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Levels and causes of adult mortality in rural Tanzania with special reference to HIV/AIDS*

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Abstract

Data from a longitudinal study in northwest Tanzania were used to assess the levels of adult mortality and the leading causes of death. Adult mortality in this rural area was high and 42 per cent of persons aged 15 will die before their sixtieth birthday at current mortality rates. Mortality in this population with an HIV prevalence of about six per cent in 1994-95, has increased by about one-third because of HIV/AIDS, and further increase is likely. Other infectious diseases cause nearly a quarter of deaths and non-communicable diseases are still a relatively minor cause. The occurrence of the AIDS epidemic may have further delayed the onset of the epidemiological transition in many parts of Africa.

Adult health in developing countries has ranked low on the international and national agenda. In part this was due to preoccupation with high levels of child mortality, and child survival programs consumed the bulk of resources. Adults mainly benefited from efforts directed at specific disorders or conditions through programs such as those on safe motherhood or specific tropical diseases.

Demographic changes such as declining levels of child mortality and fertility have led to increasing importance of adult health (Feachem et al. 1992). Changes in disease epidemiology among adults are also taking place in many parts of the developing world and this calls for a major reorientation of health policy (Gribble and Preston 1993). Non-communicable diseases are becoming more important as a cause of adult morbidity and mortality.

In many parts of Africa demographic and epidemiological changes occur at a slower pace than in most other developing countries. A primary obstacle towards developing an effective adult health policy in sub-Saharan Africa is the extreme paucity of data on mortality levels, differentials and causes. Estimates of levels and trends, mostly based on census data,

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yield an incomplete and inaccurate picture of adult mortality in sub-Saharan Africa (Timaeus 1993). Data on causes of death among adults are limited to a few populations or hospitals.

The AIDS epidemic has contributed to the increasing interest in adult mortality; a handful of longitudinal studies in mainly eastern Africa have been initiated to assess the epidemic's causes and consequences. These efforts should lead to more and better data on adult mortality, including non-HIV-related causes of death. This study presents data from one of such efforts in northwestern Tanzania, where the HIV epidemic is now about a decade old. Data from two years of follow-up of a rural population of 20,000 are used to assess the level of mortality, causes of death, and health services utilization during terminal illnesses.

Data and methods

The study was conducted in Kisesa ward in Mwanza Region, Tanzania. The ward has a population of 20,000 and lies about 20 kilometres east of the regional capital Mwanza, along the main road to Kenya. Kisesa ward includes six villages, with about 40 per cent of its population located in a trading centre along the road. More than 90 per cent of the population are Sukuma, the largest ethnic group in Tanzania.

A demographic surveillance system forms the basis of all research activities in Kisesa. In 1994 a baseline census was carried out. All households in Kisesa ward were visited by field workers who listed all persons, and their sex, age (and birth date), schooling, and relationship to the head of the household. Follow-up visits were made every four months. At such visits data were collected on survival status, residence status, pregnancy of women of reproductive ages, and new arrivals. A new person was only listed as a household member if the household respondent had indicated that this person was intending to stay in the household. If the person had left the household by the next round he or she was not considered a resident. By mid-1996 six rounds, including the baseline census, had been completed.

If a death had occurred of a person under 60 years of age the household was visited by an assistant medical officer who interviewed relatives of the deceased or others who knew the deceased well. This interview included an open disease history and a structured questionnaire and was conducted in Swahili, the national language, or in Sukuma, the predominant local language. The questionnaire had been developed following anthropological and clinical research. A qualitative study was conducted in nearby fishing villages to describe local interpretation of illness (Washija and Pool 1996). Within Kisesa, focus-group discussions were held to find the most commonly used terms for signs and symptoms and causes of death . A detailed study of signs and symptoms in adults with HIV/AIDS compared to other illnesses had been completed in the regional referral hospital (Kalluvya et al. 1996). Clinicians of the local referral hospital and public health experts met to develop the questionnaire and algorithms for the most common causes of death.

A survey of all adults 15-44 years was conducted in Kisesa from August 1994 to July 1995. Three-quarters of all eligible adults participated in the survey which included a structured questionnaire and the collection of serum for HIV and syphilis testing (Kisesa Sero-Survey Team 1996). HIV testing was done using at least two ELISA tests, and in case of indeterminate results a Western Blot. Overall HIV prevalence among 5721 adults 15-44 in the ward was six per cent, ranging from four per cent in the five rural villages to ten per cent in the roadside village (Kisesa Sero-Survey Team 1996). Participation was poorer in the roadside village than in the rural villages. If HIV prevalence among non-participants were the same as among study participants from the same village, HIV prevalence would be 7.5 per cent in the ward.

Mortality rates were calculated using the number of deaths occurring between the baseline census and follow-up round 6, and person-years of follow-up. The calculations were

restricted to the resident population. This implied that a person had to be listed at least once as a resident. If a person moved into the Kisesa area after the last round of follow-up and died before the next round, he or she was not included in the analysis. With regard to the calculations of the person-years of observation, the time between the first and last follow-up round in which the person was listed as living in the household was taken for survivors. If a person had moved out for at least two rounds and later returned this person was considered a new resident. Mortality calculations are limited to deaths of those 15-59 years of age, in line with other studies of adult mortality in Africa (Murray, Yang and Qiao 1992; Timaeus 1993).

For the calculations of HIV-specific mortality rates those with indeterminate HIV status were excluded. The follow-up time was calculated from the date of the HIV test until the last round of observation, or in the case of a death, until the midpoint in the interval between two rounds in which the death occurred.

The data from the verbal autopsy questionnaire were analysed using a computer-based diagnosis based on predefined algorithms. For example, to make the diagnosis AIDS the following algorithm was used, based on clinical case definition from WHO (1994): two major symptoms such as at least one month of fever, diarrhoea, or weight loss; and one minor sign: persistent cough, generalized body itching, multiple body swelling as a sign of lymphadenopathy, history of herpes zoster, dysphagia or white spots in the mouth, neck-stiffness, more than five skin abscesses, recent tuberculosis. As for most deceased persons, the sero-survey was carried out after their death and HIV results were available for only 28 per cent of deaths. If HIV results were available (for most deaths the sero-survey was held after the death) these results were used to make the diagnosis. All deaths with positive HIV-antibody test were classified as HIV disease. The diagnosis AIDS was made if other symptoms occurred in addition to HIV infection, in line with the expanded case definition recommended by the World Health Organization (1994).

In addition to the algorithm-based diagnosis, two clinicians were given the disease history, as reported by the respondent, with the structured questionnaires, and made a diagnosis. The three diagnoses were put together and a final diagnosis was made if at least two of the three diagnoses were in agreement. If this was not the case, the cause of death was considered unknown. To simplify the analysis we opted for a single final diagnosis even though the clinicians used multiple causes. Only in the case of HIV/AIDS were multiple conditions recorded. In the analysis the causes were divided into communicable and reproductive causes, non-communicable causes, injuries and undetermined, following Murray et al. (1992).

Results

Mortality rates by age and sex

Table 1 presents the mortality rates for men and women 15-59 years. Overall mortality rates among men and women 15-59 years were 10.8 and 10.0 per 1000 person-years respectively. The age patterns were rather similar for both sexes. These rates can be used to estimate the probability that a man or woman aged 15 dies before his or her sixtieth birthday at current mortality rates ($_{45}Q_{15}$): 42 per cent of men and 43 per cent of women would have died before reaching the age of 60.

There were only minor differences in mortality rates 15-59 between the roadside villages and rural villages within Kisesa (9.8 and 10.6 per 1000 respectively).

Table 1
Mortality rates by age and sex, Kisesa, 1994-96.

Males			
Age	Deaths	PYO	Mortality rate
15-24	18	3156	5.7
25-34	25	2115	11.8
35-44	21	1302	16.1
45-54	14	910	15.4
55-59	3	305	9.8
All 15-59	81	7788	10.4
Females			
Age	Deaths	PYO	Mortality rate
15-24	11	2992	3.7
25-34	29	2350	12.4
35-44	16	1289	12.3
45-54	14	884	15.8
55-59	9	354	25.4
All 15-59	79	7869	10.0

Causes of death

Verbal autopsy interviews were conducted for 141 of 160 deaths (88%). The main reason for not obtaining information for all deaths was absence of the whole household or of key members of the household who were knowledgeable about events before the death. Other reasons included administrative errors (4) and refusal (2). The most common respondents were parents (29%), other relatives (18%), spouse (17%), sibling (16%), friend or neighbour (11%) or child (9%). Interviews were on average conducted 4.9 months after a death (range 2 weeks to 13 months). In addition, three deaths were included for which HIV status but no complete verbal autopsy was available. These deaths were coded as HIV disease (2), or unknown if the HIV test was negative (1).

Table 2
Causes of death among adults 15-59 years, by sex, Kisesa 1994-96

Causes of death	Men		Women		All	
	N	%	N	%	N	%
Communicable and reproductive	47	64.4	43	60.6	90	62.5
HIV/AIDS	22	30.1	28	39.4	50	34.7
Diarrhoea	7	9.6	2	2.8	9	6.3
Tuberculosis	4	5.5	2	2.8	6	4.2
Malaria	4	5.5	3	4.2	7	4.9
Other infections	10	13.7	3	4.2	13	9.0
Maternal causes	-		5	7.0	5	3.5
Non-communicable	9	12.3	10	14.1	19	13.2
Neoplasms	0	0	4	5.6	4	2.8
Endocrine	1	1.4	0	0	1	0.7
Cardiovascular	4	5.5	3	4.2	7	4.9
Respiratory	2	2.7	2	2.8	4	2.8

Digestive / urogenital	2	2.7	1	1.4	3	2.1
Injuries	6	9.2	7	9.9	13	9.0
Unintentional	4	5.5	3	4.2	7	4.9
Intentional	2	2.7	4	5.6	6	4.2
Undetermined	11	15.1	11	15.5	22	15.3
Total	73	100.0	71	100.0	144	100.0

Table 2 presents the probable causes of death for 144 deaths 15-59 years by sex. For 15 per cent of deaths no cause could be ascertained. Communicable and reproductive conditions accounted for 62.5 per cent of all deaths. HIV/AIDS mortality was associated with 35 per cent of all deaths, and was the leading cause for both sexes: 30 per cent of male and 39 per cent of female deaths. Among 50 deaths classified as HIV-associated, there were 30 deaths with clinical AIDS but no tuberculosis, 13 with HIV/AIDS and tuberculosis, and 7 deaths among HIV-positives with no clinical AIDS. These included deaths due to malaria, hepatitis, neoplasm (not cervix carcinoma or Kaposi's sarcoma), and four deaths with no other diagnosis than a positive HIV test. One death due to puerperal sepsis in an HIV-positive woman was classified as maternal death.

Other communicable disease were thought to be the cause of 24 per cent of all deaths. Tuberculosis was associated with 13.2 per cent of all deaths, and two-thirds of those deaths were in persons with HIV/AIDS. Six deaths (4.2%) were ascribed to tuberculosis without HIV infection. The most common diarrhoeal disease was dysentery which was the probable cause of 3.5 per cent of deaths. The most common 'other infections' were meningitis (3.5%) and severe anaemia (2.8 per cent). Strictly anaemia is not an infection, but in the tropics it is frequently the consequence of multiple infections, such as malaria and helminthic infections, and poor nutrition (excluding sickle cell anaemia). No deaths could be ascribed to pneumonia, except as part of clinical AIDS. All deaths with symptoms of respiratory infections of cough, and breathing difficulties, with or without fever, had either prolonged coughing (more than 4 weeks), symptoms of cardiac problems, or signs of tuberculosis, and were classified in the other categories.

Non-communicable diseases were responsible for a relatively small proportion of adult deaths (13%). The most important causes were cardiovascular diseases, neoplasm and liver problems (especially cirrhosis, 5 cases, i.e. 3.5% of all deaths). Thirteen deaths were associated with injuries (9%). Non-intentional injuries included three motor vehicle accidents. There were six homicide cases.

The distributions of causes of death were very similar for men and women. The main differences were more HIV/AIDS-associated mortality among women and more deaths from other infections among men. There were five maternal deaths, which corresponded with seven per cent of all adult female deaths. One of these deaths was due to an induced abortion. Mortality due to non-communicable causes and injuries was equally important for both sexes. Notable was the high number of deaths among women due to homicide (4), compared to two male deaths due to homicide. These women were all over 35 years and in at least three of these four cases alleged witchcraft practices of the deceased were the reason for the homicide.

Table 3
Mean age at death and mean duration of illness by cause of death and sex (standard deviation in parentheses), Kisesa 1994-96.

Cause of death	N	Age at death (years)	Duration of illness (months)	
HIV/AIDS	48	35.1 (8.6)	10.1	(8.6)
Other communicable	40	32.2 (11.6)	2.5	(4.6)

Non-communicable	19	41.8 (12.5)	9.0	(9.1)
Injuries	13	40.7 (13.4)	0.2	(0.3)
Undetermined	21	33.6 (12.6)	7.0	(8.1)
All	141	35.5 (11.4)	6.4	(8.0)

Table 3 shows the mean age at death (in years) for the five groups of causes for 141 deaths with complete verbal autopsy interviews. The overall mean age at death was 35.5 years and the differences between the causes of death were small. Deaths due to infections occurred at an earlier age than those due to non-communicable diseases (32.2 and 41.8 years respectively). The mean age of deaths due to HIV/AIDS was close to the overall mean. Analysis of age at death by sex and cause however showed a significant difference between men and women for HIV/AIDS: 38.7 and 32.6 years respectively (t=2.56 with 56 degrees of freedom; p =.014).

The mean duration of illness, as reported by the respondents, is also shown in Table 3. The mean duration of illness for all deaths was 6.4 months. Persons who died of HIV/AIDS had been sick for 10.1 months, followed by non-communicable diseases (9 months). The terminal illness for HIV-associated deaths lasted four times as long as for deaths due to other communicable and reproductive disorders.

Mortality by HIV status

Mortality rates by HIV status are presented in Table 4 for both sexes combined. There were 22 deaths among those with negative HIV test results, resulting in a mortality rate of 4.1 per thousand person-years among adults 15-44. There were also 22 deaths among HIV-positive persons, which corresponded with a mortality rate of 72.8 per thousand person-years. The age-adjusted mortality rate ratio was 14.5 (95% confidence interval 9.4-33.8). The population-attributable fraction, the proportion of deaths attributable to HIV infection among persons 15-44 years, is 47 per cent.

Table 4
Mortality rates per thousand person-years of observation (PYO) by age and HIV status, Kisesa, 1994-96

Age	HIV negative			HIV positive		
	Deaths	PYO	Mortality	Deaths	PYO	Mortality
15-24	10	2535	3.9	2	59	33.9
25-34	4	1764	2.3	13	160	81.3
35-44	8	1090	7.3	7	83	84.3
All	22	5389	4.1	22	302	72.8[a]

[a] Age adjusted rate ratio 14.5

A more detailed picture by age and sex can be obtained by using the verbal autopsy data and dividing the deaths into three groups: HIV-associated (based on HIV test and/or verbal autopsy), other conditions and unknown (Figure 1). The latter include deaths with no verbal autopsy. Among women HIV-associated mortality peaks at 25-34 years and exceeds mortality due to all other causes. Mortality due to other conditions increased gradually by age. The cause of death was unknown for a large proportion of female deaths over 45 years, making the picture in this age group unreliable. Among men, HIV-associated mortality increased by age and reached its highest level at 45-54 years. Mortality due to other

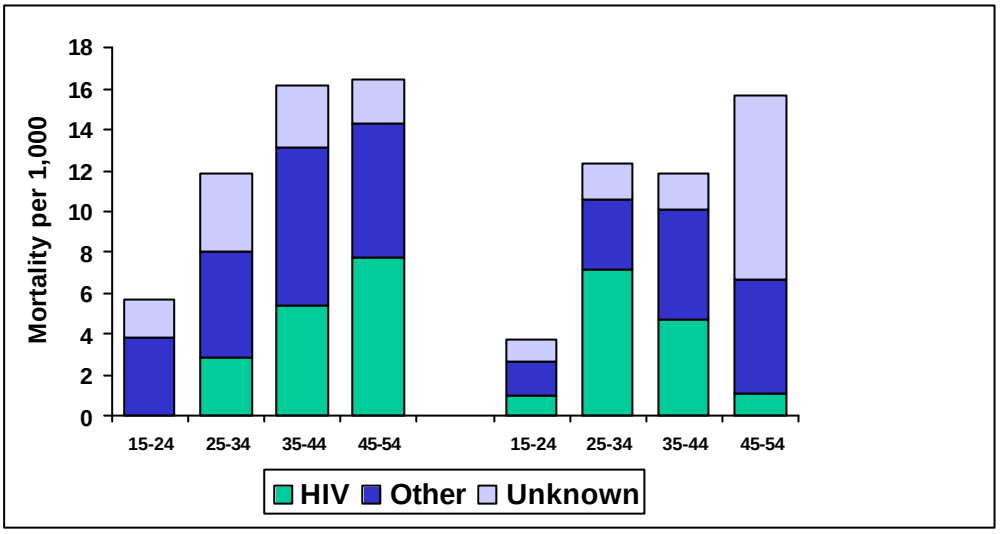
conditions and HIV-associated mortality each account for about half of the male deaths among those aged 35 years and above.

Health services utilization

During the period of terminal illness 40.4 per cent of the deceased had been admitted to a hospital. Among those who died of HIV/AIDS this proportion was 50 per cent, and this did not differ significantly from the proportion admitted among those who died of other communicable or non-communicable diseases (44.1%). There were no differences between men and women.

Utilization of traditional healers was high: 65.3 per cent of all persons who died had visited a traditional healer during the terminal illness and many had stayed for prolonged periods at the traditional healer's premises. Among those with HIV/AIDS deaths 75 per cent had used traditional healers, compared to 57.6 per cent among deaths due to other diseases. Women made more use of traditional healers than men (71.7% and 59.3% respectively for deaths due to diseases), particularly if the cause of death was HIV/AIDS: 85.7 per cent and 60 per cent visited traditional healers respectively. None of these differences however was significant at the 5 per cent level using Fisher's exact test for 2x2 tables.

Figure 1
Mortality rates per 1000 person-years by cause of death and age



During the open-ended section of the verbal autopsy interview many respondents spontaneously mentioned that the cause of death was witchcraft. This occurred more frequently for deaths due to HIV/AIDS than for other deaths (45.8% and 32.2% respectively), but this difference was not statistically significant.

Most deaths took place at home (62.4%), while 13.5 per cent of deaths took place in a health facility. This proportion was similar for deaths due to HIV/AIDS (12.5%). The remaining deaths occurred in another home (family member, traditional healer, 22.0%) or on the road (2.1%).

Discussion

In the Kisesa rural population mortality rates for those aged 15-59 years were 10.8 per thousand for men and 10 for women. This is considerably higher than the mortality estimate of 5.7 per thousand person-years 15-49 for Mwanza Region, in which Kisesa is located, derived from the 1988 national census data (World Bank 1992). Our estimates of ${}_{45}Q_{15}$ (42% for men and 43% for women) were also higher than estimates of 33 per cent for males and females derived from the 1988 census using information on recent death and orphanhood (Timaeus 1993). The Kisesa estimate for male mortality, however, is very close to the results of a follow-up study of more than 10,000 adults in 12 rural communities in Mwanza Region (11 per 1000 person-years for males 15-54), but higher than the female mortality in that study (7.6 per 1000) (Todd et al. 1997). A large study based on vital registration of deaths and annual censuses was carried out in three other locations in Tanzania during 1992-94 (Kitange et al. 1996). Adult mortality rates (15-59 years) were estimated at 8.1 and 6.1 per thousand person-years in Hai district in northern Tanzania, and 15.9 and 13.4 per thousand in rural Morogoro district in central Tanzania, for men and women respectively. In Dar es Salaam the corresponding mortality rates were 10.2 and 10.4 per thousand. Mortality data from longitudinal studies in Uganda were in the same range or higher than in Kisesa. In 15 rural villages in Masaka, southwest Uganda, mortality was 10.3 per thousand person-years among persons aged 13-54 years (Mulder et al. 1994). In a population in Rakai district, Uganda, with

HIV prevalence above 20 per cent, mortality was very high (31.9 per 1000 years of follow-up among persons 15-49) during 1990-91 (Sewankambo et al. 1994).

A problem compounding the measurement of mortality in longitudinal studies is the mobility of sick persons before death. This problem is likely to become larger because AIDS is a chronic illness and gives many sick persons sufficient time to choose a place of dying. In a study in Morogoro district, Tanzania, the homecoming sick constituted 11 per cent of all deaths, and in Hai district this proportion was even higher, 19 per cent (Kitange et al. 1996). In the Kisesa study six deaths were of people who had come home because they were sick. Another two deaths occurred among new arrivals who had been present for only one round and had died at the time of the next visit. The problem of homecoming sick in Kisesa is however not thought to affect mortality estimates or cause-of-death patterns because of the frequency of household visits (three per year) and because of the criteria used for inclusion in the study (at least one round resident and intending to stay). Another problem is the high mobility of HIV-infected persons, perhaps even before they fall sick. In Kisesa mobility was high: about ten per cent of the population moved to another household each year. Mobility among HIV-positive persons may also be higher than among HIV-negative adults. This will only cause a bias if more HIV-positives move out of the study area than into the area. Apart from the migration of the terminally ill out of Mwanza town there is no evidence of such a bias.

The high mortality among HIV-positive persons considerably increases adult mortality rates in African communities. In our study annual mortality rates among HIV-positives 15-44 years were 7.3 per cent compared to 9.3 per cent in rural Mwanza Region (15-44, Todd et al. 1997), 9.6 per cent in Masaka, Uganda (13-44 years, Mulder et al. 1994) and 10.6 per cent in Rakai, Uganda (15-49 years, Sewankambo et al. 1994). The proportion of deaths associated with HIV among persons 15-44 was 47 per cent in Kisesa, compared to 40 per cent in rural Mwanza Region (Todd et al. 1997), 85 per cent in Masaka, Uganda, where mortality among HIV-negatives was very low (Mulder et al. 1994), and 73 per cent in Rakai district, Uganda, where HIV prevalence was very high (Sewankambo et al. 1994).

Mortality rates among HIV-infected persons depend on the stage of the epidemic, as the median duration since infection in the population of infected individuals is shorter in the earlier years of the epidemic. The differences in annual HIV mortality rates between the studies may indicate that HIV-associated mortality in Kisesa may still increase further, not only because of large numbers of HIV-infected persons, but because of the relative dominance of recent infections among HIV-positives. HIV prevalence in rural Mwanza Region may have increased from about 2.5 per cent in 1990/91 to four per cent in 1992 (Grosskurth et al. 1995). Preliminary data from the repeat Kisesa sero-survey also seem to indicate that prevalence is still increasing. The number of seroconversions is higher than the number of HIV-associated deaths, as was also shown in other rural areas in Mwanza region (Todd et al. 1997). This suggests that the epidemic is still in its early stages, with HIV prevalence not yet at its peak and therefore mortality still many years removed from its peak. Simulations have indicated that mortality rates initially increase slowly, followed by a rapid increase 5-10 years into the epidemic, and stabilizing around 15-20 years after the onset of the epidemic in the general population (Gregson, Garnett and Anderson 1994).

The Kisesa cause-of-death structure can be compared with the predicted cause-of-death structures presented by Murray et al. (1992) for different levels of mortality. Even if HIV/AIDS mortality is excluded, the comparison suggests that mortality due to communicable diseases is higher than predicted in the models, particularly for diarrhoea, malaria and other infections. Non-communicable diseases in Kisesa were thus less important than in the models, even if we consider that the deaths from unknown causes may have predominantly been from non-communicable diseases. The hostile tropical environment may

contribute to the relatively high level of mortality from infectious diseases, which was also observed in other studies on causes of death in Africa (Timaeus 1993).

HIV-associated mortality was more common among women: 39 per cent of female and 30 per cent of male adult deaths. The sex difference becomes larger if the age at death is taken into account. Women died of HIV/AIDS at an earlier age than men and also than women dying of other causes. Thus, HIV-associated mortality was responsible for 47 per cent of the years of life lost between 15 and 60 years among women, while the corresponding proportion among men was 25 per cent.

Limitations and procedures for verbal autopsy among adults have been reviewed by Chandramohan et al. (1996). In our study considerable attention was paid to the development of an appropriate survey instrument, from both the anthropological and biomedical perspectives. The open-ended questions turned out to be very useful. The use of an experienced, medically-trained interviewer, knowledgeable about the local culture, was essential. During the course of the study more attention was paid to structuring and recording the medical and social history, as narrated by the respondent. This section now includes information on health services utilization, household social context, consequences of the death for the household, and expenditure during the illness.

In Masaka, Uganda, the diagnosis based on verbal autopsy was compared to HIV status for 155 deaths (Kamali et al. 1996). The results showed high specificity and positive predictive value of the verbal autopsy technique: 92 per cent. In our study such a comparison was not possible because HIV status was available for only 28 per cent of deaths. The verbal autopsy data may have led to an under- or overestimation of the proportion of deaths associated with HIV/AIDS. We have no way to assess the magnitude of such biases, but two potential biases can be described. For 14 per cent of the 50 deaths thought to be associated with HIV no clinical diagnosis of AIDS was made. Some of these deaths may have been primarily due to other causes, but we classified these deaths as HIV/AIDS. On the other hand, while among those with HIV test results in the age group15-44 years 50 per cent of deaths were HIV-associated, only 33 per cent of all deaths in this age group were attributed to HIV/AIDS based on verbal autopsy interviews and HIV data.

In Rakai, Uganda, AIDS was frequently reported as the cause of death during verbal autopsy interviews (Sewankambo et al. 1994). Almost three-quarters of the HIV-associated deaths were identified as AIDS by the respondents, while specificity was also high. Awareness of HIV/AIDS in our study population is high, but HIV prevalence and mortality are considerably lower than in the Ugandan population. Perhaps as a consequence, only eight respondents mentioned AIDS as the cause of death, either spontaneously or when prompted. In seven of these deaths the final diagnosis was AIDS. It can safely be assumed that the HIV status of the deceased was not known to the large majority of respondents as very few people in Kisesa are at present aware of their serostatus. The lack of reporting of AIDS as a cause of death may simply be due to lack of recognition of the symptoms: in 1994-95 64 per cent of respondents 15-44 years said they did not know anyone who had AIDS or had died of AIDS (Kisesa Sero-Survey Team 1996). Alternatively, there may be reluctance to recognize or report AIDS, as it still is a highly stigmatizing condition. Finally, witchcraft plays a very important role in the explanatory models of disease and death of this population. In this study this was evidenced by the high proportion of deaths attributed to witchcraft, the high level of use of traditional healers and the homicide of three older women who were suspected of witchcraft. Anthropological studies have also shown the importance of local belief systems (Washija and Pool 1996).

In sum, adult mortality in this rural area is high and 42 per cent of persons aged 15 will die before their sixtieth birthday at current mortality rates. Mortality in Kisesa, with an HIV prevalence of about six per cent in 1994-95, has increased by about one-third owing to

HIV/AIDS, and further increase is likely. Other infectious diseases cause nearly a quarter of deaths and non-communicable diseases are still a relatively minor cause. The occurrence of the AIDS epidemic may have further delayed the onset of the epidemiological transition in many parts of Africa.

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