuberculosis, and circulatory deaths in the middle-aged and young elderly and Kahn and Tollman<sup>21</sup> highlight the stroke mortality rates for adults over the age of 35 years and found that 10% of deaths in the age group 35-64 resulted from stroke. Mortality data from the third, smaller site, situated in Dikgale are not available.

Demographic surveillance was initiated around the Africa Centre in northern KwaZulu-Natal district of Umkhanyakude, near Hlabisa. Hosegood et al.<sup>22</sup> report the major impact that HIV has on adult mortality in this area with a steady rise in mortality in the late 1990s. By 2000, HIV-related diseases, with or without TB were the leading cause of adult deaths accounting for 48%. They also found, in a rural setting, that mortality from noncommunicable disease and, injuries among , was high. Mortality in the study area rose sharply in the late 1990s. The infant mortality rate was relatively high and HIV was attributed to 41% of deaths in the under-5 age group followed by lower respiratory infections.<sup>23</sup> The data from these surveillance sites indicate that infant and child mortality levels in rural areas of SA are high and have been impacted by the HIV epidemic.

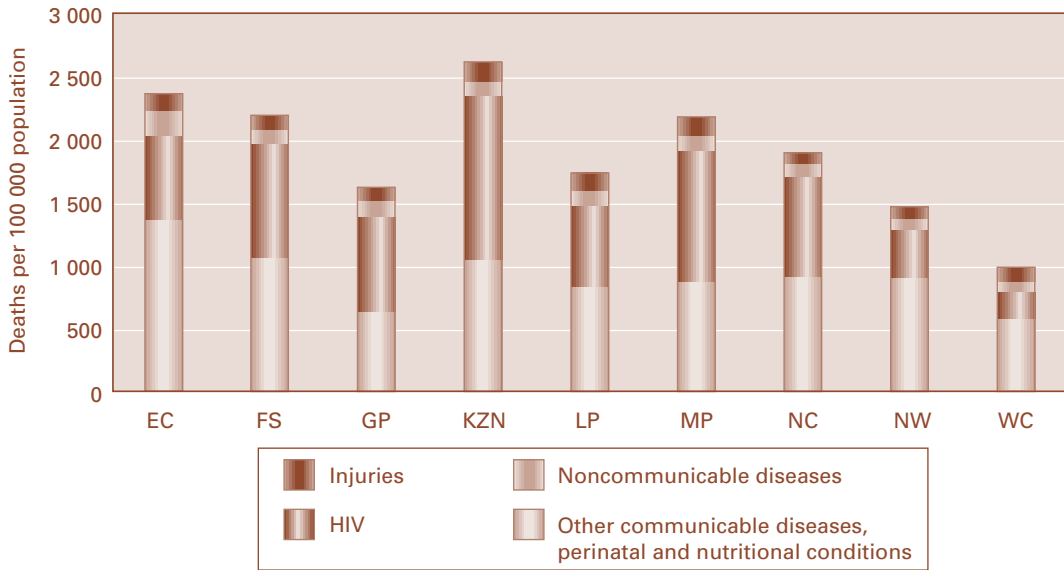
As additional cause of death data have become available since the Initial Burden of Disease Study, it has been necessary to revise these estimates.<sup>24</sup> The provincial estimates draw on the sample of the cause of death notification data.<sup>25</sup> These estimates quantify the HIV-related deaths, and attempt to distinguish the deaths resulting from infections that are not related to HIV.<sup>26</sup> Thus the estimated proportion of deaths from TB in this study, are considered to be those that are not HIV-related. While the burden of disease study provides best estimates of the cause specific mortality rates, it must be realised that these have been derived from imperfect data. As better data become available, these might be found to need revisions.

## MORTALITY IN CHILDREN UNDER-FIVE YEARS

The age specific death rate for children under-5 years of age in the year 2000 by province is shown in Figure 5. This is apportioned according to broad cause group. The mortality rate in KwaZulu-Natal, Eastern Cape, Mpumalanga and Free State is 2-2.5 times higher than that in the Western Cape, the province with the lowest rate. While a large part of the variation is a result of the difference in the estimate for HIV mortality, there is also a large variation in the mortality from other infectious diseases, perinatal and nutritional causes. For the latter causes, the provinces of Gauteng and Western Cape stand out as having the lowest rates while Eastern Cape has the highest rates, reflecting the urgent need to ensure that provision of basic services such as water and sanitation as well as health care in the Eastern Cape are improved.<sup>26</sup>

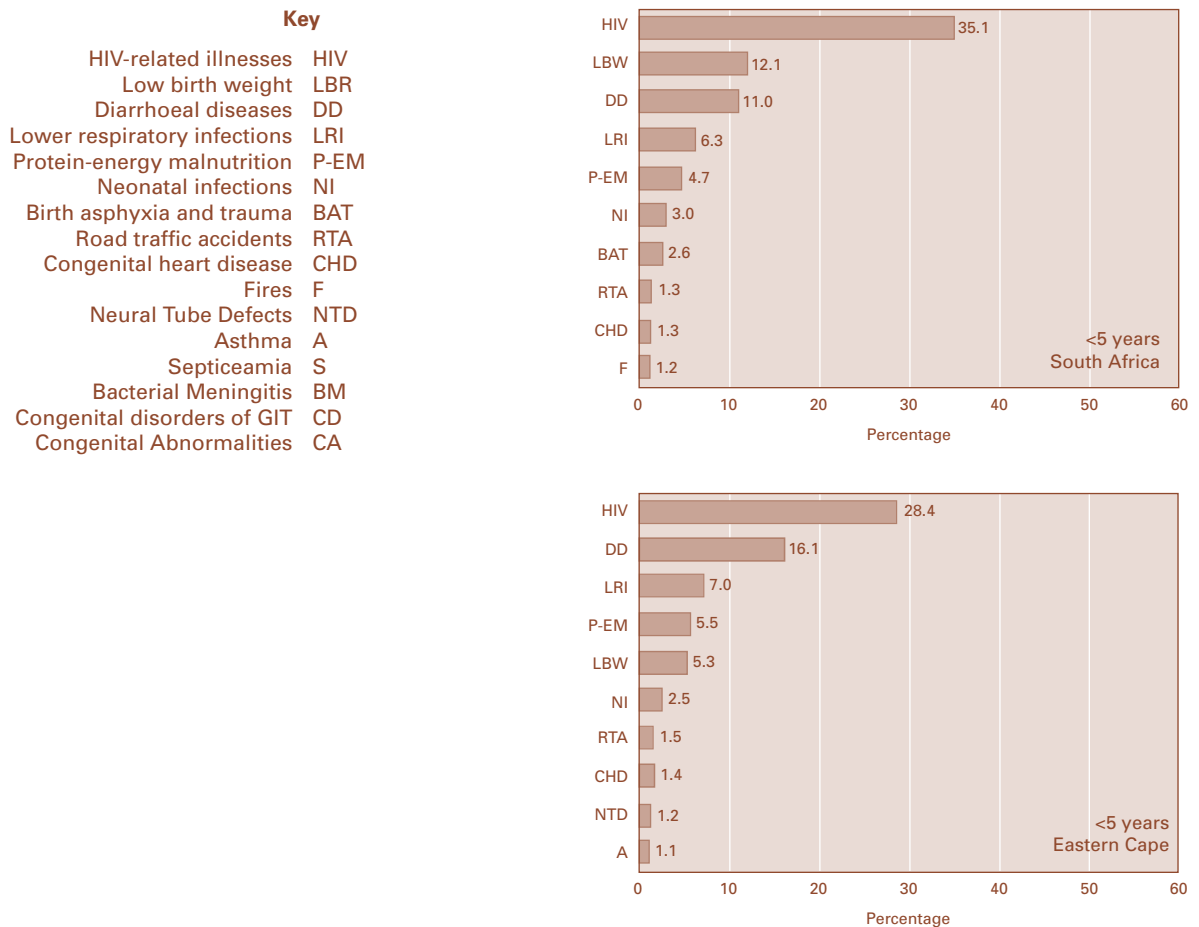
In the year 2000, more than half of the deaths resulted from infectious diseases together with perinatal and nutritional conditions and a further 35% resulted from HIV. The ten leading causes of child deaths nationally, and for each province, in the year 2000 are shown in Figure 6. HIV is the leading cause of child deaths in every province, ranging from 21.5% of child deaths in the Western Cape to 50.1% in KwaZulu-Natal.

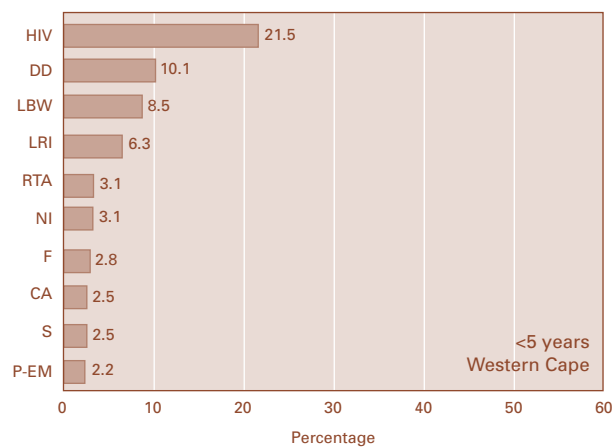
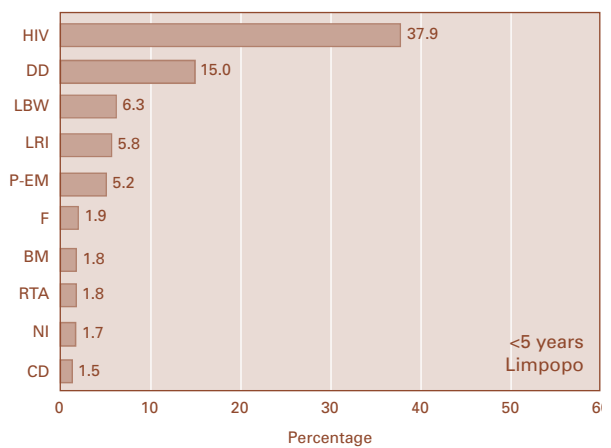
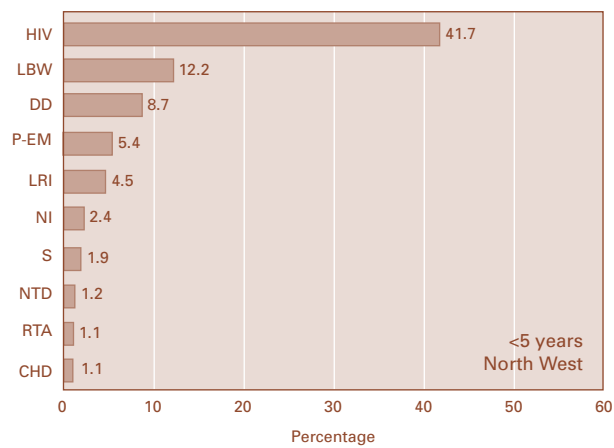
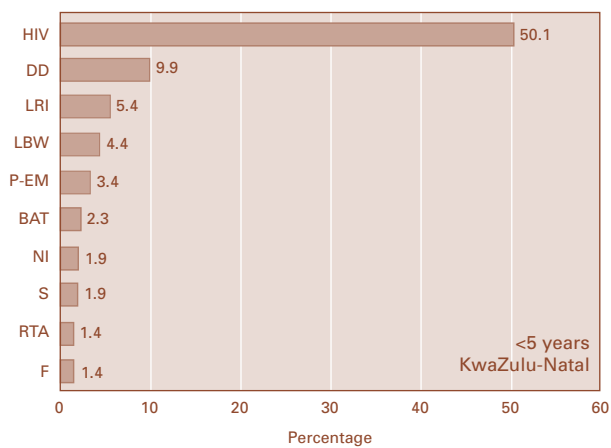
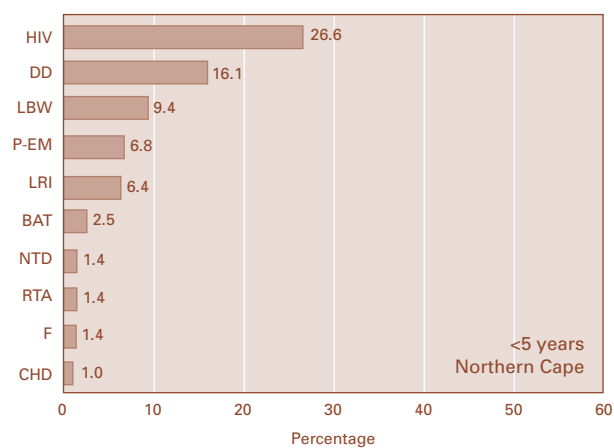
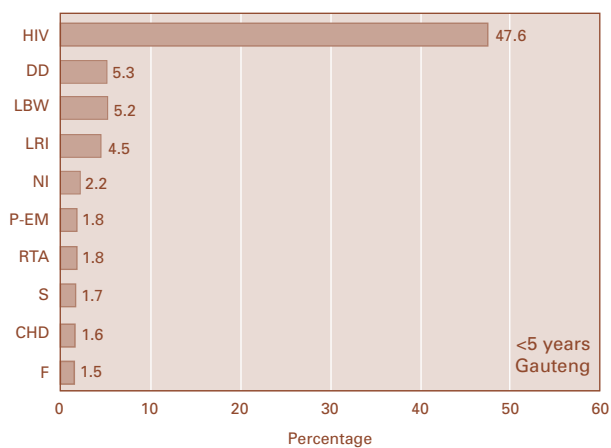
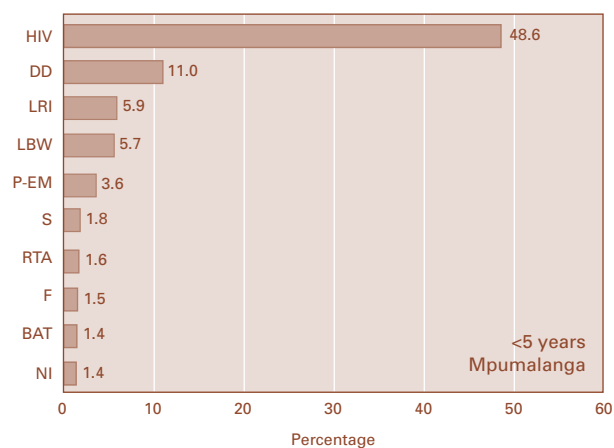
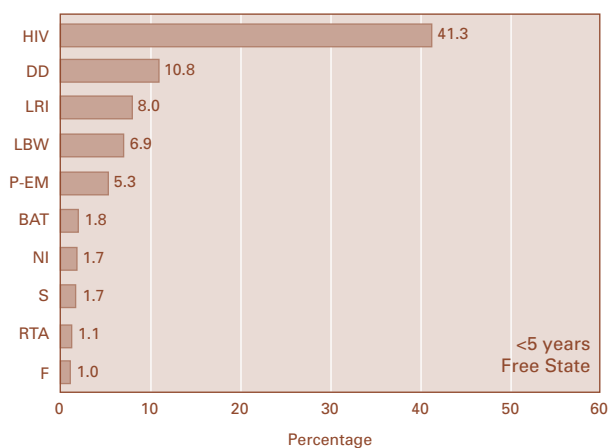
FIGURE 5:  
Age specific mortality rates for children under-5 years by province, 2000



Source: Bradshaw et al., 2005.<sup>26</sup>

FIGURE 6:  
Leading ten causes of death nationally and in each province for children under-5 years, 2000





Source: Bradshaw et al., 2005.<sup>26</sup>

Despite the roll-out of the prevention of mother-to-child transmission of HIV (PMTCT) programme, there is little data to assess its impact. However, there are indications that many children become infected and that the child death rates may still be increasing. A study conducted in four public sector hospitals in Mafikeng health region in North West province in 2001 included 239 under-5 deaths that occurred in the health facilities.<sup>27</sup> The main causes of death were lower respiratory tract infections (31.4%), HIV-related (21.3%) and sepsis (13.4%). When adding all causes of death and contributing conditions, 61.9% were HIV-related. This study was extended to hospitals in 5 provinces and about 59% of deaths in the 6 month period from September 2003 to February 2004 were HIV-related.<sup>28</sup>

This system is now established as the Child Healthcare Problem Identification Programme (ChIP) to monitor and evaluate the quality of child care through routine clinical audits of child deaths and the systematic related data. In 2005 ChIP was implemented in 21 institutions across all 9 provinces and 15 submitted data to the central system. An initial summary of the data was presented at a workshop held in May 2006 at Kopanong where it was noted that 7 out of 100 children admitted to hospital had died. While ChIP does include some deaths of older children, almost 90% of the deaths were children under-5 years. A substantial number of modifiable factors were identified among the 15 institutions, reflecting a thorough level of review. It will be important to follow the trend in this carefully and assess whether any changes have resulted from changes in care or changes in the level of case review. The findings highlighted by ChIP reflect a context of poverty and a high incidence HIV infection.<sup>29</sup>

According to the ChIP data, the HIV status was unknown in 50% of the child deaths.<sup>29</sup> This is worrying given the important role of HIV in child mortality and may suggest that the clinical management of children, in the context of the HIV pandemic is not adequate. Despite a sizable proportion of HIV-infected children meeting the clinical criteria for ART, relatively few children appear to have commenced on it. These data also suggest that PMTCT needs to be improved – a high proportion of the children who were HIV-positive did not receive Nevirapine. Acute respiratory infections

remain the most common immediate cause of death (33%) – with a high proportion of these being confirmed or suspected *Pneumocystis Carinii* Pneumonia (PCP). This is followed by sepsis (16%) and diarrhoea (12%). TB accounted for 7% of the child deaths. The small number of PCP deaths amongst whom cotrimoxazole was given suggests that the guideline for prophylactic provision of cotrimoxazole appears to be inadequately implemented. Data from 2004 found that many of the children who died were malnourished (66%) which has remained the case in 2005.<sup>29</sup>

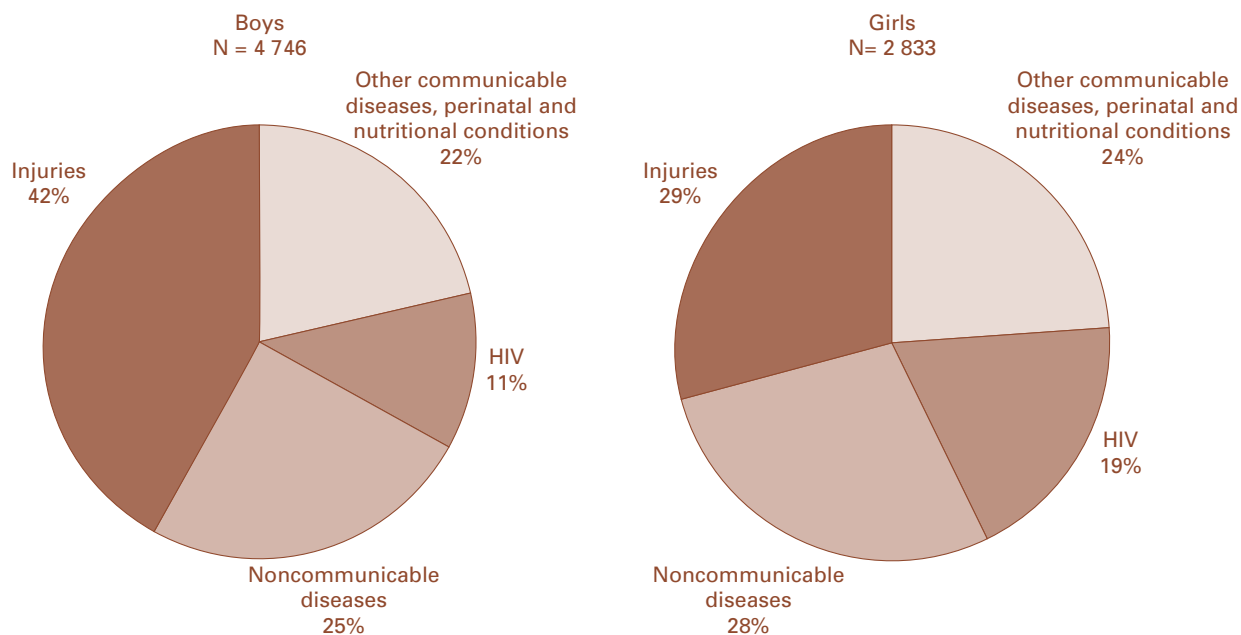
An important aspect of ChIP is to review the factors contributing to the death of each child in terms of **where** they occurred (home, primary health care {PHC}, hospital) and **who** was responsible (caregivers, clinical personnel, health administrators).<sup>29</sup> Factors identified regarding the career of the child included delay in seeking care and not realising the severity of an illness. These remain significant for caregivers while inappropriate nutrition also featured. The findings at PHC level suggest that the effective implementation of Integrated Management of Childhood Illnesses (IMCI) could have made a difference. Another problem at clinics was around the assessment and delay in referring children with failure to thrive. In the wards, the management of intravenous fluids continued to be problematic as well as some aspects of monitoring and inappropriate treatment. The top modifiable factors concerning administrators were around the lack of professional nurses and senior doctors, as well as problems with lack of beds.<sup>29</sup>

## MORTALITY AMONG BOYS AND GIRLS 5-14 YEARS

The cause of death profile for this age group is somewhat different from that among the under-fives – and it differs for boys and girls. Injuries, particularly among boys, and noncommunicable diseases play a more significant role in these ages. The estimated profile of broad causes for boys and girls are shown in Figure 7.



FIGURE 7:  
Broad cause of death profile for boys and girls 5-14 years, 2000

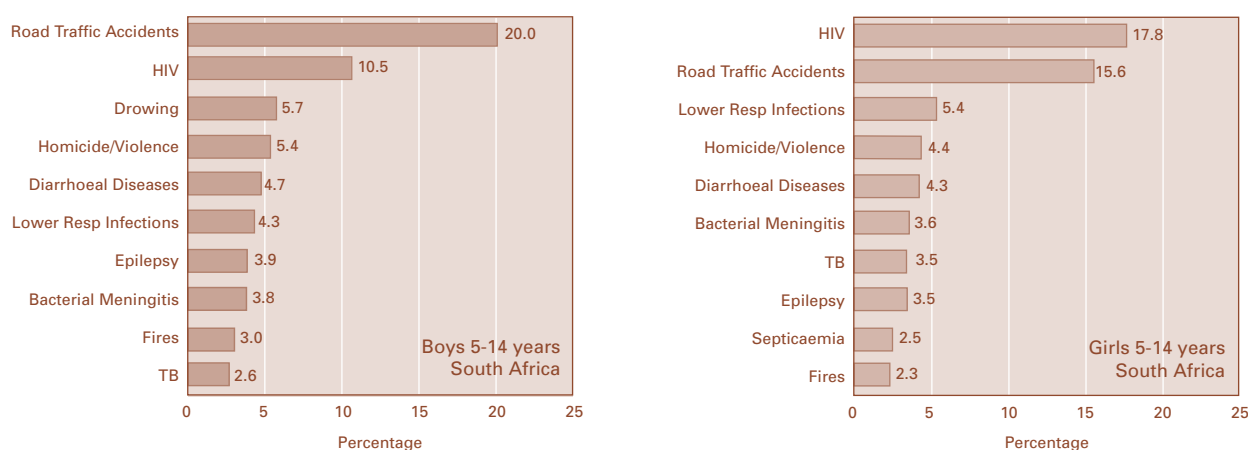


Source: Norman et al., 2006.<sup>24</sup>

Figure 9 shows the estimated mortality rates for boys and girls by province. These rates highlight that male mortality is higher than female mortality in this age group, largely as a result of the high injury mortality but also as a result of differences in the non-communicable diseases – including cancers, digestive diseases, mental disorders and epilepsy. Rates differ across the provinces with the Western Cape having the lowest and KwaZulu-Natal and Mpumalanga having the highest. While injuries are prominent in this age range with road traffic injuries, drowning,

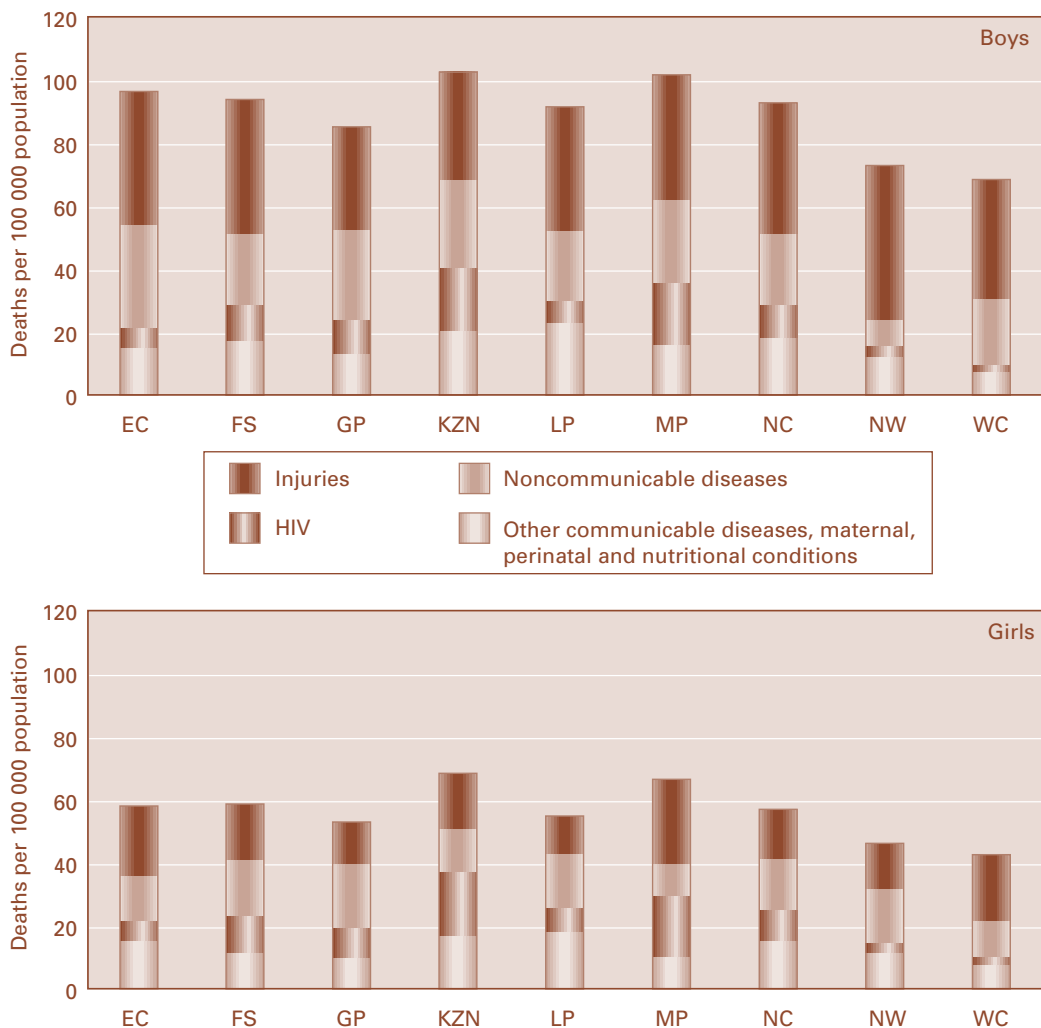
homicide and fires in the leading causes for boys, drowning does not feature in the top causes for girls. HIV-related diseases are the leading cause for girls and the 2nd leading cause for boys. Other infectious diseases such as diarrhoea, lower respiratory infections, bacterial meningitis, tuberculosis and septicaemia also feature. Epilepsy is the 8th and 9th leading cause for girls and boys respectively. While these trends do seem plausible, it must be recognised that the estimates are based on imperfect data and these patterns do need to be verified.

FIGURE 8:  
Leading ten causes of death nationally for children 5-14 years, 2000



Source: Bradshaw et al., 2005.<sup>26</sup>

FIGURE 9:  
Estimated age specific mortality rates by broad cause group and province, 2000

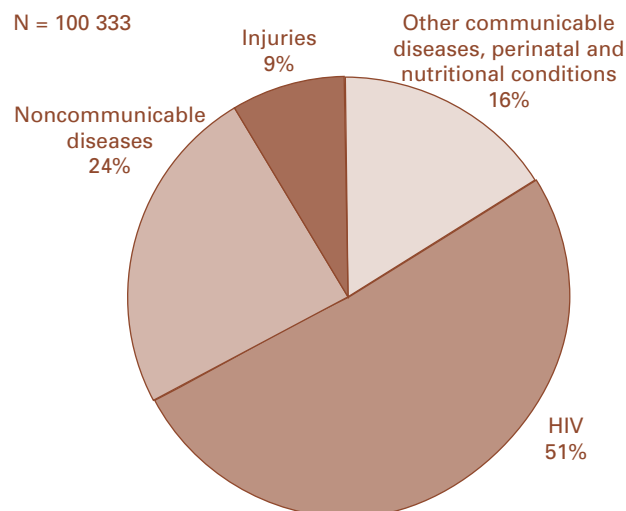


Source: Bradshaw et al., 2005.<sup>26</sup>

## MORTALITY AMONG WOMEN AGED 15-54 YEARS

Mortality rates among young women have increased rapidly over the last few years. It is estimated that by the year 2000, just over half (51%) of the deaths were a result of HIV in this age group (Figure 10). This was followed by 24% resulting from noncommunicable diseases and 16% from other infections, maternal and nutritional conditions. Injuries only account for 9% of deaths among women in this age group.

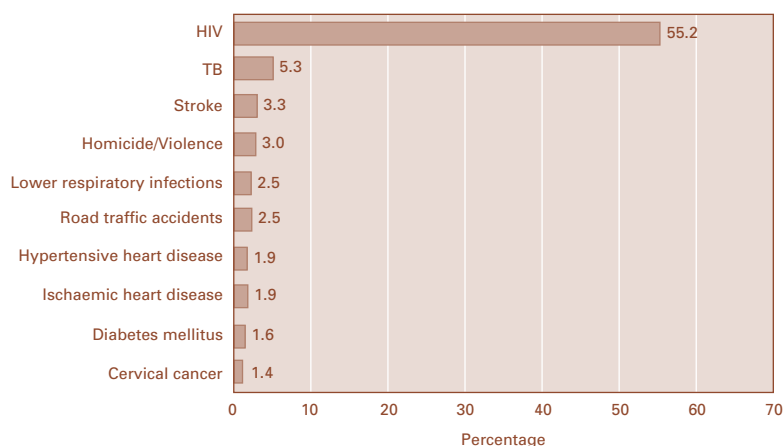
FIGURE 10:  
Broad cause of death profile for women aged 15-54 years, 2000



Source: Norman et al., 2006.<sup>24</sup>



FIGURE 11:  
Leading ten causes of death nationally for women 15-54 years, 2000<sup>26</sup>



Source: Bradshaw et al., 2005.<sup>26</sup>

Figure 11 shows that HIV is by far the leading cause of death in this age group accounting for 51%. Other leading causes of death are TB, stroke, homicide / violence and lower respiratory infections.

Estimates of age-specific mortality rates for women in this age range are shown for each province in Figure 12. The impact of HIV is pronounced in the 25-34 and the 35-44 year age groups and in some provinces makes the overall mortality rate in these groups higher than that in the older age group. This occurs in Free State, KwaZulu-Natal, Mpumalanga and North West. The Northern Cape and the Western Cape were the only two provinces where the mortality rates increased steadily with age. While the mortality due to other infections, maternal and nutritional conditions increases slightly with age in each province, which for noncommunicable increases markedly in the 45-54 year age group. The injury mortality rate tends to be higher in the 35-44 years age group.

There is a lack of data on the level of maternal mortality in SA. The 1998 SADHS estimated that the maternal mortality ratio for the 10-year period preceding the survey was 150 per 100 000 live births.<sup>30</sup> The Confidential Enquiry into maternal deaths collects data on the maternal deaths that occur in facilities, following a review of the case. The Fourth Interim Report covers the years 1998-2003 and shows that there has been an increase from 676 deaths to 1 154 during this period.<sup>31</sup> The causes have shifted from hypertension and haemorrhage as the leading causes to non-pregnancy related infections resulting from HIV-

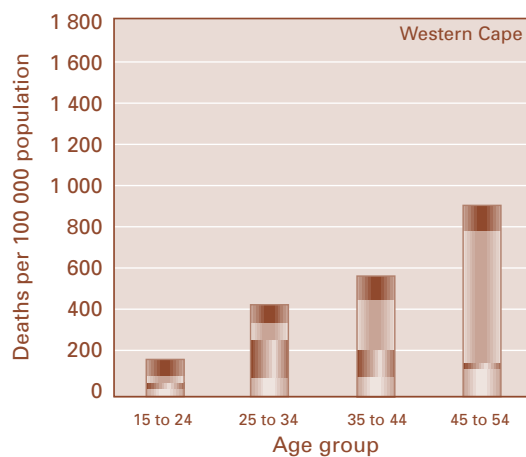
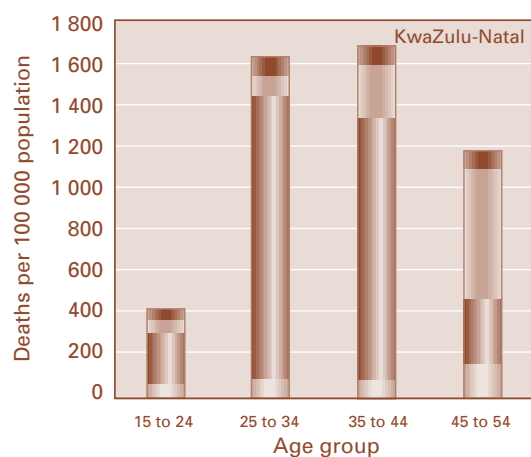
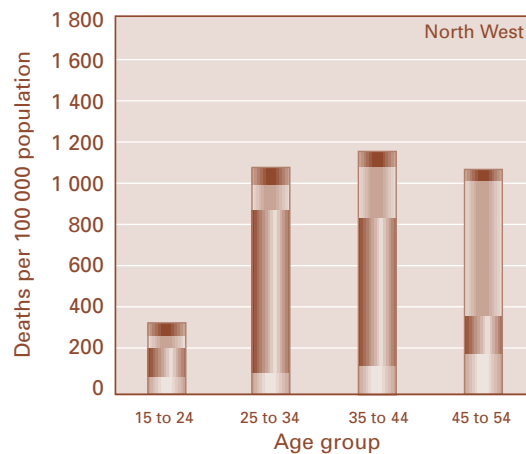
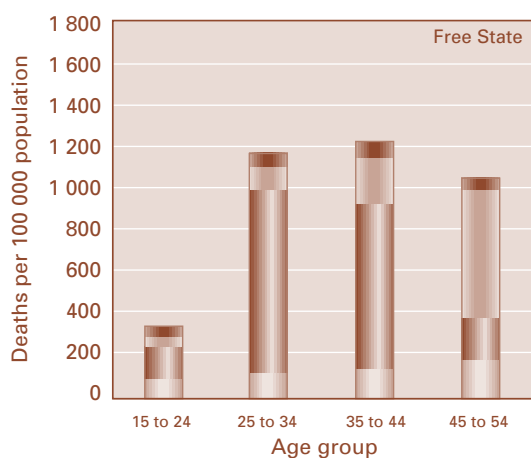
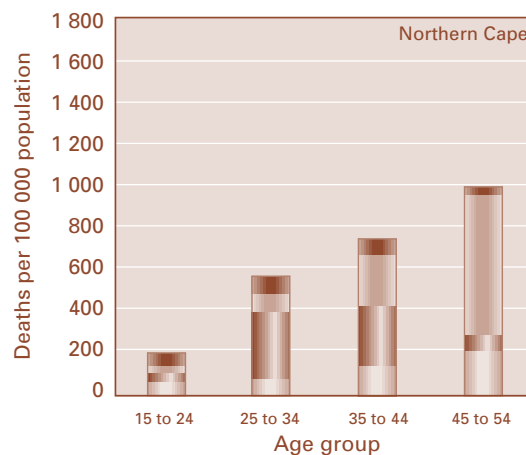
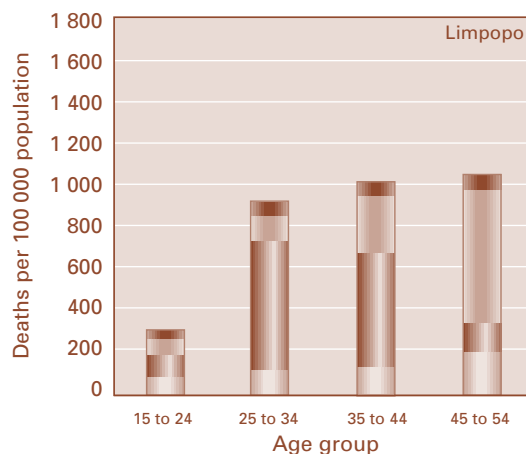
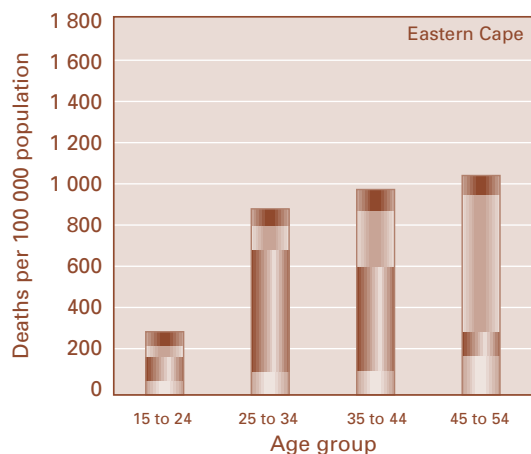
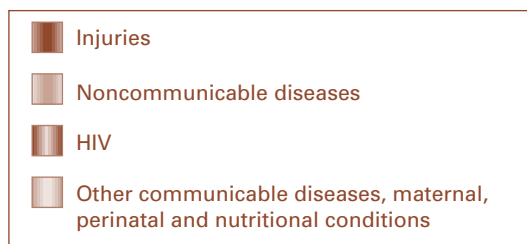
related diseases. It is strongly recommended that the roll-out of antiretroviral therapy must include Level 1 institutions as a priority, or alternatively, women with non-pregnancy related infections need to be referred to Level 2 or 3 institutions. Clinical guidelines have been developed by the National Committee on the Confidential Enquiry into Maternal Deaths (NCCEMD) for the provision of antiretroviral therapy to pregnant women who need it.

The NCCEMD was concerned to find increasing proportions of deaths in Level 1 institutions due to hypertension and pregnancy related sepsis which the NCCEMD consider to indicate the poor functioning of those institutions or of the referral system.<sup>31</sup> Data from the enquiries find that complications of hypertension, obstetric haemorrhage and pregnancy related sepsis remain the major direct causes of maternal death. The committee was also concerned that in 2002 and 2003, there was an increase in maternal deaths due to lack of availability of blood for blood transfusions.<sup>31</sup>

Kruger and Bhagwanjee<sup>32</sup> report on the impact of HIV on maternal mortality at the Johannesburg Hospital. Compared with the level of 183 per 100 000 live-births in 1995/1996, the maternal mortality ratio had increased to 354 per 100 000 by 2000/2001. In this setting, HIV-related deaths became the leading cause having replaced hypertension. Data collected in Durban in 1996-1998 by Khan et al.,<sup>33</sup> demonstrated that TB and HIV were emerging as significant contributors to maternal mortality.

Fawcus et al.<sup>34</sup> conducted a 50-year audit (1953-2002)

FIGURE 12:  
Age-specific mortality rates for women (per 100 000)  
by broad cause group and province, 2000



Source: Bradshaw et al., 2005.<sup>26</sup>



on maternal mortality using the data collected in the Peninsula Maternal and Neonatal Service of Cape Town reflecting all women who gave birth in Cape Town. During this period maternal mortality declined from 301 deaths per 100 000 deliveries in 1953 to 31.2 in the 1987-1989 period. Thereafter, the MMR increased, reaching 112 per 100 000 deliveries in 2002. There was a decline in maternal deaths related to hypertension, haemorrhage, abortion, suspected pulmonary embolism, pregnancy-related sepsis and cardiac disease. In the later period there was a further decline in the maternal deaths associated with abortion, a slight increase in maternal deaths attributed to hypertension and pregnancy-related sepsis and a marked increase in deaths associated with non-pregnancy-related infections predominantly due to HIV.

## MORBIDITY TRENDS

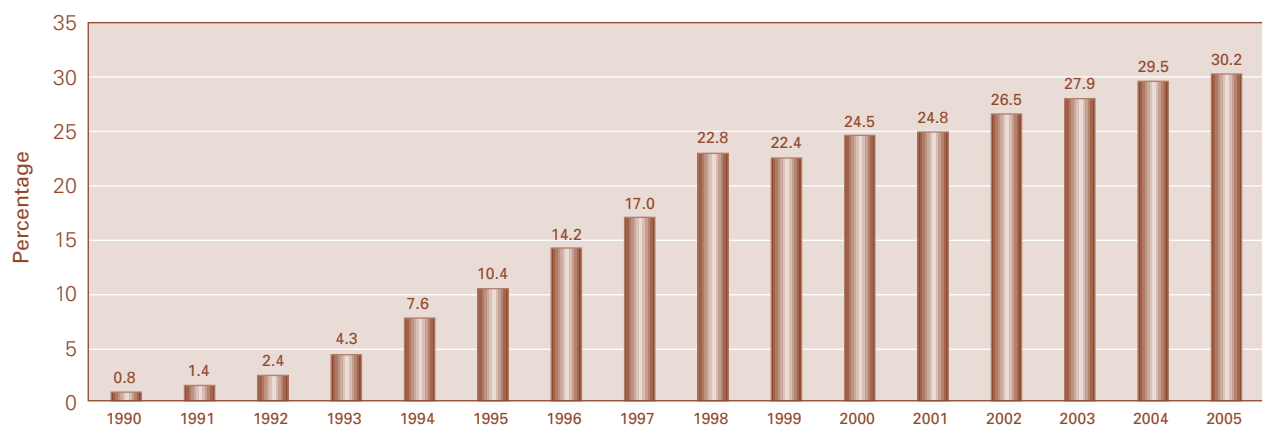
### HIV

The annual HIV sero-prevalence survey conducted among pregnant women attending antenatal clinics in the public sector has shown that there has been an unrelenting increase of the prevalence (Figure 13).<sup>35</sup> In 1990, the prevalence was less than 1% and by 2005 had reached a level of 30%. Most disturbing is the lack of evidence of a sustained slowing down of the epidemic.

The prevalence among the young women <20 years has been at a level of 16% for the last 5 to 6 years and shows no sign of decreasing. Clearly, if the epidemic is to be slowed down, young people have to be targeted to protect themselves from becoming infected.

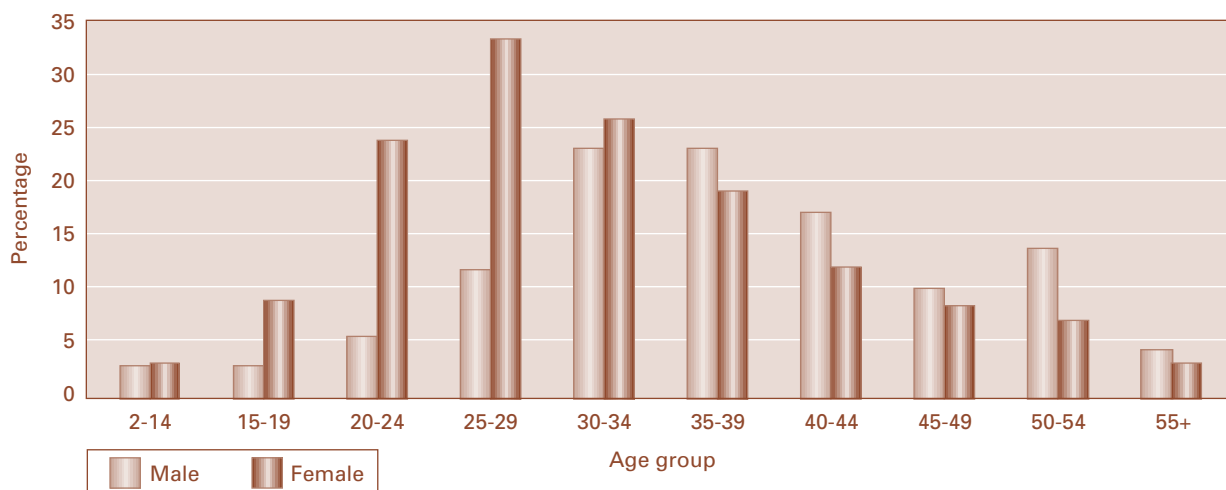
There have been three national household surveys providing population based estimates of HIV infection prevalence. The first survey in 2002 included people aged 2 years and older.<sup>36</sup> The 2nd survey was conducted in 2003 and included people aged 15-24 years.<sup>37</sup> These surveys found similar proportions of people who were HIV-positive in these age groups. Both surveys found a striking difference in the HIV infection prevalence between young men and women; the prevalence amongst young women was approximately 4 times higher than that among young men. The most recent survey, conducted in 2005, has found a similar overall prevalence of 11% in the population over 2 years of age.<sup>38</sup> Figure 14 shows the distinct age and sex pattern of HIV infection prevalence. The rates peak to higher levels for women at a younger age, and the peak for males is at an older age and over a wider age span.

FIGURE 13:  
HIV prevalence among public sector antenatal care attendees 1990-2005



Source: DoH, 2006.<sup>35</sup>

FIGURE 14:  
HIV prevalence by age and sex, SA 2005



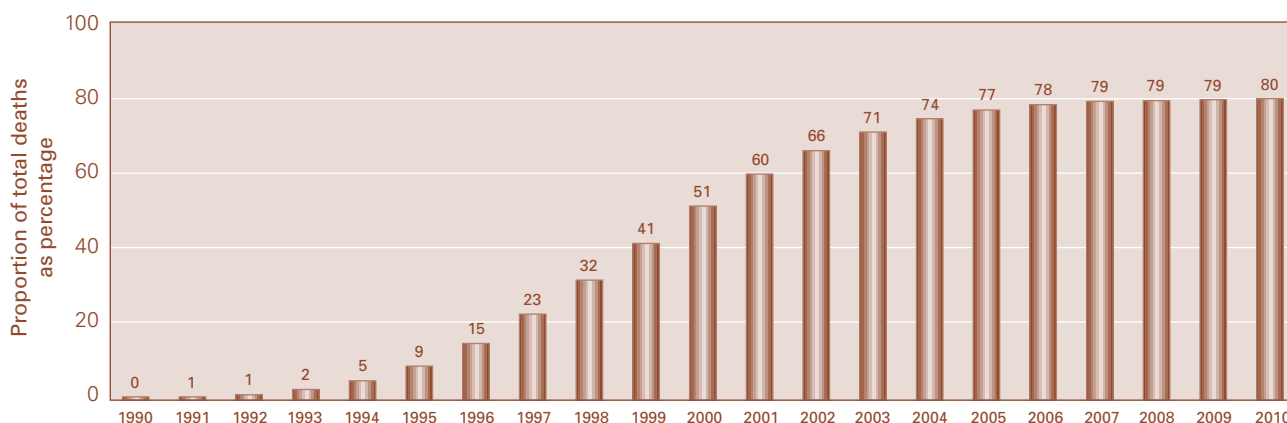
Source: Shisana et al., 2005.<sup>38</sup>

There are no national data on HIV-related illnesses, nor the number of people who are on antiretroviral treatment. Also, there are no routinely collected hospital or clinic data that can provide such information. A study of hospital admissions between 1998 and 2002 in KwaZulu-Natal shows that HIV was the primary cause of admission accounting for about 12% and the leading cause of mortality accounting for 39% of inpatient deaths.<sup>39</sup> It is likely that this is an underestimate as conservative diagnostic criteria were used. Another study of admissions to a rural hospital in northern KwaZulu-Natal between 1991 and 2002 found that the characteristics of the patients changed towards a younger age with higher inpatient mortality.<sup>40</sup>

The authors conclude that the HIV epidemic has increased the number of medical hospital admissions through infectious diseases such as tuberculosis, lower respiratory infection, and diarrhoeal illnesses.

The ASSA2003<sup>41</sup> model provides a projection based on a realistic scenario of 5 prevention and treatment interventions that would alter the risk of infection and increase the survival of HIV-positive people. These projections suggest that by about 2010, 50% of deaths would result from HIV-related diseases. The proportion from HIV-related illnesses among women aged 15-54 years can be expected to increase to 80%.

FIGURE 15:  
Projected proportion of total deaths in women 15-54 years resulting from HIV, 1990-2010



Source: ASSA 2003, 2005.<sup>41</sup>



## TUBERCULOSIS

Certain medical conditions have to be reported to the Department of Health (DoH). The latest available statistics are for the 6 month period January - June 2005. It is known that the notification system is inaccurate. For example, a study in the Agincourt area found many TB deaths were undiagnosed by the health service.<sup>42</sup> Nonetheless, despite efforts to control it, TB is by far the most common of the notifiable conditions.

The World Health Organization (WHO) estimate of the incidence of TB in SA was 718 per 100 000 population in 2004, showing an increase of 8.5% per year (Figure 16). This is estimated from the notification rate of 560 per 100 000 assuming that there is a case detection rate of 78%.<sup>43</sup> The incidence of smear positive rate has increased from 100 per 100 000 in 1996 to 293 per 100 000 in 2004. This indicates that there is a very high rate of people who are able to spread the epidemic further. The proportion of new TB cases that are multi-drug-resistant is 1.8% (i.e. infected by strains of TB that are resistant to at least the two main first-line TB drugs – isoniazid and rifampicin). Given the high incidence of TB in SA, this accounts for a worrying number of such cases.

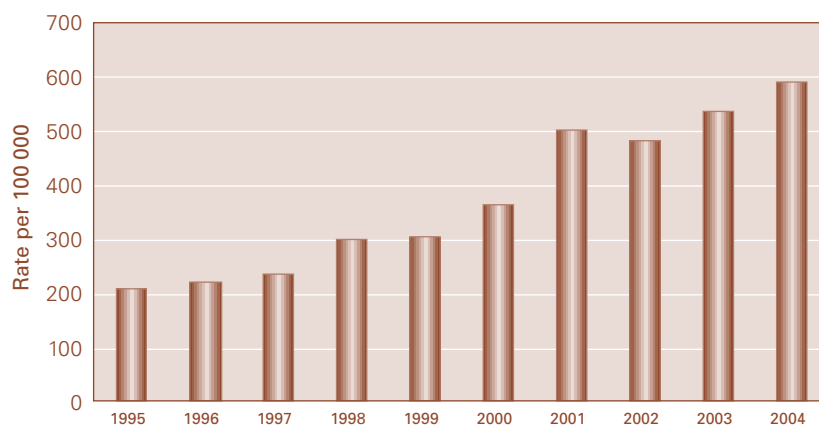
The TB epidemic has been fuelled by the HIV epidemic, and its nature has changed. It is estimated that nationally, 60% of TB patients are HIV-positive.<sup>43</sup> A study of TB patients admitted to a hospital in KwaZulu-Natal found that active TB was common and there was high in-hospital mortality.<sup>44</sup> The study found that TB

patients had presented late in disease and advocate for early detection and effective treatment of active TB in the community. A detailed examination of the trends in the TB notification rate and the prevalence of HIV infection in a peri-urban township in SA during 1996-2004 showed that even after the prevalence of HIV infection had stabilised, the TB rates continued to rise steeply.<sup>45</sup>

An outbreak of Extreme Drug Resistant TB (XDR-TB) occurred in KwaZulu-Natal earlier in 2006 involving 53 confirmed patients. WHO and Centers for Disease Control (CDC) and Prevention have described TB strains that are also resistant to three or more of the six classes of second-line drugs as XDR-TB and have found it to occur in all regions of the world. Most of the 53 patients in KwaZulu-Natal were HIV-positive and all but one died, on average within 25 days. Urgent preventative action is required, particularly in the context of the high HIV prevalence. WHO recommends that TB care be strengthened and facilities to detect and manage resistant cases be improved.<sup>46</sup>

In August 2005, the WHO declared the TB epidemic in Africa to be a regional emergency. A recent review of the intervention efforts to control HIV-related TB in the 25 countries most affected by the HIV epidemic has revealed that they are unlikely to be successful unless there is increased investment in such programmes.<sup>47</sup> Target treatment outcomes are not being met and HIV prevention and care measures are not being

FIGURE 16:  
TB notification rate, 1995-2004



Source: WHO, 2006.<sup>43</sup>

implemented. Controlling HIV-related tuberculosis requires increased investment in full implementation of the Directly Observed Treatment Strategy (DOTS) and the key HIV prevention measures. In settings fully implementing these basic interventions, collaboration between TB and HIV programmes is necessary to scale up implementation of additional prioritised interventions to control HIV-related TB (e.g. antiretroviral therapy, intensified TB case finding and isoniazid and cotrimoxazole preventive therapies) that are of demonstrated feasibility, effectiveness and cost-effectiveness. Lawn et al. argue that additional targeted, age-specific interventions for the control of TB and HIV infection are needed.<sup>45</sup>

A study conducted in 2004-2005 among health care workers in eThekweni found very high incidence rates of TB, particularly among the paramedical staff.<sup>48</sup> Most of the cases were pulmonary TB and 3% were MDR-TB. Less than half of the health care workers with TB completed their treatment and 22.2% were cured. These findings are very worrying.

## DIARRHOEA, CHOLERA AND TYPHOID

Diarrhoea, one of the HIV indicator related conditions can be expected to be on the increase. However, it is not clear how this relates to diarrhoea epidemics. SA experiences outbreaks of diarrhoea from time to time. The cholera epidemic of 2000-2001 was extensive, affecting approximately 120 000 people. Despite the large number of people who became ill, the case fatality rate was relatively low with only 265 deaths reported. This is most unusual for cholera as epidemics usually occur in under-serviced areas – where neither clean water, nor health services are available. The epidemic has been therefore characterised as a failure of prevention but well-treated.<sup>49</sup> Hemson and others<sup>50</sup> have examined government's response to the epidemic and whether it has resulted in a long term solutions. The provision of free health care followed by health promotion efforts in the community clearly helped to curb the epidemic. However, access to clean water remains an issue particularly to the poorest of the poor. The outbreak of typhoid in 2005 resulted in 5 deaths and was traced to contaminated water.

## VACCINE PREVENTABLE DISEASES

According to the notification data, as well as data from the National Institute for Communicable Diseases (NICD), there appears to be relatively few cases of measles and other vaccine preventable diseases. It would be useful for a more careful analysis of the trends in these data including assessments of the completeness of registration.

As part of the global effort to eradicate polio, SA is conducting surveillance of acute flaccid paralysis (AFP) through the NICD. There has not been a case of polio since 1989, but national polio free certification can only be awarded if AFP surveillance is adequate. In 2004, the case detection rate in each province would meet the minimal requirement. However, the proportion of stool specimens that were adequate was 75% – below the target of 80%.<sup>51</sup>

## RHEUMATIC FEVER

Rheumatic fever (RF) is an illness that if not properly treated can result in long term complications including heart disease. A review of the notification system in the Western Cape has revealed substantial under-notification of rheumatic fever.<sup>52</sup> The researchers noted that more cases diagnosed in a single hospital than were captured at the municipal or provincial level. They strongly recommend that health care professionals need to be educated about the statutory requirement to notify all RF cases in SA. An effective national disease notification system is required.

A retrospective study of paediatric rheumatic fever/rheumatic heart disease patients attending 3 hospitals during 1993-1995 in Gauteng aimed to assess the frequency and severity of these conditions.<sup>53</sup> Comparing the number of rheumatic fever/rheumatic heart disease cases against all congenital heart disease cases revealed high proportions in patients living in KwaZulu-Natal, Limpopo and Mpumalanga with Gauteng being lower than expected. While the incidence of rheumatic fever/rheumatic heart disease remains unknown, this study suggests that there may be regional variations.



## HELMINTHS

There are limited data on the levels of exposure to soil-transmitted helminths (worms). A cross-sectional study of school children from one of the townships of Cape Town found an infestation rate of 55.8%.<sup>54</sup> The most common were *Ascaris*, *Trichuris* and *Giardia*. While a deworming programme has subsequently been initiated in this community, the results may point to a more widespread problem. Aside from the direct health concerns, the immune response to intestinal parasites might be a risk factor for HIV and TB. Long term solutions need to be considered as well as deworming treatment.

## MENTAL HEALTH

Epidemiological data on mental illness are lacking. The South African Stress and Health Survey has been conducted on a nationally representative sample and is expected to provide data on the prevalence and severity of specific psychiatric disorders and psychosocial correlates for the first time.<sup>55</sup> In a planning exercise in the Western Cape, a review of the literature together with expert input was used to develop estimates of prevalence of mental illness in the province. Taking comorbidity into account, Kleintjes et al.<sup>56</sup> estimate that 25% of adults suffer from an episode of mental illness every year. Depression is the most common condition followed by anxiety disorders, post traumatic stress disorder, and simple phobias. While there is a high prevalence of substance abuse, the estimates for alcohol dependence and abuse (about 7%) is higher than drug dependence and abuse (1-2%). They estimate that 1% of the population have an episode of schizophrenia per year. A community based study among an adult African population also found a prevalence for generalised anxiety and depressive disorders of 24%.<sup>57</sup> Data from psychiatric services in outlying areas of KwaZulu-Natal found that more than half had diagnoses of schizophrenia.<sup>58</sup> These data showed that many more men than women had substance-induced psychosis, while more women had depressive and anxiety disorders. Research conducted in a township area of Cape Town among women who had recently delivered a baby found that 35% were suffering from major depression.<sup>59</sup> They found that maternal depression was associated with poor emotional and practical support from the partner and with insensitive engagement with the infants.

Kleintjes et al. estimate that 17% of children and adolescents experience a mental illness per year in the Western Cape. For children and adolescents, the most common disorders were generalised anxiety disorder (11%), followed by post traumatic stress disorder and major depressive disorder/dysthymia (both 8%). Psychiatric disorder with impairment was recorded for 15% of children and adolescents in a community based study in an informal settlement in the Western Cape.<sup>60</sup> In a study conducted in a rural setting in Limpopo, children aged 2-9 years were screened for intellectual disability.<sup>61</sup> Intellectual disability was observed in 3.5% of the children with more boys than girls being affected. Epilepsy (15.5%) and cerebral palsy (8.4%) were the commonest associated disabilities. Christiansen et al.<sup>62</sup> observed that more than a half of the children in the study with epilepsy did not receive anticonvulsant medication. Based on data collected in a children's hospital, Leary et al.<sup>63</sup> also raise a concern about the lack of preventative measures in the community to reduce symptomatic epilepsy and also noted a correlation between intellectual disability and epilepsy. Foetal alcohol syndrome results from in-utero exposure to alcohol and results in growth retardation, intellectual disability and characteristic facial dysmorphism. The prevalence of foetal alcohol syndrome is particularly high in some communities of SA. A study conducted in the Western Cape among the 1st grade school children found that almost 5% of the children had the characteristics of the syndrome, a prevalence that is markedly higher than any observed in the USA.<sup>64</sup>

Dinan et al.<sup>65</sup> report that in a sample of health care-seeking women, two thirds reported having experienced several traumatic events outside the home and half of them met the criteria for post-traumatic stress disorder (PTSD). In a record review of a children and adolescent psychiatric in-patient unit, Traut et al.<sup>66</sup> observe that PTSD is a common disorder that is responsive to treatment with psychotherapy and/or medication. Peltzer<sup>67</sup> found that 8% of a sample of Northern Sotho children fulfilled the criterion of PTSD. In a previous study,<sup>68</sup> he had found a high life time prevalence of traumatic events (56%) among a sample of university students in Limpopo. He found a positive relationship between exposure to traumatic events and PTSD with a prevalence of 12%.

Studies of health care providers, emergency service providers and military personnel show occupational risks for PTSD and other mental health and behavioural problems.<sup>69-73</sup> Organisations should be aware of this and should provide appropriate support.

There is also a growing literature about the mental health concerns associated with HIV-related diseases. Aside from the neurological symptoms that can accompany HIV infections,<sup>74</sup> PTSD, depression and anxiety disorders can result from HIV infection diagnosis. Olley et al.<sup>75</sup> observed a prevalence of PTSD of 15% among a sample of newly diagnosed HIV patients and about a third of these were a direct result of the HIV diagnosis. These studies point to a growing mental health burden in SA.

## CONCLUSIONS AND RECOMMENDATIONS

Monitoring trends in mortality and morbidity is still fraught with challenges posed by data inadequacies. While great strides have been made in improving the cause of death statistics, there is much scope for improvement and a need to improve the quality of cause of death certification.<sup>76</sup> The lack of reliable statistics on the level of child mortality is a critical gap that needs urgent attention.

Morbidity data are also lacking and there is no routine analysis of trends in the notifiable conditions. A recent evaluation of the data concerning RF reveals extensive shortcomings in the notification system which may well occur for the other diseases. A review of the data collected through the surveillance system would be useful to identify trends and assess the quality of the data.

While there is a need to continue improving the health information system so that it can provide good quality data on mortality and morbidity trends, there is also a need to utilise the available data. The SA NBD Study for the year 2000 made use of the available data to develop consistent and coherent estimates. The study highlighted that much of the mortality and morbidity in SA was preventable and emphasised the quadruple burden of disease experienced in SA. A broad range of interventions are needed including improved access to

health care and ensuring that basic needs, including water and sanitation, are met. These are particularly relevant to child health. However, there is also a need to target the risk factors that result in chronic disease in adulthood.

It is clear that the last few years have seen a rapid change in the mortality profile with a profound impact from HIV-related diseases affecting young adults and children. The impact on women has been greater than among men. The high death rates due to HIV highlight the urgency to ensure that PMTCT works effectively in all areas and to accelerate the implementation of the comprehensive plan for the treatment and prevention of HIV.

Social determinants of health play a major role in the health of the nation. The recent report on macro-social trends by the Office of the Presidency highlights the critical importance of containing the HIV epidemic. They suggest that mortality statistics do help to isolate issues that require attention to improve the health profile of the nation – as these are driven primarily by social conditions and lifestyles.<sup>77</sup> As poverty, gender inequalities, and crime and violence are factors that play a role in exacerbating the burden of disease, efforts to improve the health of the nation would need to extend to the very core of our society and cultures if there is to be a sustained improvement.



## REFERENCES

- 1 United Nations. United Nations Millennium Declaration. Resolution adopted by the General Assembly Fifty-fifth session Agenda item 60 (b). A/RES/55/2; 2000.  
URL: <http://www.un.org/millennium/>
- 2 Bradshaw D, Schneider M, Dorrington R, Bourne DE, Laubscher R. South African cause-of-death profile in transition – 1996 and future trends. *S Afr Med J* 2002 Aug;92(8):618-23.
- 3 Bradshaw D, Groenewald P, Laubscher R, Nannan N, Nojilana B, Norman R, et al. Initial Burden of Disease Estimates for South Africa, 2000. *S Afr Med J* 2003;93:682-8.
- 4 Dorrington R, Bourne D, Bradshaw D, Laubscher R, Timæus IM. The impact of HIV/AIDS on adult mortality in South Africa. Technical Report. Cape Town: Medical Research Council; 2001.  
URL: <http://www.mrc.ac.za/bod/index.htm>
- 5 Bradshaw D, Laubscher R, Dorrington R, Bourne DE, Timæus IM. Unabated rise in number of adult deaths in South Africa. *S Afr Med J* 2004;94(4):278-9.
- 6 Statistics South Africa. Advance release of recorded cause of deaths 1997-2001. Statistical Release P0309.2. Pretoria: Statistics South Africa; 2002.  
URL: <http://www.statssa.gov.za/publications/statsdownload.asp?ppn=P0309.2&SCH=2454>
- 7 Statistics South Africa. Mortality and causes of death Statistical release in South Africa, 1997 - 2003. Findings from death notification. P0309.3. Pretoria: Statistics South Africa; 2005.
- 8 Statistics South Africa. Mortality and causes of death Statistical release in South Africa, 2003 and 2004. Findings from death notification. P0309.3. Pretoria: Statistics South Africa; 2006.  
URL: <http://www.statssa.gov.za/publications/P03093/P03093.pdf>
- 9 Nannan N, Bradshaw D, Mazur R, Maphumulo S. What is the infant mortality rate in South Africa? The need for improved data. *S Afr Med J* 1998 Dec;88(12):1583-7.
- 10 Nannan N, Bradshaw D, Timæus IM. Levels and differentials in child mortality 1977-1998. *Journal of Biosocial Demography*. (In press)
- 11 Dorrington RE, Moultrie T, Timæus IM. Estimating mortality using the South African Census 2001 data. Monograph 11: UCT Centre for Actuarial Research; 2004.  
URL: <http://www.commerce.uct.ac.za/Research%5FUnits/CARE/Monographs/Monographs/Mono11.pdf>
- 12 Department of Health, ORC Macro International. South Africa Demographic and Health Survey 2003-2004. Preliminary Report. Pretoria: Department of Health; 2006.  
URL: <http://www.doh.gov.za/facts/index.html>
- 13 Kleinschmidt I. South African tuberculosis mortality data– showing the first sign of the AIDS epidemic? *S Afr Med J* 1999 Mar;89(3):269-73.
- 14 Groenewald P, Bradshaw D, Dorrington R, Bourne D, Laubscher R, Nannan N. Identifying deaths from AIDS in South Africa: an update. *AIDS* 2005;19(7):744 (Letter)
- 15 Groenewald P, Nannan N, Bourne D, Laubscher R, Bradshaw D. Identifying deaths due to AIDS in South Africa. *AIDS* 2005;19(2):193-201.
- 16 Moorman J, Edginton ME. Cause of death of patients on treatment for tuberculosis: a study in a rural South African hospital. *Int J Tuberc Lung Dis* 1999 Sep;3(9):786-90.
- 17 Bah S. Unnoticed decline in the number of unnatural deaths in South Africa. *S Afr Med J* 2004 Jun;94(6):442-3. Erratum in: *S Afr Med J* 2004 Nov;94(11):872.
- 18 Garenne M, Kahn K, Tollman S, Gear J. Causes of death in a rural area of South Africa: an international perspective. *J Trop Pediatr* 2000 Jun;46(3):183-90.
- 19 Tollman SM, Kahn K, Garenne M, Gear JS. Reversal in mortality trends: evidence from the Agincourt field site, South Africa, 1992-1995. *AIDS* 1999 Jun 18; 13(9):1091-7.
- 20 Kahn K, Tollman SM, Garenne M, Gear JS. Who dies from what? Determining cause of death in South Africa's rural north-east. *Trop Med Int Health* 1999 Jun;4(6):433-41.
- 21 Kahn K, Tollman SM. Stroke in rural South Africa–contributing to the little known about a big problem. *S Afr Med J* 1999 Jan;89(1):63-5.
- 22 Hosegood V, Vanneste AM, Timæus IM. Levels and causes of adult mortality in rural South Africa: the impact of AIDS. *AIDS* 2004 Mar 5;18(4):663-71.
- 23 Garrib A, Jaffar S, Knight S, Bradshaw D, Bennish ML. Rates and causes of child mortality in an area of high HIV prevalence in rural South Africa. (In press)
- 24 Norman R, Bradshaw D, Schneider M, Pieterse D, Groenewald P. Revised Burden of Disease Estimates for the Comparative Risk Factor Assessment, South Africa 2000. Methodological Note. Cape Town: Medical Research Council; 2000.  
URL: <http://www.mrc.ac.za/bod/bodestimate.pdf>
- 25 Statistics South Africa. Causes of death in South Africa, 1997-2001: Advanced release of recorded causes of death (P0309.2). Pretoria: Statistics South Africa; 2002.
- 26 Bradshaw D, Nannan N, Groenewald P, Joubert J, Laubscher R, Nojilana B, et al. Provincial mortality in South Africa, 2000 – priority-setting for now and a benchmark for the future. *S Afr Med J* 2005 Jul;95(7):496-503.
- 27 Krug A, Pattinson RC, Power DJ. Why children die: an under-5 health care survey in Mafikeng region. *S Afr Med J* 2004 Mar;94(3):202-6.
- 28 Krug A, Pattinson RC. Saving children : A survey of child healthcare in South Africa. Pretoria: Child-PIP Group and the MRC unit for Maternal and Infant Health Care Strategies; 2005.  
URL: <http://www.mrc.ac.za/maternal/savingchildren.pdf>

- 29 Stephen CR. Presentation to ChIP workshop, Kopanong 23 May 2006.
- 30 Department of Health, Medical Research Council, Macro International. South Africa Demographic and Health Survey 1998. Full Report. Pretoria: Department of Health; 2002.  
URL: <http://www.doh.gov.za/facts/index.html>
- 31 National Committee for Confidential Enquiries into Maternal Deaths. Fourth Interim Report on Confidential Enquiries into Maternal Deaths in South Africa. Changing Patterns in Maternal Deaths 1998-2003 and National guidelines for the use of antiretroviral therapy in pregnancy. Pretoria: Department of Health; 2006.
- 32 Kruger AM, Bhagwanjee S. HIV/AIDS: impact on maternal mortality at the Johannesburg Hospital, South Africa, 1995-2001. *Int J Obstet Anesth* 2003 Jul;12(3):164-8.
- 33 Khan M, Pillay T, Moodley JM, Connolly CA. Maternal mortality associated with tuberculosis-HIV-1 co-infection in Durban, South Africa. *AIDS* 2001 Sep 28;15(14):1857-63.
- 34 Fawcus SR, van Coeverden de Groot HA, Isaacs S. A 50-year audit of maternal mortality in the Peninsula Maternal and Neonatal Service, Cape Town (1953-2002). *BJOG* 2005 Sep;112(9):1257-63.
- 35 Department of Health. National HIV and syphilis antenatal sero-prevalence survey in South Africa 2005. Pretoria: Epidemiology and Surveillance Directorate, Department of Health; 2005.  
URL: <http://www.doh.gov.za/docs/>
- 36 Shisana O, Simbayi L. Nelson Mandela/HSRC study of HIV/AIDS. South African National HIV prevalence, behavioural risks and mass media household survey 2002. Cape Town: Human Sciences Research Council; 2002.  
URL: <http://www.hsrbpress.co.za/index.asp?id=2134>
- 37 Pettifor AE, Rees HV, Steffenson A, Hlongwa-Madikizela L, MacPhail C, Vermaak K, et al. HIV and sexual behaviour among young South Africans: a national survey of 15-24 year olds. Johannesburg: Reproductive Health Research Unit, University of the Witwatersrand; 2004.  
URL: <http://www.rhru.co.za/images/Docs/national%20survey%20RHRU.pdf>
- 38 Shisana O, Rehle T, Simbayi LC, Parker W, Zuma K, Bhana A, et al. South African National HIV Prevalence, HIV Incidence, Behaviour and Communication Survey, 2005. Cape Town: Human Sciences Research Council; 2005.  
URL: <http://www.hsrbpress.co.za/index.asp?id=2134>
- 39 KwaZulu-Natal Epidemiology Unit. An analysis of the hospital admissions in KwaZulu-Natal between 1998 and 2002. *KwaZulu-Natal Epidemiology Bulletin*. Issue 6. March 2004. Pietermaritzburg: KwaZulu-Natal Department of Health; 2004.  
URL: <http://www.kznhealth.gov.za/epibulletin6.pdf>
- 40 Reid A, Dedicat M, Lalloo D, Gilks CF. Trends in adult medical admissions in a rural South African hospital between 1991 and 2002. *J Acquir Immune Defic Syndr* 2005 Sep 1;40(1):53-6.
- 41 Actuarial Society of South Africa. ASSA2003 AIDS and demographic model. 2005.  
URL: <http://www.assa.org.za/default.asp?id=1000000050>
- 42 Pronyk PM, Kahn K, Hargreaves JR, Tollman SM, Collinson M, Hausler HP, et al. Undiagnosed pulmonary tuberculosis deaths in rural South Africa. *Int J Tuberc Lung Dis* 2004 Jun;8(6):796-9.
- 43 World Health Organisation. Global tuberculosis control - surveillance, planning, financing WHO Report 2006. WHO/HTM/TB/2006.362. Geneva: World Health Organisation; 2006.  
URL: [http://www.who.int/tb/publications/global\\_report/en/index.html](http://www.who.int/tb/publications/global_report/en/index.html)
- 44 Alvarez GG, Thembela BL, Muller FJ, Clinch J, Singhal N, Cameron DW. Tuberculosis at Edendale Hospital in Pietermaritzburg, Kwazulu Natal, South Africa. *Int J Tuberc Lung Dis* 2004 Dec;8(12):1472-8.
- 45 Lawn SD, Bekker LG, Middelkoop K, Myer L, Wood R. Impact of HIV infection on the epidemiology of tuberculosis in a peri-urban community in South Africa: the need for age-specific interventions. *Clin Infect Dis* 2006 Apr 1;42(7):1040-7. Epub 2006 Feb 16.
- 46 WHO Media Release. Emergence of XDR-TB. 5 September 2006.  
URL: <http://www.who.int/mediacentre/news/notes/2006/np23/en/index.html>
- 47 Maher D, Borgdorff M, Boerma T. HIV-related tuberculosis: how well are we doing with current control efforts? *Int J Tuberc Lung Dis* 2005 Jan;9(1):17-24.
- 48 Naidoo S, Jinabhai CC. TB in health care workers in KwaZulu-Natal, South Africa. *Int J Tuberc Lung Dis* 2006 Jun;10(6):676-82.
- 49 Morris K. "Prevention fails to halt South Africa's well-treated cholera epidemic." *Lancet* 2001 Jan 27;357(9252):290.
- 50 Hemson D, Dube B, Mbele T, Nnadozie R, Ngcobo D. Still paying the price: Revisiting the cholera epidemic of 2000-01 in South Africa. *Municipal Service Project Occasional Papers Series 8*. February 2006.  
URL: [http://www.hsrb.ac.za/research/programmes/URED/news/20060712\\_cholera.html](http://www.hsrb.ac.za/research/programmes/URED/news/20060712_cholera.html)
- 51 McAnerney J, Harris B. AFP surveillance 2004. *Communicable Diseases Surveillance Bulletin* January 2005. National Institute for Communicable Diseases of the National Health Laboratory Service.  
URL: <http://www.nicd.ac.za/pubs/survbull/2005/CommDisBullJan052.pdf>
- 52 Nkgudi B, Robertson KA, Volmink J, Mayosi BM. Notification of rheumatic fever in South Africa -- evidence for underreporting by health care professionals and administrators. *S Afr Med J* 2006 Mar;96(3):206-8.
- 53 Clur SA. Frequency and severity of rheumatic heart disease in the catchment area of Gauteng hospitals, 1993-1995. *S Afr Med J* 2006 Mar;96(3 Pt 2):233-7.
- 54 Adams VJ, Markus MB, Adams JF, Jordaan E, Curtis B, Dhansay MA, et al. Paradoxical helminthiasis and giardiasis in Cape Town, South Africa: epidemiology and control. *Afr Health Sci* 2005 Jun;5(2):131-6.



- 55 Williams DR, Herman A, Kessler RC, Sonnega J, Seedat S, Stein DJ, et al. The South Africa Stress and Health Study: rationale and design. *Metab Brain Dis* 2004 Jun;19(1-2):135-47.
- 56 Kleintjes S, Flisher AJ, Fick M, Railoun A, Lund C, Molteno C, et al. The prevalence of mental disorders among children, adolescents and adults in the Western Cape, South Africa. *South African Psychiatry Review*. August 2006;9:157-60.
- 57 Bhagwanjee A, Parekh A, Paruk Z, Petersen I, Subedar H. Prevalence of minor psychiatric disorders in an adult African rural community in South Africa. *Psychol Med* 1998 Sep;28(5):1137-47.
- 58 Pillay AL, Sargent C. Descriptive profile of sex and psychiatric diagnosis among rural and peri-urban clinic attenders in South Africa. *Psychol Rep* 2003 Apr;92(2):595-8.
- 59 Cooper PJ, Tomlinson M, Swartz L, Woolgar M, Murray L, Molteno C. Post-partum depression and the mother-infant relationship in a South African peri-urban settlement. *Br J Psychiatry* 1999 Dec;175:554-8.
- 60 Robertson BA, Ensink K, Parry CD, Chalton D. Performance of the Diagnostic Interview Schedule for Children Version 2.3 (DISC-2.3) in an informal settlement area in South Africa. *J Am Acad Child Adolesc Psychiatry* 1999 Sep;38(9):1156-64.
- 61 Christianson AL, Zwane ME, Manga P, Rosen E, Venter A, Downs D, et al. Children with intellectual disability in rural South Africa: prevalence and associated disability. *J Intellect Disabil Res* 2002 Feb;46(Pt 2):179-86.
- 62 Christianson AL, Zwane ME, Manga P, Rosen E, Venter A, Kromberg JG. Epilepsy in rural South African children--prevalence, associated disability and management. *S Afr Med J* 2000 Mar;90(3):262-6.
- 63 Leary PM, Riordan G, Schlegel B, Morris S. Childhood secondary (symptomatic) epilepsy, seizure control, and intellectual handicap in a nontropical region of South Africa. *Epilepsia* 1999 Aug;40(8):1110-3.
- 64 May PA, Brooke L, Gossage JP, Croxford J, Adnams C, Jones KL, et al. Epidemiology of fetal alcohol syndrome in a South African community in the Western Cape Province. *Am J Public Health* 2000 Dec;90(12):1905-12.
- 65 Dinan BA, McCall GJ, Gibson D. Community violence and PTSD in selected South African townships. *J Interpers Violence* 2004 Jun;19(6):727-42.
- 66 Traut A, Kaminer D, Boshoff D, Seedat S, Hawkrigde S, Stein DJ. Treatment utilisation and trauma characteristics of child and adolescent inpatients with posttraumatic stress disorder. *Curationis* 2003 Aug;26(2):44-8.
- 67 Peltzer K. Posttraumatic stress symptoms in a population of rural children in South Africa. *Psychol Rep* 1999 Oct;85(2):646-50.
- 68 Peltzer K. Traumatic experiencing and post traumatic psychological symptoms in South African University students. *Cent Afr J Med* 1998 Nov;44(11):280-3.
- 69 Seedat S, le Roux C, Stein DJ. Prevalence and characteristics of trauma and post-traumatic stress symptoms in operational members of the South African National Defence Force. *Mil Med* 2003 Jan;168(1):71-5.
- 70 Emsley RA, Seedat S, Stein DJ. Posttraumatic stress disorder and occupational disability in South African Security Force members. *J Nerv Ment Dis* 2003 Apr;191(4):237-41.
- 71 Carey PD, Stein DJ, Zungu-Dirwayi N, Seedat S. Trauma and posttraumatic stress disorder in an urban Xhosa primary care population: prevalence, comorbidity, and service use patterns. *J Nerv Ment Dis* 2003 Apr;191(4):230-6.
- 72 Crabbe JM, Bowley DM, Boffard KD, Alexander DA, Klein S. Are health professionals getting caught in the crossfire? The personal implications of caring for trauma victims. *Emerg Med J* 2004 Sep;21(5):568-72.
- 73 Ward CL, Lombard CJ, Gwebushe N. Critical incident exposure in South African emergency services personnel: prevalence and associated mental health issues. *Emerg Med J* 2006 Mar;23(3):226-31.
- 74 Bhigjee AI. Neurological manifestations of HIV infection in Kwazulu-Natal South Africa. *J Neurovirol* 2005;11 Suppl 1:17-21.
- 75 Olley BO, Zeier MD, Seedat S, Stein DJ. Post-traumatic stress disorder among recently diagnosed patients with HIV/AIDS in South Africa. *AIDS Care* 2005 Jul;17(5):550-7.
- 76 Bah S. Improving the quality of cause-of-death statistics in South Africa--some practical steps. *S Afr Med J* 2005 Dec;95(12):902-3.
- 77 South African Presidency. *A Nation in the Making. A discussion document on macro-social trends in South Africa. Policy Co-ordination and Advisory Services (FCAS). South African Presidency; 2006.*

