Impact on mortality of the AIDS epidemic in northern Namibia assessed using parish registers

Veijo Notkola, Ian M. Timæus and Harri Siiskonen

Objectives: HIV spread rapidly in Namibia in the 1990s. As in most of Africa, however, few data exist to document the impact on mortality of AIDS. Such data can contribute to knowledge of the epidemiology of HIV infection and inform the development of programmes to mitigate the impact of the AIDS epidemic.

Design: This study analyses death records from the registers of eight Evangelical Lutheran parishes in northern Namibia. The dataset covers the experience between 1980 and January 2001 of 4680 couples who married between 1956 and 2000 and their children.

Methods: We examine trends in post-neonatal and 1–4-years mortality, and the age-standardized death rates at age 20–64 years of both men and women. Poisson regression for rates is used to smooth the data and test for statistically significant discontinuities in the trend.

Results: Post-neonatal mortality increased more than sixfold and 1–4-years mortality more than threefold between 1991 and 2000. By 2000 adult mortality for women was 3.5 times, and for men 2.5 times its 1993 level. The increase in adult mortality was concentrated at ages 30–54 years for men and 25–49 years for women.

Conclusions: The pattern of mortality increase by age is consistent with the hypothesis that it is entirely due to AIDS. While not widely available, parish registers exist elsewhere in Africa and are potentially a low-cost source of data for study of the impact of AIDS on mortality and demographic trends more generally.

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Introduction

According to UNAIDS estimates, although Africa accounts for only a tenth of the world’s population, some 83% of all AIDS deaths have occurred in the region [1]. In Namibia, the explosive spread of HIV began around the time of independence on 21 March 1990 [2]. During the transition period about 45 000 exiles returned to Namibia. Some 33 000 of them eventually settled in the region of the country studied.
Several studies have documented large increases in mortality either among HIV-infected adults or in populations where HIV has become prevalent [4–7]. In Tanzania, for example, the mortality rates of HIV-infected adults were 15 times higher than those of the HIV-negative [8,9]. In Zimbabwe, age-specific death rates of the adult population rose two- to threefold between 1986 and 1997 [10]. Nevertheless, little is known about either the demographic impact of AIDS in Africa in terms of mortality by age or the background level of adult mortality at the beginning of the HIV/AIDS epidemic. Most estimates and projections of AIDS deaths in Africa are made using models to extrapolate from antenatal clinic data on HIV prevalence [11]. Better empirical data on mortality could reduce uncertainty about the correct values of the parameters of such models. In particular, it could provide a much firmer basis for assessing the severity of the epidemic among men.

This analysis of AIDS mortality in northern Namibia is based on routinely collected church records that have been shown previously to be a reliable source of deaths data [12,13]. These parish registers are a source of longitudinal surveillance data on a scale that is rare, and with a time depth that is unique, in an African context. The level and the age pattern of mortality before and after the onset of the HIV/AIDS epidemic can be analysed and compared.

**Data and methods**

The data analysed for this study consist of the parish registers of eight parishes of the Evangelical Lutheran Church in Namibia. The parishes are located in the Northwest Health region [12,13], in an area historically known as Ovamboland. About 45% of Namibia’s population live in this region. At the end of 1990, the eight parishes ranged in size from 2800 to 11 500 members [12]. The data cover 4680 couples marrying between 1956 and 2000 and their children. Follow-up extends to 31 January 2001. The family reconstitution method was used to extract mortality data from the microfilmed registers [14].

The parishes cover both economic and administrative centres and outlying areas and settlements both close to and far from the main transportation routes. During the 1990s about 80% of population of the study area were the members of the Evangelical Lutheran Church. Although no other population-based data exist on the mortality of adults in this region, the register-based estimates of child mortality up to 1990 have been validated against estimates based on survey and census data [13].

Individuals and families who migrate out of the parishes (or leave the church) are treated as censored. However, male labour migrants who spend short periods working in the south of the country remain in the population as almost all vital events occurring to them are registered. Data on 147 individuals were excluded because it was unclear when they were lost to follow up and those on another 298 individuals because their ages were unknown. This leaves 18 677 individuals with exposure in 1980 or later.

The quality of the age and age at death data in this study is unusually high for Africa as they are computed from the dates recorded in the registers rather than recalled by respondents. An exact date was recorded for 97% of the deaths since 1980 and an exact date of birth for 99% of the children. While only the year of birth is known for half the adults, their date of birth can usually be narrowed down more closely as exact dates of baptism are almost always available.

Age-specific death rates are presented for 1980–1993 and 1994–2000. There were 303 deaths of males aged between 1 month and 65 years during the first period and 176 of females. For 1994–2000 the corresponding figures are 288 and 168 (Table 1). Total follow-up time in the same age range during 1980–1993 is 78883 years for males and 83 851 years for females. During 1994–2000 follow-up time is 39 471 years for males and 43 791 years for females. Older age groups are not studied in detail as the data on them appear unreliable. No information on causes of death is available.

The trend in mortality among adults between 1980 and 2000 is measured using the directly age-standardized death rate at ages 20–64 year. The change in early-age mortality is measured using the post-neonatal and 1–4-year death rates. Neonatal mortality cannot be studied using these data as the deaths of unbaptised infants are not recorded in the registers. The statistics on post-neonatal mortality also need to be interpreted cautiously as the median age of baptism is about 3.5 months. However, this is unlikely to bias seriously our estimates of mortality trends. As about 90% of children are baptised before their first birthday, the estimates of 1–4-year mortality could only be affected trivially. Directly calculated estimates of adult and post-neonatal and 1–4-year mortality in each calendar year are presented, together with fitted estimates modelled using Poisson regression for rates to smooth the series and test whether apparent discontinuities in mortality trends are statistically significant.
Results

No evidence exists of any trend in post-neonatal mortality in northern Namibia during the 1980s (Fig. 1a). However, the death rate at 1–4 years was falling by about 9% [95% confidence interval (CI), 3–15%] each year even after one excludes the exceptionally high death rate of 1982 from the calculation of the trend. An abrupt reversal in the previous trend in mortality occurred in about 1991 when an annual 25% (CI, 10–41%) upward trend in the mortality of both infants and young children was overlain on to the previous trends (Fig. 1a). According to the smoothed trend, post-neonatal mortality rose to more than six times its initial level between 1991 and 2000 from 13 to 77 per 1000. The same period saw a tripling of the probability of dying between the first and fifth birthday ($4q_1$) from 6 to 18 per 1000.

Adult mortality rates were stagnating in northern Namibia during the 1980s with no statistically significant upward or downward trend for either men or women (Fig. 1b). Mortality at ages 20–65 years started to increase exponentially for both men and women in about 1994, that is a couple of years after infant and child mortality began to rise. Modelling of the trend in mortality by age group reveals that the reversal of the trend in men’s mortality has been restricted to those aged 30 years or more. Death rates at ages 30–49 years increased about 24% (CI, 16–33%) each year while those of men aged 50–64 years increased about 15% (CI, 6–24%) a year. The increase in women’s mortality after 1993 affects the age group 25–29 years as well as older women. The death rates increased by about 33% (CI, 21–47%) each year at ages 25–49 years and by about 15% (CI, 1–30%) a year for women aged 50–64 years.

The cumulative impact of the increase in adult mortality after 1993 has been dramatic. The fitted age-
standardized adult death rate of men in 2000 was 3.5 times higher than in 1993. Moreover, adult women’s mortality was 5.3 times higher in 2000 than in 1993.

Using the fitted death rates, one can calculate the period probability of dying between ages 15 and 60 \((45q_{15})\). This measure increased from about 220 to 550 per 1000 for men between 1993 and 2000—an absolute increase of 33%—and from about 95 to 335 per 1000 for women—an absolute increase of 24%.

The analysis of age-specific mortality in the periods before and after the onset of the increase in adult mortality also shows that mortality change has been concentrated among young children, women aged 25–49 years, and men aged 30–54 years. As a result of these changes, the age profile of mortality in the later period is extremely flat for men aged 30–64 years and women aged 25–59 years (Table 1).

**Discussion**

According to this parish register study, a dramatic increase occurred during the 1990s in the death rates of this previously low mortality population in northern Namibia. The increase in adult mortality began about 4 years after Namibia developed a generalized HIV epidemic. It has been concentrated among young adults. At early ages, infant and child mortality began to increase about 2 years before adult mortality, with mortality in the post-neonatal period increasing to six times its initial level by 2000. The largest increases in mortality have occurred in precisely those age groups in which one can place most faith in these data. If this trend was wholly or partly spurious, we would expect it to be most evident in other age groups. In fact, adolescents and older men and women are unaffected. This suggests both that it is unlikely that our findings are biased by changes in the completeness of the registers and that the entire increase in mortality in northern Namibia in the 1990s may be attributable to AIDS.

Following independence, increased immigration, the abolition of restrictions on the movement of the population and perhaps also a new sexual environment, allowed HIV to spread freely across Namibia. Knowledge about HIV/AIDS improved during the 1990s, and misconceptions about the transmission and prevention of HIV/AIDS have diminished [15, 16]. However, Namibia has still developed one of the highest rates of HIV infection in the world [17]. In part, this reflects the ineffective implementation of the first National AIDS Control Programme launched in 1990 [18]. This led to the launching of a reorganized national programme in 1999.

Reliable data on AIDS mortality in Africa are vital both for improving understanding of HIV epidemiology and as a basis for the development of effective programmes for mitigation of the impact of AIDS deaths. Few empirical data existed until recently on the mortality associated with HIV epidemics in Sub-Saharan Africa or on the age and sex distribution of those dying. More data are now emerging based on civil registration of deaths [10], surveillance of population cohorts [19], and household surveys [20]. This study reveals the value of another data source. While not widely available, parish registers exist elsewhere in Africa and are potentially a low-cost source of data for study of the impact of AIDS on mortality and demographic trends more generally.

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References