EARLY CHILDHOOD MORTALITY 8

This chapter presents information on levels, trends, and differentials in neonatal, infant, and child mortality. This information is important to both the demographic assessment of the population and the evaluation of health policies and programmes. Estimates of infant and child mortality may be used as inputs into population projections, particularly if the level of adult mortality is known from another source or can be inferred with reasonable confidence. Information on mortality of children also serves the needs of agencies providing health services by identifying subgroups of the population that are at high risk of mortality.

8.1 BACKGROUND AND ASSESSMENT OF DATA QUALITY

The rates of childhood mortality presented in this chapter are defined as follows:

- **Neonatal mortality:** the probability of dying within the first month of life
- **Postneonatal mortality:** the arithmetic difference between infant and neonatal mortality
- **Infant mortality:** the probability of dying between birth and the first birthday
- **Child mortality:** the probability of dying between the exact age one and the fifth birthday
- **Under-five mortality:** the probability of dying between birth and the fifth birthday.

All rates are expressed as deaths per 1,000 live births, except child mortality, which is expressed as deaths per 1,000 children surviving to the first birthday.

Information drawn from the questions asked in the birth history section of the Women's Questionnaire is used to calculate the mortality rates presented in this chapter. First, the respondents were asked a series of questions about their childbearing experience. In particular, they were asked to report the number of sons and daughters who live with them, the number who live elsewhere, and the number who died. In the birth history, for each live birth, information was collected on sex, month, and year of birth; survivorship status and current age; and age at death if the child died.

The quality of mortality estimates calculated from retrospective birth histories depends on the mother's ability to recall all of the children she had given birth to, as well as their birth dates and age at death. The most potentially serious data quality problem is the selective omission from the birth histories of births that did not survive. If the problem of omission is serious, it can result in an overall underestimation of the level of childhood mortality. When selective omission of childhood deaths occurs, it is usually more severe for deaths occurring early in infancy. Generally, if there is substantial underreporting of deaths, the result is an abnormally low ratio of early neonatal deaths (deaths within the first week of life) to all neonatal deaths, and an abnormally low ratio of neonatal deaths to infant deaths.

Appendix Table C.4 shows that the proportion of all neonatal deaths that took place within the first seven days of birth was 74 percent for the five-year period prior to the 2005-06 ZDHS. This proportion is within the expected range and similar to the proportions recorded for the five-year periods prior to the 1994 ZDHS (71 percent) and the 1999 ZDHS (76 percent). However, it is somewhat lower than proportions of early neonatal deaths recorded in the 2005-06 ZDHS for the periods 5-19 years before the survey, which ranged between 83 percent and 87 percent. Looking at the ratio of neonatal deaths to all deaths, Appendix Table C.5 shows that the proportion was 41 percent for the five-year period prior to the

2005-06 survey. This is somewhat lower than the proportions recorded for the five-year periods prior to the 1994 ZDHS (49 percent) and the 1999 survey (47 percent), and it is also somewhat lower than the proportions reported in the 2005-06 ZDHS for the periods 5-19 years before the survey, which ranged between 47 percent and 52 percent.

Another potential data quality problem involves the displacement of birth dates, which may cause a distortion of mortality trends. This can occur if an interviewer knowingly records a death as occurring in a different year, which would happen if an interviewer is trying to cut down on their overall work, because births occurring during the five years preceding the interview are the subject of a lengthy set of additional questions. In the 2005-06 ZDHS questionnaire, the cutoff year for these questions was 2000. Appendix Table C.6 shows little evidence of severe transference of deceased children from 2000 to earlier years.

A third factor that affects childhood mortality estimates is the quality of reporting of age at death. Misreporting of the child's age at death may distort the age pattern of mortality, especially if the net effect of the age misreporting is a transference of deaths from one age bracket to another. For example, a net transfer of deaths from under one month to a higher age will affect the estimates of neonatal and postneonatal mortality. To minimise errors in reporting of age at death, ZDHS interviewers were instructed to record age at death in days if the death took place in the month following the birth, in months if the child died before age two, and in years if the child was at least two years of age. They also were asked to probe for deaths reported at one year to determine a more precise age at death in terms of months.

Despite the emphasis during interviewer training and fieldwork monitoring on probing for accurate age at death, Appendix Table C.5 shows that, for the five years preceding the survey, the number of reported deaths at age 12 months or one year of age is more than twice the number of deaths reported at 11 months and many times the number reported at 13 months. It is likely that some of these deaths actually occurred before one year of age but are not included in the infant mortality rate, thus distorting the age pattern of mortality. This problem is not, however, more severe in the 2005-06 survey than in the earlier rounds of the ZDHS.

Finally, it is important to note that any method of measuring childhood mortality that relies on the mothers' reports (e.g., birth histories) rests on the assumption that female adult mortality is not high, or if it is high, that there is little or no correlation between the mortality risks of the mothers and that of their children. In countries like Zimbabwe with high rates of female adult mortality, primarily due to the AIDS epidemic (see Chapter 15), these assumptions may not hold and the resulting childhood mortality rates will be understated to some degree.

8.2 Infant and Child Mortality Levels and Trends

Table 8.1 presents childhood mortality rates for the three five-year periods before the 2005-06 ZDHS. The data show that, for the five-year period immediately prior to the survey, the under-five mortality was 82 per 1,000 live births, that is, around one out of every 12 Zimbabwean children died before reaching their fifth birthday during the five-year period. The infant mortality rate was 60 deaths per 1,000 live births, and the neonatal mortality rate was 24 per 1,000 births. Thus, around three-quarters of the childhood deaths occurred during infancy, with more than one-quarter taking place during the first month of life.

Table 8.1 Early childhood mortality rates

Neonatal, postneonatal, infant, child, and under-five mortality rates for five-year periods preceding the survey, Zimbabwe 2005-2006

Years preceding the survey	Neonatal mortality (NN)	Postneonatal mortality (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)[1]	Under-five mortality ($_5q_0$)
0-4	24	36	60	24	82
5-9	18	19	37	17	54
10-14	20	21	40	18	58

[1] Computed as the difference between the infant and neonatal mortality rates

An examination of the mortality levels across the three successive five-year periods shown in Table 8.1 suggests that under-five mortality rose from a level of 58 deaths per 1,000 births during the early 1990s (circa 1991-92 to 1995-96) to 82 deaths per 1,000 births during the first half of this decade (circa 2001-02 to 2005-06). Most of the rise in mortality occurred outside of the neonatal period.

Trends in mortality in early childhood can also be explored by examining the mortality results from successive rounds of DHS surveys in Zimbabwe. Table 8.2 shows the infant and under-five mortality rates for two successive five-year periods preceding the 1988, 1994, 1999, and 2005-06 ZDHS surveys. The overall pattern suggests that mortality levels declined during the first half of the 1980s, remained relatively stable for the next 10 years, and then began rising in the latter half of the 1990s.

Table 8.2 Trends in early childhood mortality

Trends in neonatal, infant, and under-five mortality from various selected surveys, Zimbabwe 1979-2006

Reference period	Approximate midpoint	Survey	Infant mortality	Under-five mortality
2001-02-2005-06	2003	2005-06 ZDHS	60	82
1994-95-2000-01	1998	2005-06 ZDHS	37	54
1995-1999	1997	1999 ZDHS	65	102
1990-1994	1992	1999 ZDHS	54	77
1990-1994	1992	1994 ZDHS	53	77
1985-1989	1987	1994 ZDHS	50	75
1984-1988	1986	1988 ZDHS	53	75
1979-1983	1981	1988 ZDHS	64	104

The direction of the trend in mortality during the first half of the current decade is, however, less certain. A comparison of the under-five mortality for the five-year period prior to the 2005-06 ZDHS with the rate for the five-year period prior to the 1999 ZDHS suggests that mortality has fallen, from the level of 102 deaths per 1,000 births at the time of the 1999 survey to 82 deaths at the time of 2005-06 ZDHS. Most of the difference in under-five mortality between the two most recent ZDHS surveys would appear to be the result of a decline in child mortality because the infant mortality rate at the time of the 2005-06 ZDHS was 60 deaths per 1,000 births, only slightly lower than the rate observed in the 1999 ZDHS (65 deaths per 1,000).

Further examination of the rates from the two most recent ZDHS surveys, however, raises questions about the comparability of the mortality results from the two surveys. For example, the 5-9 year rates from the 2005-2006 ZDHS (an infant mortality rate of 37 and under-five mortality rate of 54) and the 0-4 year rates from the 1999 survey (an infant mortality rate of 54 and an under-five mortality rate

of 77) are not comparable although they refer to approximately the same time frame (i.e., circa 1997-1998). Additional analysis is, therefore, needed to investigate the recent pattern of early childhood mortality in Zimbabwe before a conclusion is reached that mortality has declined over the period between the 1999 and 2005-06 ZDHS surveys. As discussed above, possible factors that may be affecting the mortality estimates include reporting errors during the surveys and excess mortality among mothers. Sampling variability also should be considered.

8.3 SOCIOECONOMIC DIFFERENTIALS IN EARLY CHILDHOOD MORTALITY

Table 8.3 shows differentials in infant and child mortality by residence, mother's level of education, and type of antenatal care and delivery assistance. The mortality estimates are calculated for the 10-year period before the survey so that the rates are based on a sufficient number of cases in each category to ensure statistically reliable estimates.

Table 8.3 Early childhood mortality rates by socioeconomic characteristics

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by background characteristics, Zimbabwe 2005-2006

Background characteristic	Neonatal mortality (NN)	Postneonatal mortality[1] (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Residence					
Urban	20	26	47	18	64
Rural	22	29	51	22	72
Province					
Manicaland	38	33	71	32	100
Mashonaland Central	15	30	45	29	73
Mashonaland East	27	20	47	25	71
Mashonaland West	17	39	56	23	77
Matabeleland North	11	35	46	22	67
Matabeleland South	12	20	32	14	45
Midlands	28	25	53	13	65
Masvingo	15	27	42	17	58
Harare	24	22	46	20	65
Bulawayo	5	29	34	11	45
Education					
No education	17	24	40	30	69
Primary	22	30	52	20	71
Secondary	22	27	49	20	68
More than secondary	17	27	44	13	57
Wealth quintile					
Lowest	17	31	48	25	72
Second	25	34	59	15	73
Middle	24	25	48	29	76
Fourth	24	22	46	23	68
Highest	16	28	45	12	57

[1] Computed as the difference between the infant and neonatal mortality rates

Child survival rates are higher in urban than in rural areas. For example, the under-five mortality rate is 64 deaths per 1,000 births in the urban areas, compared with 72 deaths per 1,000 births in rural areas. There is also substantial variation in the mortality level across provinces. Under-five mortality is highest in Manicaland (100 deaths per 1,000 births) and lowest in Matabeleland South and Bulawayo (45 deaths per 1,000 births).

Children whose mothers have more than a secondary education have somewhat lower mortality than children whose mothers have less education.

8.4 BIODEMOGRAPHIC DIFFERENTIALS IN EARLY CHILDHOOD MORTALITY

The relationship between early childhood mortality and various demographic variables is examined in Table 8.4. Although the pattern is not uniform at all ages, male children experience higher mortality than their female counterparts. Infant mortality for males and females is 51 and 48 deaths per 1,000 births, respectively, while under-five mortality rates for males and females are 71 and 68 deaths per 1,000 births, respectively.

The relationship between childhood mortality and mother's age at birth does not show the expected U-shape pattern, except for the postneonatal period. The childhood mortality rates generally rise with the child's birth order although not uniformly.

Table 8.4 Early childhood mortality rates by demographic characteristics

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by demographic characteristics, Zimbabwe 2005-2006

Demographic characteristic	Neonatal mortality (NN)	Postneonatal mortality[1] (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Child's sex					
Male	23	28	51	21	71
Female	19	29	48	21	68
Mother's age at birth					
<20	18	30	48	23	70
20-29	20	28	48	21	68
30-39	24	27	51	22	72
40-49	42	30	73	5	77
Birth order					
1	21	26	47	20	66
2-3	17	29	46	23	68
4-6	25	31	55	20	74
7+	39	25	65	16	80
Previous birth interval[2]					
<2 years	58	60	118	27	142
2 years	16	28	44	24	66
3 years	17	24	40	16	56
4+ years	18	22	40	22	60
Birth size[3]					
Small/very small	42	41	83	na	na
Average or larger	19	36	55	na	na
Don't know/missing	93	56	149	na	na

na = Not applicable
[1] Computed as the difference between the infant and neonatal mortality rates
[2] Excludes first-order births
[3] Rates for the five-year period before the survey

Studies have shown that a longer birth interval seems to increase a child's chance of survival. Data from the 2005-06 ZDHS support this observation. For example, children born less than two years after a preceding sibling are more than twice as likely to die in infancy as those born two to three years after a preceding sibling (118 compared with 44 per 1,000). This link between the pace of childbearing and child survival rates is observed in all age groups. These findings point out the potential for mortality reduction that could result from successful efforts to promote birth spacing in Zimbabwe.

A child's size at birth is an indicator of the risk of dying during infancy, particularly during the first months of life. In the 2005-06 ZDHS, in addition to recording the actual birth weight, interviewers asked mothers whether the reference child was very small, small, average size, large, or very large at birth. This type of subjective assessment has been shown to correlate closely with actual birth weight. Newborns perceived by their mothers to be very small or small were 50 percent more likely to die in their first year than those perceived as average or larger in size. As expected, the differential is especially large during the neonatal period.

8.5 PERINATAL MORTALITY

Pregnancy losses occurring after seven completed months of gestation (stillbirths) plus deaths of live births within the first seven days of life (early neonatal deaths) constitute perinatal deaths. The distinction between a stillbirth and an early neonatal death (deaths in the first week after birth) is recognized as a fine one, often depending on observing and then remembering sometimes faint signs of life after delivery. Furthermore, the causes of stillbirths and early neonatal deaths are closely linked, and examining just one or the other can understate the true level of mortality around delivery. For this reason, deaths around delivery are combined into the perinatal mortality rate. Information on stillbirths is available for the five years preceding the survey and was collected using the calendar at the end of the Women's Questionnaire.

Table 8.5 indicates that the perinatal mortality for the country as a whole is 25 deaths per 1,000 pregnancies. Differentials in perinatal mortality across selected background characteristics of the mothers are generally similar to those observed for neonatal mortality. A particularly marked decline in perinatal mortality is associated with increased education of women.

Table 8.5 Perinatal mortality

Number of stillbirths and early neonatal deaths, and the perinatal mortality rate for the five-year period preceding the survey, by background characteristics, Zimbabwe 2005-2006

Background characteristic	Number of stillbirths[1]	Number of early neonatal deaths[2]	Perinatal mortality rate[3]	Number of pregnancies of 7+ months duration
Mother's age at birth				
<20	12	18	28	1,082
20-29	14	50	22	2,953
30-39	12	15	25	1,069
40-49	2	6	47	166
Previous pregnancy interval in months				
First pregnancy	12	28	25	1,598
<15	4	1	27	203
15-26	1	19	36	573
27-38	4	11	14	994
39+	19	30	26	1,902
Residence				
Urban	15	28	28	1,528
Rural	25	61	23	3,743
Region				
Manicaland	7	18	36	687
Mashonaland Central	4	6	17	589
Mashonaland East	4	6	25	391
Mashonaland West	0	8	16	519
Matabeleland North	5	2	20	345
Matabeleland South	5	2	28	247
Midlands	5	19	31	779
Masvingo	1	12	17	791
Harare	8	14	32	674
Bulawayo	1	2	12	249
Education				
No education	3	4	30	215
Primary	17	30	24	1,939
Secondary	20	55	25	2,992
More than secondary	0	1	12	124
Wealth quintile				
Lowest	6	15	16	1,302
Second	13	18	28	1,106
Middle	3	20	26	914
Fourth	6	24	27	1,097
Highest	12	13	29	851
Total	40	89	25	5,271

[1] Stillbirths are foetal deaths in pregnancies lasting seven or more months.
[2] Early neonatal deaths are deaths at age 0-6 days among live-born children.
[3] The sum of the number of stillbirths and early neonatal deaths divided by the number of pregnancies of seven or more months' duration

8.6 HIGH-RISK FERTILITY BEHAVIOUR

Typically, infants and young children have a higher risk of dying if they are born to very young mothers or older mothers, if they are born after a short interval, or if their mothers have already had many children. In the following analysis, mothers are classified as too young if they are less than 18 years old at the time of birth of the child and too old if they are age 35 years or more at the time of the birth. A short birth interval is defined as less than 24 months, and a high-order birth is defined as occurring after four or more previous births (i.e., birth order 5 or higher). A birth may be at an elevated risk of dying owing to a combination of characteristics.

The first column of Table 8.6 shows the percentage of births in the five years before the survey classified by various risk categories. Overall, 38 percent of births are in at least one high-risk category; 27 percent are in a single high-risk category and 11 percent have multiple high-risk characteristics.

The second column in Table 8.6 presents risk ratios, which represent the increased risk of mortality among births in various high-risk categories relative to births not having any high-risk characteristics. The primary factor leading to heightened mortality risk in Zimbabwe is short birth interval (2.20), followed by mother's age greater than 34 (1.55). The largest percentage of high-risk births in Zimbabwe are of high birth order (birth order >3) and have a comparatively modest increased risk of mortality (1.13). This acts to reduce the risk ratios in the overall single high-risk category (1.4) and in the overall multiple high-risk category (1.9).

The third column of Table 8.6 shows the distribution of currently married women by the risk category into which a birth conceived at the time of the survey would fall. The data in the table shows that 30 percent of women are not in any elevated mortality risk category and 6 percent have only given birth once, which is an unavoidable risk. Among those who are in an elevated mortality risk category (64 percent of women), 32 percent have a single high risk and 32 percent have multiple risks.

Table 8.6 High-risk fertility behaviour

Percent distribution of children born in the five years preceding the survey by category of elevated risk of mortality and the risk ratio, and percent distribution of currently married women by category of risk if they were to conceive a child at the time of the survey, Zimbabwe 2005-2006

Risk category	Births in the 5 years preceding the survey		Percentage of currently married women[1]
	Percentage of births	Risk ratio	
Not in any high-risk category	36.9	1.00	30.1[a]
Unavoidable risk category			
First order births between ages 18 and 34 years	25.1	1.02	6.4
Single high-risk category			
Mother's age <18	6.8	1.47	1.4
Mother's age >34	1.1	1.55	4.4
Birth interval <24 months	3.7	2.20	12.0
Birth order >3	15.5	1.13	14.0
Subtotal	27.2	1.38	31.7
Multiple high-risk category			
Age <18 and birth interval <24 months[2]	0.2	7.64	0.3
Age >34 and birth interval <24 months	0.0	na	0.1
Age >34 and birth order >3	7.6	1.01	20.8
Age >34 and birth interval <24 months and birth order >3	0.7	3.71	2.9
Birth interval <24 months and birth order >3	2.4	3.46	7.5
Subtotal	10.9	1.85	31.7
In any avoidable high-risk category	38.1	1.51	63.5
Total	100.0	na	100.0
Number of births	5,233	na	5,143

Note: Risk ratio is the ratio of the proportion dead among births in a specific high-risk category to the proportion dead among births *not in any high-risk category*.
na = Not applicable
[1] Women are assigned to risk categories according to the status they would have at the birth of a child if they were to conceive at the time of the survey: current age less than 17 years and 3 months or older than 34 years and 2 months, latest birth less than 15 months ago, or latest birth being of order 3 or higher.
[2] Includes the category age <18 and birth order >3
[a] Includes sterilised women