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Data collected in the 2001-2002 ZDHS on the survivorship of respondents' siblings allows for the estimation of adult mortality. This information is useful in assessing the impact of the AIDS epidemic on survivorship of adults in Zambia. The inclusion of questions to determine if the deaths of female siblings were maternity-related also permits the estimation of the level of maternal mortality, a major indicator of maternal health and well-being.

## 15.1 ADULT MORTALITY DATA

### 15.1.1 Data Collection Procedures

Women in the 2001-2002 ZDHS were asked about the survivorship of all live births of their natural mother (i.e., their siblings). To obtain these data, each female respondent was first asked to give the total number of her mother's live births. Then she was asked to provide a list of the children born to her mother starting with the first-born. For each sibling named, information was obtained on whether the sibling was still alive at the survey date. For living siblings, current age was collected; for deceased siblings, age at death and years since death were collected. Interviewers were instructed that when a respondent could not provide precise information on age at death or years since death, approximate answers were acceptable. For sisters who died at age 12 or older, three questions were used to determine if the death was maternity-related: "*Was [NAME OF SISTER] pregnant when she died?*" and if negative, "*Did she die during childbirth?*" and if negative, "*Did she die within six weeks of the birth of a child or pregnancy termination?*"

The direct approach to estimating adult and maternal mortality maximises use of these data for estimating adult mortality. The number of person-years of exposure to mortality risk for all siblings and the number of sibling deaths is aggregated for defined calendar periods. Rates of maternal (and adult) mortality are obtained for the calendar periods by dividing maternal (or all female and male adult) deaths by person-years of exposure (Rutenberg and Sullivan, 1991).

### 15.1.2 Data Quality Assessment

Estimation of adult and maternal mortality requires reasonably accurate reporting of the number of sisters and brothers that the respondent ever had, the number who have died, and the number of sisters who have died of maternity-related causes. There is no definitive procedure for establishing the completeness or accuracy of retrospective data on sibling survivorship. However, Table 15.1 looks at several indicators relevant to the quality of sibling survivorship data including the sex ratio of the siblings reported by respondents and the completeness of the data on siblings' survival status (i.e., current age, age at death, and years since death).

The sex ratio of enumerated siblings (the ratio of brothers to sisters) is 1.01, only slightly lower than the expected value of 1.02 or 1.03 (see Table 15.1). Respondents were knowledgeable about their siblings' survival status, with only 9 out of over 50,000 siblings missing this information. Ages were missing for only a few living siblings (0.1 percent). In the case of deceased siblings, complete reporting of age at death and years since death were also nearly universal; almost all (>99 percent) of deceased

Table 15.1 Completeness of reporting on siblings						
Number of siblings reported by female survey respondents and completeness of reported data on sibling age, age at death (AD) and years since death (YSD), Zambia 2001-2002						
Survival status of siblings and completeness of reporting	Sisters		Brothers		All siblings	
	Number	Percentage	Number	Percentage	Number	Percentage
<b>All siblings</b>	23,721	100.0	24,035	100.0	47,755	100.0
Living	18,955	79.9	18,938	78.8	37,893	79.3
Dead	4,761	20.1	5,093	21.2	9,853	20.6
Status missing	5	0.0	4	0.0	9	0.0
<b>Living siblings</b>	18,955	100.0	18,938	100.0	37,893	100.0
Age reported	18,939	99.9	18,912	99.9	37,850	99.9
Age missing	17	0.1	26	0.1	43	0.1
<b>Dead siblings</b>	4,761	100.0	5,093	100.0	9,853	100.0
AD and YSD reported	4,721	99.2	5,046	99.1	9,767	99.1
AD missing	28	0.6	36	0.7	64	0.7
YSD missing	4	0.1	2	0.0	6	0.1
AD and YSD missing	7	0.1	9	0.2	16	0.2

siblings have both age at death and years since death reported. Rather than exclude the small number of siblings with missing data from further analysis, information on the birth order of siblings in conjunction with other information was used to impute the missing data.<sup>1</sup> The sibling survivorship data, including cases with imputed values, were used in the direct estimation of adult and maternal mortality.

## 15.2 DIRECT ESTIMATES OF ADULT MORTALITY

### 15.2.1 Levels and Trends in Adult Mortality

Table 15.2 presents the age-specific rates of female and male mortality (15-49 years) for the five-year period before the 2001-2002 ZDHS. This period was chosen in order to allow an assessment of the level of adult mortality during the period following the 1996 ZDHS. The centre of the reference period for the estimates is the calendar year 1999. To allow an assessment of adult mortality trends over roughly the past decade in Zambia, estimates from the 1996 ZDHS are presented in the final column of the table; these estimates refer to a five-year period before the 1996 ZDHS, a period centered on 1995.

The results in Table 15.2 indicate that, the adult mortality rate over the age range 15-49 years was 14.3 deaths per 1,000 for the five-year period prior to the 2001-2002 ZDHS. The rate was somewhat higher among women than men (14.8 deaths per 1,000 versus 13.9 per 1,000, respectively).

<sup>1</sup> The imputation procedure is based on the assumption that the reported birth ordering of siblings in the history is correct. The first step is to calculate birth dates. For each living sibling with a reported age and each deceased sibling with complete information on both age at death and years since death, the birth date was calculated. For a sibling missing these data, a birth date was imputed within the range defined by the birth dates of the bracketing siblings. In the case of living siblings, an age was then calculated from the imputed birth date. In the case of deceased siblings, if either the age at death or years since death were reported, that information was combined with the birth date to produce the missing information. If both pieces of information were missing, the distribution of the ages at death for siblings for whom the years since death were unreported, but age at death was reported, was used as a basis for imputing the age at death.

Table 15.2 Adult mortality rates

Direct estimates of age-specific mortality rates for men and women age 15-49 for the period 0-4 years preceding the 2001-2002 ZDHS and the 1996 ZDHS

Age	2001-2002 ZDHS			1996 ZDHS
	Deaths	Exposure (person-years)	Mortality rate <sup>1</sup>	mortality rate <sup>1</sup>
WOMEN				
15-19	66	14,695	4.5	4.3
20-24	167	16,230	10.3	9.0
25-29	253	14,187	17.8	15.8
30-34	241	11,043	21.9	16.9
35-39	193	7,656	25.3	18.2
40-44	107	4,690	22.9	15.9
45-49	54	2,765	19.6	15.4
15-49	1,082	71,265	14.8 <sup>a</sup>	11.7 <sup>a</sup>
MEN				
15-19	57	14,207	4.0	3.6
20-24	99	16,436	6.0	6.0
25-29	174	15,194	11.5	12.9
30-34	251	11,057	22.7	19.5
35-39	228	7,779	29.3	25.5
40-44	137	4,642	29.5	26.6
45-49	60	2,563	23.6	25.9
15-49	1,007	71,877	13.9 <sup>a</sup>	12.9 <sup>a</sup>
TOTAL				
15-19	123	28,902	4.3	4.0
20-24	266	32,666	8.1	7.5
25-29	427	29,381	14.5	14.3
30-34	493	22,100	22.3	18.2
35-39	421	15,434	27.3	21.8
40-44	244	9,332	26.2	20.9
45-49	115	5,327	21.5	20.5
15-49	2,089	143,142	14.3 <sup>a</sup>	12.2 <sup>a</sup>

<sup>1</sup> Expressed per 1,000 person-years of exposure

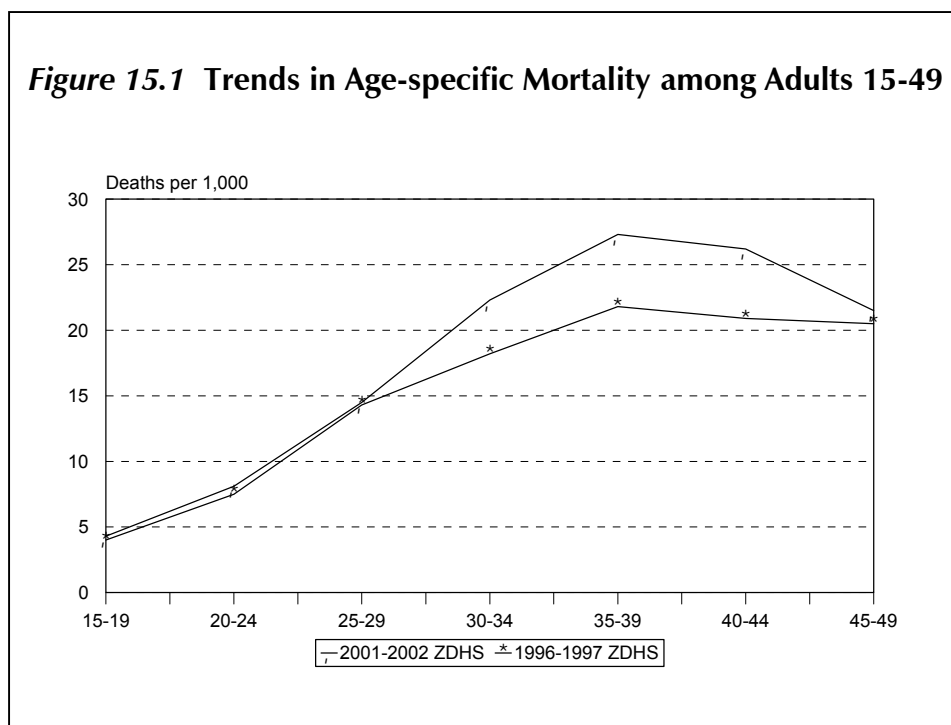
<sup>a</sup> Age-adjusted rates

For both women and men, mortality rates rise rapidly with age. The rise is steeper for women than for men in the younger age ranges; however, levels are higher for men than for women at older ages. Both patterns are consistent with the gender differences in the age patterns of HIV infection described in the previous chapters (i.e., infection levels are higher for women than men at younger ages and higher for men than women at older ages).

Comparison of adult mortality estimates from the 2001-2002 ZDHS with those from in the 1996 ZDHS suggests that mortality rates for all adults 15-49 rose by more than 15 percent during the period between the two surveys.<sup>2</sup> As Figure 15.1 shows, most of the increased mortality was due to higher mortality among women and men age 25 and over.

<sup>2</sup> The adult mortality estimates presented here are for a five-year reference period preceding the 1996 and 2001-2002 surveys. The decision to employ this reference period was made to avoid any overlap of the time periods to which the estimates pertain. An earlier publication of estimates of adult mortality based on data from the 1996 survey was for the seven-year period preceding that survey (1996 ZDHS). The overall adult mortality estimates based on a seven-year period preceding both the 1996 and the 2001-2002 surveys are 10.9 and 14.1 per 1,000, which implies an increase in the mortality level of about 25 percent (similar results pertain to male and female adult mortality estimates). Thus, basing the analysis on the reference period used for earlier published results does not change the conclusion that adult mortality in Zambia has increased sharply over the past decade.

**Figure 15.1 Trends in Age-specific Mortality among Adults 15-49**



### 15.2.2 Differentials in Adult Mortality Levels

Table 15.3 presents differentials in adult mortality by residence and province for the 2001-2002 ZDHS respondents. In interpreting these differentials, it is important to remember that, for some subgroups, the numbers of deaths are small (particularly when gender is taken into account). Also of concern in interpreting the results is that the characteristic referred to relates to the status of the 2001-2002 ZDHS respondent who provided the information and not to the status of the sibling(s) who died. To the extent that respondents differ in a consistent direction from their siblings in the characteristics shown, the rates will be biased. For example, if respondents are more likely to have migrated from rural to urban areas than their siblings, the urban-rural rates will not accurately reflect the actual mortality differentials between urban and rural areas in Zambia. It is, however, likely that there is considerable consistency among siblings in the characteristics shown.

Characteristic	Women	Men	Total
<b>Residence</b>			
Urban	16.9	15.7	16.2
Rural	10.1	10.8	10.4
<b>Province</b>			
Lusaka/Copperbelt/South	17.4	15.1	16.2
West/East/Central	13.0	13.3	13.1
North/North-west/Luapula	12.0	12.5	12.2
Total	14.8	13.9	14.3

Note: All rates are age-adjusted.

While again not definitive, the results in Table 15.3 indicate that adult mortality levels are around 25 percent higher in urban than rural areas in Zambia. The provinces in Table 15.3 have been categorised into three groups according to HIV prevalence (see Chapter 14); Lusaka, Copperbelt, and Southern provinces have the highest HIV rates, and Northern, North-Western, and Luapula have the lowest infection rates. The patterns of adult mortality shown in Table 15.3 parallel the patterns of HIV prevalence; adult mortality is nearly 60 percent higher in Lusaka, Copperbelt, and Southern provinces than in Northern, North-Western, and Luapula provinces.

### 15.3 ESTIMATES OF MATERNAL MORTALITY

Data collected on the reported survivorship of sisters was used to derive direct estimates of maternal mortality (Table 15.4). The number of female deaths occurring during pregnancy, at delivery, or within six weeks of delivery is not large. As a result, maternal mortality estimates are typically subject to larger sampling errors than adult mortality estimates. Therefore, reflecting standard DHS procedures, the maternal mortality estimates shown in Table 15.4 are calculated for a seven-year period before the survey rather than the five-year period that was used to calculate adult mortality. This seven-year period centres on 1998.

Based on the 2001-2002 ZDHS data, the rate of mortality associated with pregnancy and childbearing is 1.44 per thousand. Except for the 40-44 group, the age-specific rates shown in Table 15.4 exhibit a plausible pattern, being higher at the peak childbearing ages of the twenties and thirties than at younger and older age groups.

The maternal mortality rate can be converted to a maternal mortality ratio and expressed per 100,000 live births by dividing the rate by the general fertility rate of 0.198, which prevailed during the same time period. In this way, the obstetrical risk of pregnancy and childbearing is underlined. Using this procedure, the maternal mortality ratio during the seven-year period prior to the 2001-2002 ZDHS is estimated as 729 maternal deaths per 100,000 live births.

Estimates of maternal mortality from the 2001-2002 ZDHS can be compared with estimates from the 1996 ZDHS (also shown in Table 15.4) to obtain insight into the probable trend of maternal mortality levels during the 1990s. The comparison suggests that maternal mortality levels remained moderately high in Zambia throughout the period between the two surveys, and may even have been rising slightly toward the end of the decade. This is consistent with the general pattern of rising adult female mortality described earlier. However, it is important to recognize that the small numbers of maternal deaths reported in the surveys make it difficult to assess with any statistical confidence whether the magnitude and direction of the indicated changes accurately reflect trends in maternal mortality in Zambia over the decade.

Table 15.4 Direct estimates of maternal mortality

Age	2001-2002 ZDHS		Mortality rate <sup>1</sup>	1996 ZDHS mortality rate <sup>1</sup>
	Deaths	Exposure (woman-years)		
15-19	16.4	21,291	0.77	0.75
20-24	29.6	22,600	1.27	1.40
25-29	51.0	19,360	2.64	2.14
30-34	27.7	14,772	1.81	1.96
35-39	12.7	10,036	1.16	1.46
40-44	12.3	6,077	2.04	0.50
45-49	0.4	3,492	0.12	0.82
15-49	147	97,629	1.44 <sup>a</sup>	1.34 <sup>a</sup>
General fertility rate			0.198 <sup>a</sup>	0.206 <sup>a</sup>
Maternal mortality ratio <sup>2</sup>			729	649

<sup>1</sup>Expressed per 1,000 woman-years of exposure

<sup>2</sup>Calculated as the maternal mortality rate divided by the general fertility rate and expressed per 100,000 live-births

<sup>a</sup>Age-adjusted rates