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In an earlier chapter of this report, estimates of mortality during the first years of life were presented and discussed. Early childhood mortality varies substantially as an index of social and economic development and thus tends to be predictably high in disadvantaged settings. Mortality during later childhood and adolescence is, on the other hand, relatively low in all societies but begins to rise with age starting in the late teenage years. The pattern and pace of the rise in adult mortality with increasing age is tied closely to the occupational profile, fertility pattern, and epidemiological characteristics of a population. Two aspects of adult mortality dynamics deserve close attention. First, given sharp rises in the prevalence of HIV infection and AIDS (discussed in the previous chapter) over the last 20 years, Malawi is expected to suffer increases in both female and male adult mortality in the near term. Second, mortality related to pregnancy and childbearing (maternal mortality) serves as an important indicator to monitor women's and reproductive health programmes in the country.

In the 2000 Malawi Demographic and Health Survey (MDHS), data were collected on adult and maternal mortality. Similar data were collected in the 2004 MDHS, allowing estimation of adult and maternal mortality using a direct estimation procedure. The basis for the calculation of the mortality rates is the survivorship of all live births to the respondent's natural mother (i.e., the respondent's brothers and sisters). The direct approach to estimating adult and maternal mortality maximise use of the available data, including information on the age of surviving siblings, the age at death of siblings who died, and the number of years ago the sibling died. The data are aggregated for determining the number of person-years of exposure to mortality risk and the number of sibling deaths occurring in defined calendar periods. Rates of maternal and adult mortality are obtained by dividing maternal (or all female or male adult) deaths by person-years of exposure (Rutenberg and Sullivan, 1991). The procedure calculates rates in each of the five-year age groups, then aggregates the estimates for the whole age 15-49 range, weighting the age-specific estimates using the observed age structure of the female population.

## 13.1 DATA

Each female respondent in the 2004 MDHS was first asked to give the total number of her mother's live births. Then she was asked to report how many siblings were born ahead of her. Then, she was asked to provide a list of the children born to her mother, starting with the first born and including whether or not each 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 to accept approximate answers when a respondent could not provide precise information on ages or years ago. For sisters who died at age 10 years 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 estimation of adult and maternal mortality requires reasonably accurate reporting of the number of sisters and brothers the respondent ever had, the number who died, and (for maternal mortality) the number of sisters who died of maternity-related causes. Table 13.1 shows the number of siblings reported by the respondents and the completeness of the reported data on current age, age at death, and years since death.

The sex ratio of respondents' siblings (the ratio of brothers to sisters) is 1.01, which is slightly lower than the expected value of 1.02 or 1.03. MDHS respondents are highly knowledgeable about the survival status of their brothers and sisters, with only 16 out of 62,733 siblings missing this information. They also tend to know the ages of their surviving siblings, with only 0.2 percent of siblings missing this information. Respondents are also able to report the age at death or years since death for their deceased siblings: 98 percent of deceased siblings have both age at death and years since death reported and less than 2 percent are missing years since death or age at death or both. Rather than exclude the 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.

| Sibling status and completeness of reporting | Sisters |         | Brothers |         | Total  |         |
|----------------------------------------------|---------|---------|----------|---------|--------|---------|
|                                              | Number  | Percent | Number   | Percent | Number | Percent |
| <b>All siblings</b>                          | 31,195  | 100.0   | 31,538   | 100.0   | 62,733 | 100.0   |
| Surviving                                    | 24,256  | 77.8    | 24,429   | 77.5    | 48,686 | 77.6    |
| Deceased                                     | 6,932   | 22.2    | 7,099    | 22.5    | 14,031 | 22.4    |
| Missing information                          | 6       | 0.0     | 10       | 0.0     | 16     | 0.0     |
| <b>Living siblings</b>                       | 24,256  | 100.0   | 24,429   | 100.0   | 48,686 | 100.0   |
| Age reported                                 | 24,217  | 99.8    | 24,366   | 99.7    | 48,583 | 99.8    |
| Age missing                                  | 39      | 0.2     | 64       | 0.3     | 103    | 0.2     |
| <b>Dead siblings</b>                         | 6,932   | 100.0   | 7,099    | 100.0   | 14,031 | 100.0   |
| AD and YSD reported                          | 6,817   | 98.3    | 6,959    | 98.0    | 13,777 | 98.2    |
| Missing only AD                              | 57      | 0.8     | 44       | 0.6     | 101    | 0.7     |
| Missing only YSD                             | 23      | 0.3     | 28       | 0.4     | 50     | 0.4     |
| Missing both                                 | 36      | 0.5     | 67       | 0.9     | 103    | 0.7     |

AD = Age at death  
YSD = Years since death

<sup>1</sup> The imputation procedure is based on the assumption that the reported birth order of siblings in the history is correct. The first step is to calculate birth dates. For each living sibling with a reported age and for each dead 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 dead siblings, if either the age at death or years since death was 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 age at death for siblings for whom years since death was unreported, but age at death was reported, was used as a basis for imputing the age at death.

## 13.2 DIRECT ESTIMATES OF ADULT MORTALITY

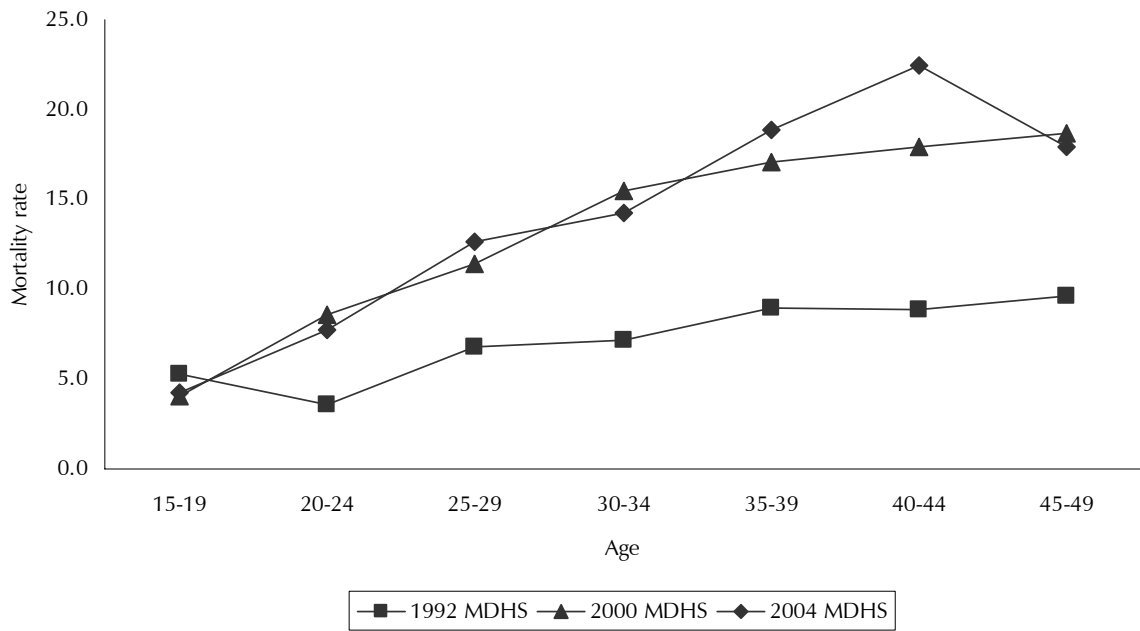
Another way to assess the quality of data used to estimate maternal mortality is to evaluate the plausibility of the adult mortality rates obtained. If the overall adult mortality rates display a generally stable, plausible pattern, it lends credence to the maternal mortality estimates. This is because maternal mortality is a subset of adult mortality.

Table 13.2 shows age-specific mortality rates for men and women age 15-49, for the calendar period 0-6 years before the survey, such as the 7-year period before the interview, which roughly corresponds to 1998-2004. Age-specific death rates are computed by dividing the number of deaths in each age group by the total person-months of exposure in that age group during a specified reference period. Since the number of deaths on which the rates are based is not large (in the 2004 MDHS they are 1,376 female and 1,193 male deaths), the age-specific rates are subject to large sampling variation. Also shown are identically calculated estimates drawn from the 1992 MDHS and the 2000 MDHS, for the same period before those surveys. The reference periods for the earlier surveys is 1986-1992 and 1994-2000, respectively. The centre of the reference period of the estimates from the three surveys are early 1989, early 1997, and mid-2001, respectively.

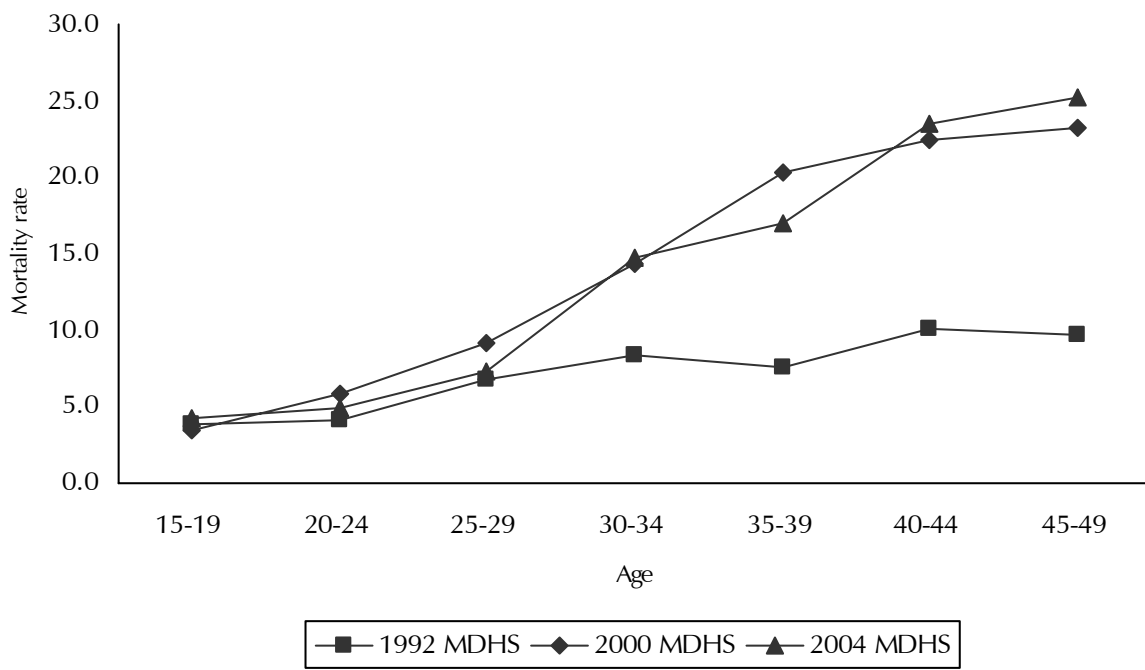
| Table 13.2 Adult mortality rates                                                                                                             |           |                         |                     |                     |                     |
|----------------------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|---------------------|---------------------|---------------------|
| Direct estimates of age-specific mortality rates for women and men age 15-49, for the periods 0-6 years prior to the 2004 MDHS and 2000 MDHS |           |                         |                     |                     |                     |
| Age                                                                                                                                          | 2004 MDHS |                         |                     | 2000 MDHS           | 1992 MDHS           |
|                                                                                                                                              | Deaths    | Exposure (person years) | Mortality rate/1000 | Mortality rate/1000 | Mortality rate/1000 |
| WOMEN                                                                                                                                        |           |                         |                     |                     |                     |
| 15-19                                                                                                                                        | 117       | 27,622                  | 4.2                 | 4.1                 | 5.3                 |
| 20-24                                                                                                                                        | 227       | 29,331                  | 7.7                 | 8.6                 | 3.6                 |
| 25-29                                                                                                                                        | 299       | 23,763                  | 12.6                | 11.4                | 6.8                 |
| 30-34                                                                                                                                        | 245       | 17,228                  | 14.2                | 15.5                | 7.2                 |
| 35-39                                                                                                                                        | 230       | 12,206                  | 18.9                | 17.1                | 9.0                 |
| 40-44                                                                                                                                        | 177       | 7,892                   | 22.5                | 17.9                | 8.9                 |
| 45-49                                                                                                                                        | 82        | 4,574                   | 17.9                | 18.7                | 9.6                 |
| 15-49                                                                                                                                        | 1,376     | 122,616                 | 11.6                | 11.3                | 6.5                 |
| MEN                                                                                                                                          |           |                         |                     |                     |                     |
| 15-19                                                                                                                                        | 118       | 27,675                  | 4.2                 | 3.4                 | 3.8                 |
| 20-24                                                                                                                                        | 143       | 28,966                  | 4.9                 | 5.9                 | 4.1                 |
| 25-29                                                                                                                                        | 178       | 24,514                  | 7.3                 | 9.1                 | 6.8                 |
| 30-34                                                                                                                                        | 258       | 17,404                  | 14.8                | 14.4                | 8.4                 |
| 35-39                                                                                                                                        | 204       | 11,992                  | 17.0                | 20.3                | 7.6                 |
| 40-44                                                                                                                                        | 178       | 7,579                   | 23.5                | 22.5                | 10.1                |
| 45-49                                                                                                                                        | 115       | 4,560                   | 25.2                | 23.2                | 9.7                 |
| 15-49                                                                                                                                        | 1,193     | 122,690                 | 10.5                | 11.1                | 6.3                 |

Data in Table 13.2 show that there was an increase in adult mortality from early 1989 to early 1997. However, mortality for both women and men has remained at the same levels since 1997 (Figure 13.1 and Figure 13.2).

**Figure 13.1 Trends in Age-specific Mortality among Women Age 15-49**



**Figure 13.2 Trends in Age-specific Mortality among Men Age 15-49**



### 13.3 MATERNAL MORTALITY

Maternal deaths are defined as any death that occurred during pregnancy, childbirth, or within two months after the birth or termination of a pregnancy.<sup>2</sup> Estimates of maternal mortality are therefore based solely on the timing of the death in relationship with pregnancy and childbearing.

Two survey methods are generally used to estimate maternal mortality in developing countries: the sisterhood method (Graham et al., 1989) and a direct variant of the sisterhood method (Rutenberg and Sullivan, 1991). The approach used to obtain the maternal mortality results in this report is the same as that used to obtain overall adult mortality. Age-specific mortality rates are calculated by dividing the number of maternal deaths by woman-years of exposure. The number of maternal deaths (240) is small, so age-specific rates are subject to very large sampling errors and should be interpreted with caution. The preferred approach is to calculate one estimate for all childbearing ages (15-49 years).

To remove the effect of truncation bias in the upper age limit (the upper boundary for eligibility for individual interview for women in the MDHS is 49 years), the overall rate for women age 15-49 is standardized by the age distribution of the survey respondents. Direct age-specific estimates of maternal mortality from the reported sibling survivorship histories are shown in Table 13.3 for the period 0-6 years before the survey, alongside estimates based on the 1992 MDHS and the 2000 MDHS data for the period 0-6 years before that survey. The proportion of all female deaths that are maternity-related in the 7-year period prior to 2004 (approximately 1998-2004) is 17 percent. This proportion is lower than that recorded in the 1992 MDHS (21 percent) and the

| Table 13.3 Direct estimates of maternal mortality                                                                               |           |                         |                     |                     |                     |
|---------------------------------------------------------------------------------------------------------------------------------|-----------|-------------------------|---------------------|---------------------|---------------------|
| Direct estimates of maternal mortality rates and the maternal mortality ratio, for the periods 0-6 years prior to the 2004 MDHS |           |                         |                     |                     |                     |
| Age group                                                                                                                       | 2004 MDHS |                         |                     | 2000 MDHS           | 1992 MDHS           |
|                                                                                                                                 | Deaths    | Exposure (person years) | Mortality rate/1000 | Mortality rate/1000 | Mortality rate/1000 |
| 15-19                                                                                                                           | 8         | 27,622                  | 0.3                 | 0.4                 | 1.3                 |
| 20-24                                                                                                                           | 52        | 29,331                  | 1.8                 | 2.4                 | 0.5                 |
| 25-29                                                                                                                           | 64        | 23,763                  | 2.7                 | 2.7                 | 1.5                 |
| 30-34                                                                                                                           | 50        | 17,228                  | 2.9                 | 3.7                 | 1.8                 |
| 35-39                                                                                                                           | 33        | 12,206                  | 2.7                 | 2.9                 | 1.9                 |
| 40-44                                                                                                                           | 22        | 7,892                   | 2.8                 | 4.5                 | 0.8                 |
| 45-49                                                                                                                           | 12        | 4,574                   | 2.7                 | 1.9                 | 3.4                 |
| 15-49                                                                                                                           | 240       | 122,616                 | 2.0                 | 2.4                 | 1.4                 |
| General fertility rate (GFR)                                                                                                    |           |                         | 0.204               | 0.210               | 0.220               |
| Maternal mortality ratio (MMR) <sup>1</sup>                                                                                     |           |                         | 984                 | 1,120               | 620                 |

<sup>1</sup> Per 100,000 live births, calculated as the maternal mortality rate divided by the general fertility rate.

<sup>2</sup> This time-dependent definition includes all deaths that occurred during pregnancy and two months after pregnancy, even if the death was due to nonmaternal causes. However, this definition is unlikely to result in overreporting of maternal deaths because most deaths to women during the two-month period are due to maternal causes. And maternal deaths are more likely to be underreported than overreported.

2000 MDHS (22 percent).<sup>3</sup> At face value, this means that maternal mortality changes at a slightly faster pace than nonmaternal mortality.

The maternal mortality rate is converted to a maternal mortality ratio (MMR) and expressed per 100,000 live births by dividing the rate by the general fertility rate (0.204) associated with the same period. In this way, the obstetrical risk of pregnancy and childbearing is underlined. Using direct estimation procedures based on the 2004 MDHS survey, the maternal mortality ratio is estimated to be 984 maternal deaths per 100,000 live births applicable to the seven-year period before the survey (centred in mid-2001). As in the case of adult mortality, the MMR based on the 2000 MDHS is significantly higher than that calculated from the 1992 MDHS. However, the estimated MMR based on the 2004 MDHS data is lower than the rate from the 2000 MDHS survey of 1,120 maternal deaths per 100,000 live births. It is unlikely that maternal mortality has gone up and then down again so dramatically, especially since the reference periods for the estimates overlap each other. Maternal mortality ratios measured in this way are subject to very high sampling errors and cannot adequately indicate trends over the short term.

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<sup>3</sup> These proportionate maternal mortality estimates are in the range of those presented by Stanton et al. (1997) in their exhaustive review of similar data collected around the world.