SOUTH AFRICAN CAUSE-OF-DEATH PROFILE IN TRANSITION — 1996 AND FUTURE TRENDS

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This paper describes the South African cause-of-death profile in 1996, the latest year for which routine data are available. Underreporting of deaths, misclassification of causes and HIV/AIDS make face value interpretation of reported cause-of-death data difficult. Changes in subsequent years due to HIV/AIDS are considered using model projections.

South Africa is undergoing a protracted bipolar transition with the coexistence of both diseases of poverty and emerging chronic diseases. In 1996 these accounted for similar proportions of the premature mortality, about 27% for males and 35% for females, with the added burden of injuries accounting for a further 35% in males and 16% in females. Tuberculosis (TB), lower respiratory tract infections, diarrhoea, HIV/AIDS, perinatal diseases, malnutrition and septicaemia contributed to the pre-transitional conditions, while stroke, diabetes, ischaemic heart disease, hypertensive heart disease, asthma, chronic obstructive lung disease, cancer of the lung in men and cancer of the cervix in women contributed to the premature mortality due to non-communicable diseases. Homicide is the major cause of injury death for men while unintentional injuries are the major cause of injury death for women. Projections suggest that this triple burden (diseases of poverty, emerging chronic diseases and injuries) has now become a quadruple burden resulting from the HIV/AIDS epidemic and that without interventions to reduce mortality, by the year 2010, AIDS deaths will account for double all other causes of death combined.

While efforts to improve the cause-of-death statistics are needed, the current data clearly suggest that comprehensive public health strategies to improve the health of the nation must be strengthened, and reducing the number of deaths that can be expected to result from AIDS requires urgent attention.

S Afr Med J 2002; **92:** 618-623.

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The cause-of-death profile reflects the state of health of the nation and is vitally important for public health and social development planning. In the past, South African death statistics were problematic, with extensive underregistration and misclassification.[1,2] However, since 1994 extensive efforts by the Departments of Health and Home Affairs, Statistics South Africa and other agencies to improve death registration and statistics, have resulted in substantial improvements. The timely availability of detailed cause-of-death statistics remains a problem, with the most recent official cause-of-death data being for the year 1996,[3] although Statistics South Africa is now in the process of rapidly coding a 15% sample of the deaths in the subsequent years.

Projections of the impact of HIV suggest that the mortality age profile is undergoing extensive change.[4,5] Calibrated to the rise in the prevalence of HIV observed in the antenatal seroprevalence surveys[6] during the 1990s, the models predict that without widespread access to anti-retrovirals or other interventions, AIDS will have an extensive impact on mortality.

This paper presents an analysis of the cause-of-death information for the year 1996 and attempts to interpret this information in the light of the projections concerning HIV/AIDS and new injury mortality surveillance data. The causes of death are examined from a public health point of view by using a burden of disease aggregation of the causes and by considering the premature loss of years of life.

CAUSES OF DEATH IN 1996

There were 327 253 deaths reported in South Africa for 1996, comprising 186 538 male deaths and 140 530 female deaths. The 1 376 deaths which had missing details for sex or age have been excluded from this analysis. Over 96% of the recorded deaths were certified by a medical practitioner, a substantial increase from the 1995 figure of only 80%. Deaths due to external causes (injuries) generally did not have the manner of death specified and are consequently classified as having an external cause with undetermined cause and undetermined intent.

The cause-of-death profiles, based on the number of deaths in 1996, are shown in Fig. 1. The graph includes the causes that account for 5% or more of the deaths. The causes of death were

aggregated using the South African Burden of Disease list,[7] developed from the Global Burden of Disease list,[8] combining conditions of common aetiology or common intervention, using the *International Classification of Diseases (ICD)-9* codes[9] recorded by Statistics South Africa. The residual categories are grouped according to broad burden of disease type: type 1, infectious diseases, maternal and perinatal conditions and malnutrition (pre-transitional causes); type 2, non-communicable diseases; and type 3, injuries, including both intentional and unintentional injuries.

A large proportion of deaths (14.7%) were from ill-defined natural causes. This has declined from 17.1% in 1995. In the case of males, there was almost the same proportion of injury-related deaths as non-communicable or communicable disease deaths, while for females the non-communicable diseases accounted for almost half of the deaths. Injuries accounted for 25% of male and 10.2% of female deaths. Cardiovascular diseases accounted for 24.3% of female and 16.6% of male deaths, and malignant neoplasms 9.3% of female and 8.5% of male deaths. Infectious and parasitic diseases accounted for 12.9% of female and 13.3% of male deaths, while respiratory diseases accounted for around 5% of all deaths for both males and females.

The ranking of diseases based on the number of deaths will always depend on the nature of the classification and the aggregation used. Based on the South African Burden of Disease list, the top 20 causes of death in 1996 are shown in Fig. 2 for males and females separately. (The ranking of the causes of death differs by age group and other details have been compiled in a full report[7] that can be downloaded from www.mrc.ac.za/bod/profile.htm.) Unfortunately, these data do not provide sufficient information to identify the causes of injury deaths. However, the National Injury Mortality Surveillance System[10] based at sentinel mortuaries found that 51% of the injury-related deaths for males in 1999 were a result of homicide, 32% accidental and 7.7% suicide. For females, the pattern was different and 44% of the injury deaths were accidental, 30% homicide and 8% suicide.

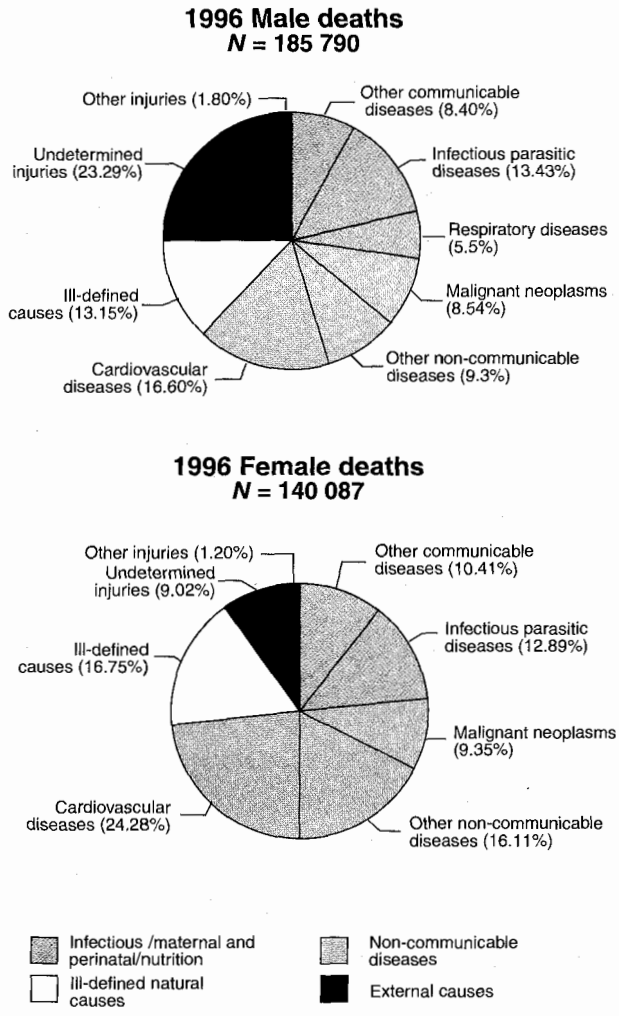

Fig. 1. Cause of death for males and females, 1996.

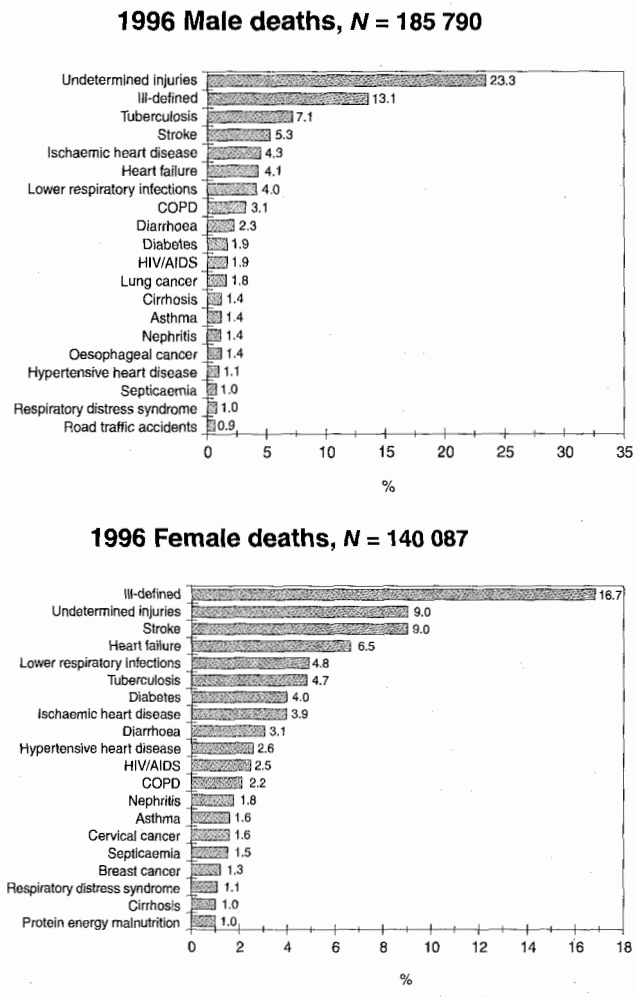

Fig. 2. Top causes of death for males and females, 1996 (COPD - chronic obstructive pulmonary disease).

YEARS OF LIFE LOST

The years-of-life-lost measure does not merely consider the number of deaths but takes into account the age at which the death occurred. This measure is of particular importance for public health planning as it focuses on premature loss of life. These premature deaths have far-reaching economic and social consequences. In this analysis the years of life lost have been calculated using life expectancy, age weights and discounting of 3%, as are standard in the Global Burden of Disease Study.[8] Discounting allows for the assumption that a year saved now is worth more that a year saved some time in the future. Age weighting allows for the higher social value placed on the years lived during young adulthood, compared with periods of greater dependency such as infancy and old age. There has been extensive debate concerning the values incorporated in such a measure through the selection of a discount rate, age weights and the standard life expectancy. While alternative standards could be used, it is unlikely that these would result in significantly different ranking of the causes of death.

Fig. 3 shows that there was a striking loss of life due to injuries for males (35%). The years of life lost due to infectious and parasitic diseases was 16% for males and when added to perinatal conditions and other communicable diseases, type 1 conditions make up 27% of the total years of life lost. A similar proportion (28%) of the total years of life lost resulted from non-communicable diseases, mostly cardiovascular (10%) and cancers (5.5%). The ill-defined cause-of-death category contributed the remaining 10% for males. The most striking characteristic of the female years of life lost shown in Fig. 3 is the large proportion attributed to type 1 and type 2 cause-of-death categories, 35% and 36% respectively, and the significantly lower proportion of injury deaths. The ill-defined category contributes about 13% for females.

The top 20 causes of premature mortality based on the years of life lost are shown in Fig. 4 for males and females. The undetermined injuries ranked first for males, accounting for 33%, and the ill-defined group was ranked second at about 10%.

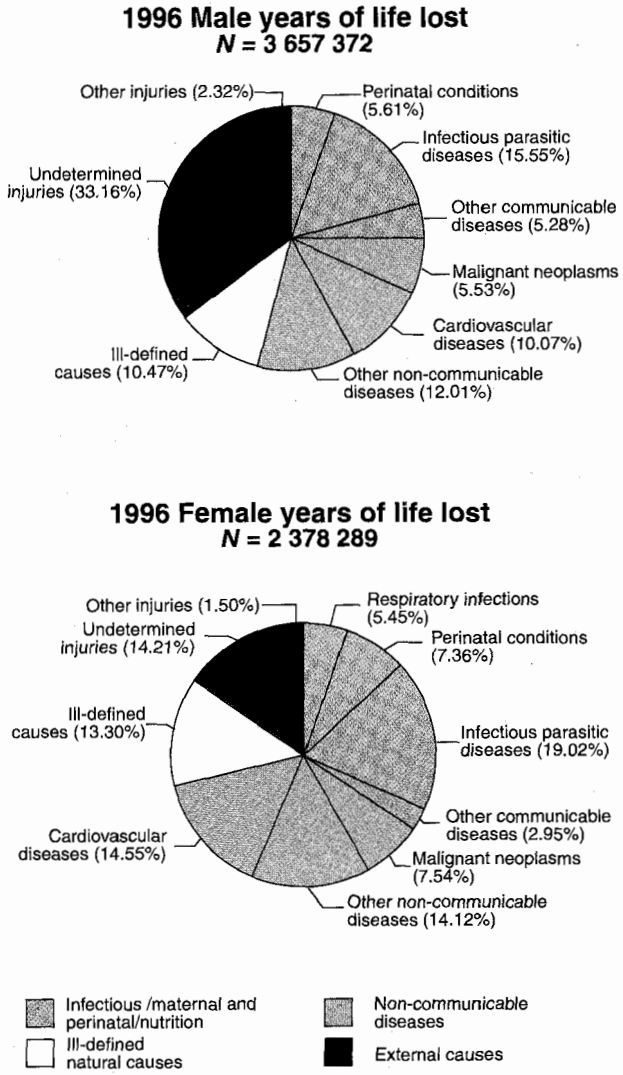

Fig. 3. Cause of years of life lost for males and females, 1996.

DATA LIMITATIONS

It is known that not all deaths are registered. Preliminary estimates by Statistics South Africa suggest that these data reflect 67% of all the deaths[3] that occurred in 1996. However, using indirect demographic techniques, Dorrington *et al.*[5] estimated that 85% of adult deaths (15 years and older) were registered and when compared with projections using the Actuarial Society of South Africa 2000 model (ASSA2000),[11] the figure for all ages is 80%. As there is greater underregistration in rural areas, this suggests a probable urban bias in the cause-of-death profile. Furthermore, there is a problem of misclassification of causes of death, with a high proportion of deaths in the ill-defined natural and undetermined unnatural categories. This lack of detailed information on the manner of injury on death notifications results from the change in the Birth and Death Act in 1992 that facilitated quicker administration of the forms.

In 1996 only 2% of registered deaths had AIDS identified as the underlying cause of death but there is underreporting of AIDS deaths. Based on the ASSA2000 model, we estimate that that over 7% of the deaths for that year were due to AIDS. Because of the stigma attached to AIDS or concerns about payment of death benefits, as well as a lack of knowledge of the HIV status of the deceased, it is likely that medical practitioners ascribe the underlying cause of death to the opportunistic infection that resulted in death, rather than to

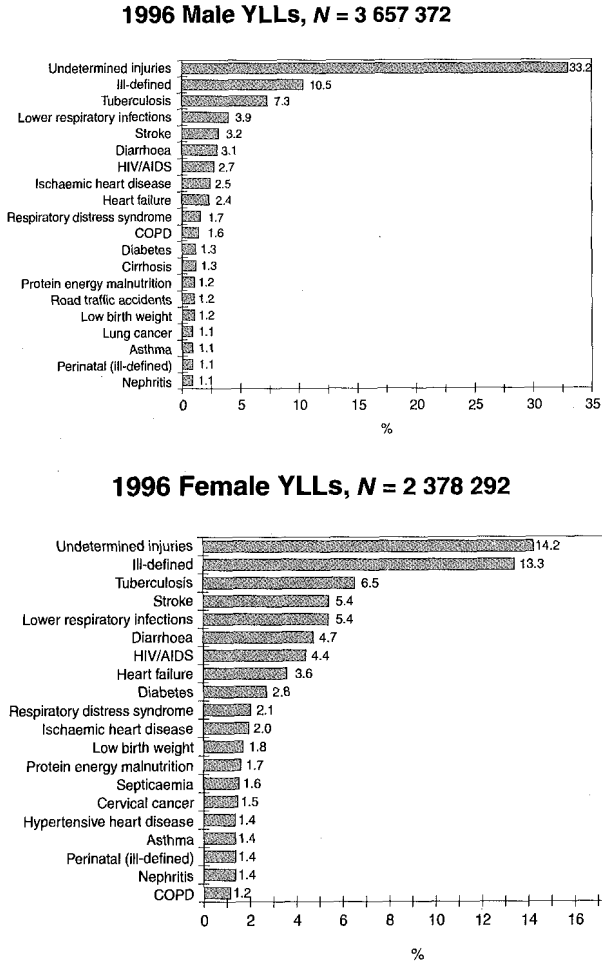

Fig. 4. Top cause of years of life lost for males and females, 1996 (COPD = chronic obstructive pulmonary disease).

AIDS. It is clear that a simplistic classification of the deaths which have HIV or AIDS recorded as a cause will grossly underestimate the impact of the epidemic.

FUTURE PROJECTIONS OF THE IMPACT OF AIDS

Models indicated that the number of deaths from the AIDS epidemic could be expected to rise from the mid-1990s.[4] This pattern has been observed empirically in the Agincourt field site[12] and also in the number of deaths obtained from the Department of Home Affairs,[5] which also showed a substantial increase in the all-cause mortality rates for young adults in recent years that can only be explained by an increase in AIDS deaths. This increase among young adults has been confirmed in official government death statistics for the period 1997 - 2000.[13]

The ASSA2000 model,[11] calibrated to the antenatal survey data[6] as well as the mortality data[5] before 2000, has been used to estimate current levels of mortality and projections to 2010. It is assumed that there is no change in behaviour and that there are no interventions, such as the use of anti-retrovirals to prevent mother-to-child transmission (MTCT) or to treat AIDS.

A summary of the projections of the main mortality indicators is provided in Table I. This shows an extraordinary change in mortality without parallel in demographic history. Period life expectancy at birth is expected to drop from the current level of 54 years in 2001 to 41 years in 2010. The total number of deaths per year is expected to increase from about 600 000 in 2001 to 1.2 million in 2010 and the proportion of deaths related to HIV will rise from one-third in 2001 to nearly two-thirds in 2010. Without significant interventions, the number of AIDS deaths can be expected to grow within the next 10 years to more than double the number of deaths due to all other causes, resulting in more than 5 million additional cumulative AIDS deaths. Child mortality levels have already nearly peaked while adult mortality is still increasing and is expected almost to double during this period. Men and women will reach similar levels of mortality even though women started from a much lower level. The increase in adult mortality will contribute to a rapid increase in the number of orphans, creating a major social burden.[14] It is critical for government, non-governmental organisations (NGOs) and society to respond to the growing number of orphans now, so as to minimise the long-term effects that could arise.[15]

SOUTH AFRICAN HEALTH TRANSITION

The change in pattern of disease as the social, economic and demographic structures of society change has been described by Omran[16,17] as the epidemiological transition. The original theory incorporated a set sequence starting with a preponderance of infectious diseases, conditions related to malnutrition and childbirth, followed by an era when chronic and degenerative diseases predominate. Frenk *et al.*,[18] based on observations of middle-income countries, modified the theory to incorporate the coexistence of both types of diseases persisting for a long time period as a result of socio-economic stratifications of society, described as a bipolar transition. The role of development and socio-economic determinants were incorporated into a broad model of the health transition.[19] In South Africa levels of fertility and mortality have been declining, with subpopulations at different stages of demographic transition.[20] The 1996 profile in South Africa shows deaths associated with poverty, such as the unacceptably high number of deaths from infectious and perinatal causes. In addition, cardiovascular disease claims very high numbers of lives, both male and female, particularly in the working age groups. Using years of life lost as a measure of mortality, the picture that emerges in 1996 is one of protracted polarised transition. In terms of the total years of life lost, the pre-transitional diseases make up 27%, with a similar proportion (28%) resulting from non-communicable diseases.

Table I. Projected impact of HIV/AIDS on mortality, ASSA2000

Indicator	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Infant mortality rate (per 1 000)	58	59	59	59	58	58	57	56	56	55
Under-5 mortality rate (per 1 000)	96	100	104	106	108	108	109	108	108	107
Adult mortality 45Q15 (%)*	44.7	49.5	54.8	60.1	65.1	69.6	73.2	75.9	77.7	78.6
Life expectancy at birth (years)	54	52	50	48	46	44	43	42	41	41
Total deaths (*N*)	587 300	658 700	739 500	826 400	914 800	998 700	1 071 800	1 128 900	1 166 800	1 185 200
HIV/AIDS deaths (*N*)	194 900	262 200	339 500	423 700	510 100	592 600	665 000	722 000	760 200	779 100
HIV/AIDS deaths (%)	33.2	39.8	45.9	51.3	55.8	59.3	62.0	63.9	65.1	65.7

*45Q15 = probability of a 15-year-old dying before the age of 60 years.

This analysis shows, however, that South Africa has an added burden due to injury, not common in a classic transition pattern, resulting in a triple burden. The extremely high number of deaths due to external causes in young adult and middle-aged men reflects poverty, unemployment and violence, as well as poor personal safety measures. These are also likely to be linked to alcohol abuse. A multisectoral approach, involving government and communities, is needed to reduce this toll.

Superimposed on this triple burden will be the devastating effects of the HIV/AIDS epidemic leading to a quadruple burden of disease, a unique phenomenon. It is estimated that already by 2001, AIDS accounted for one-third of all deaths.

South Africa needs to address, simultaneously, the backlog of malnutrition, common infections and reproduction-related conditions, while also promoting healthy lifestyles to avoid non-communicable diseases. Ongoing efforts to promote health and prevent disease need to be enhanced and new approaches to reduce injuries and chronic diseases must be developed. Urgent efforts are required to minimise the impact of AIDS. The prevention of MTCT of HIV would significantly reduce the impact on child mortality. Furthermore, even at this stage in the epidemic, effective programmes resulting in changed sexual behaviour among adolescents and adults would significantly reduce the prevalence of the disease. Efforts to promote healthy lifestyles such as the LoveLife campaign are critical and should be extended to address gender violence, general violence, smoking and alcohol abuse. Creative mechanisms need to be explored to make treatment available to people who are already infected with HIV so as to avert the huge death toll that is predicted and enable people to live longer and more productive lives.

IMPROVING DEATH STATISTICS

In this context of rising mortality and the rapidly changing cause-of-death profile, the delay in the availability of the cause-of-death data compromises its usefulness. The present health crisis makes it imperative that death data be processed more quickly as it is now of the utmost importance to monitor trends in mortality and to develop effective national health policies and interventions to improve the health of the nation. Government has responded to this, and this year initiated a project to capture rapidly a sample of the deaths for the outstanding years 1997 - 2001.

Improvements in the quality and completeness of death statistics are also needed.[21] The newly revised death notification form (BI-1603), which incorporates additional demographic and cause-of-death details was implemented nationally from September 1998.[22] Extensive training was undertaken countrywide[23] and a manual[24] on how to complete the form was made available. A sample of over 16 000 of the first of these new forms were evaluated by a technical subcommittee of the National Health Information System (NHIS/SA),[25] identifying the need for minor modification of the form and some data quality. Although it was hoped that the new death form would address problems in the data, the evaluation indicates that there are still issues that need to be addressed. Two areas that require urgent attention are details on the manner of death in the case of injuries, and the completion of socio-demographic details on the second page of the new death form. While population group was usually completed, other details such as education or occupation were often missing.

The large proportion of ill-defined causes of death currently reported is a pervasive problem in all age groups and both sexes, which makes it difficult to interpret the cause-of-death statistics. Ill-defined signs and symptoms are coded when the exact cause-of-death is not specified on the death certificate but it is definitely a natural death. This may arise when the medical practitioner does not have access to the full medical record for certification, diagnostic tests have not been done before the death and an autopsy has not been done. Medical practitioners are urged to provide more information on the cause-of-death certificate so that the large proportion of ill-

defined cause-of-deaths can be reduced. The extent of ill-defined causes is likely to increase in future years as a result of the reintroduction in 1999 of the certification of a death as natural by a traditional leader or a headman using the Death Report form (BI-1680).[26] In terms of cause-of-death statistics, the re-introduction of this process needs urgent reconsideration.

CONCLUSION

The death registration system has been improving. Despite the limitations of the data, a detailed analysis of the information does provide important insight into the health of South Africans. The overall cause-of-death pattern in 1996 reflects a triple disease burden, namely diseases related to poverty, emerging chronic diseases of lifestyle, and injuries. The AIDS epidemic has changed this to a quadruple burden.

It is important that efforts are made to release routine cause-of-death statistics more timeously. However, given the limitations of cause-of-death statistics, it is important that a full national burden of disease study be undertaken, as advocated by the World Health Organisation (WHO).[12] The aim of such a study is to collate and analyse data from various sources to derive coherent estimates of the levels of disease and cause-of-death profile, taking into account the underregistration of deaths, the lack of details on the cause of injury deaths, the relatively high proportion of ill-defined deaths and the misclassification of AIDS cases. These mortality estimates need to be accompanied by estimates of morbidity and disability to give an overall estimate of the burden of disease.

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Accepted 18 June 2002.