

INFANT AND CHILD MORTALITY

This chapter presents levels, trends, and differentials in neonatal, postneonatal, infant, and child mortality in Ethiopia. High-risk fertility behavior of women covered in the survey is also discussed. Information on infant and child mortality rates not only enriches the understanding of a country's socioeconomic situation but also sheds light on the quality of life of the population under study. Studies of mortality indicators have shown the existence of differentials by socioeconomic and demographic characteristics. To have a better understanding, the data in this report are therefore disaggregated by these groupings.

Disaggregation of mortality indicators by different economic, social, and demographic categories helps to identify populations that are at high risk. Preparation, implementation, monitoring, and evaluation of population, health, and other socioeconomic programs and policies depend to a large extent on a target population. Results from the 2000 Ethiopia DHS are also timely in evaluating the impact of some of the major national policies like the National Population Policy, the National Policy on Ethiopian Women, and the National Health Policy.

The mortality rates presented in this chapter are computed from information in the birth history section of the Women's Questionnaire. Each woman age 15-49 was asked whether she had ever given birth, and if she had, she was asked to report the number of sons and daughters who live with her, the number who live elsewhere, and the number who have died. In addition, she was asked to provide a detailed birth history of her children in chronological order starting with the first child. Women were asked whether a birth was single or multiple; the sex of the child; the date of birth (month and year); survival status; age of the child on the date of interview if alive; and if not alive, the age at death of each live birth. The rates of childhood mortality are expressed as deaths per 1,000 live births, except in the case of child mortality, which is expressed as deaths per 1,000 children surviving to age one. Childhood mortality rates are defined as follows:

- Neonatal mortality (NN): the probability of dying within the first month of life
- Postneonatal mortality (PNN): the difference between infant and neonatal mortality
- Infant mortality (${}_1q_0$): the probability of dying between birth and the first birthday
- Child mortality (${}_4q_1$): the probability of dying between exact ages one and five
- Under-five mortality (${}_5q_0$): the probability of dying between birth and the fifth birthday.

In addition to questions on live births, women were asked about pregnancies that did not end in a live birth and about children who died within seven days. This information was collected for the five years preceding the survey to minimize recall errors and is used to estimate perinatal mortality, which is the number of stillbirths and early neonatal deaths per 1,000 stillbirths and live births.

8.1. ASSESSMENT OF DATA QUALITY

The reliability of mortality estimates depends on the sampling variability of the estimates and on nonsampling errors. Sampling variability and sampling errors are discussed in detail in Appendix A. Nonsampling errors depend on the extent to which the date of birth and age at death are accurately reported and recorded and the completeness with which child deaths are reported. Omission of births

and deaths affects mortality estimates, displacement of dates impacts mortality trends, and misreporting of age at death may distort the age pattern of mortality. Typically, the most serious source of nonsampling errors in a survey that collects retrospective information on births and deaths arises from an underreporting of both births and deaths of children who are not alive at the time of the survey. It may be that mothers are generally reluctant to talk about their dead children because of the sorrow associated with any death, or they may live in a culture that discourages discussing the dead. Underreporting of births and deaths is generally more severe the further back in time an event occurred.

An unusual pattern in the distribution of births by calendar years is an indication of omission of children or age displacement. Table C.4 (refer to Appendix C) shows that the percentage of births for which a month and year of birth was reported decreases as one moves further back in time, from 100 percent for births in calendar year 2000 to 92 percent for births in calendar year 1991. This decline is more severe among dead than among living children. For example, complete information is available for 99 percent of living children, but for only 89 percent of dead children, in calendar year 1997. There is also some indication of omission of deaths in the most recent period. For example the proportion of deaths to births declines from 21 percent in the period 1991-1995 to 12 percent during the period 1996-2000. Some of this decline may be due to a real decrease in mortality in the most recent period, and some may be due to the fact that younger children have a shorter period of exposure to the risk of mortality. Nevertheless, such a sharp decline in the proportion of deaths since 1995 suggests some underreporting in the most recent period.

Age displacement is common in many surveys that include both demographic and health information for children below a specified age. In the Ethiopia DHS, the cutoff date for asking health questions was Meskerem 1987 in the Ethiopian calendar (which roughly corresponds to September 1994 in the Gregorian calendar). Table C.4 shows that there is some age displacement across this boundary and it is more obvious for living than dead children. The distribution of living children and total number of children shows a deficit in 1994 and an excess in 1993 as denoted by the calendar year ratios. This pattern could be attributed to the transference of births by interviewers out of the period for which health data were collected. However, since transference is not proportionally higher for dead children than living children, mortality rates are unlikely to be affected by such displacement. The overall sex ratio of 109 is also higher than expected, indicating that there may be some underreporting of female births, especially of female children who are no longer alive. The sex ratio for dead children is 123 compared with 105 for living children.

Underreporting of deaths is usually assumed to be higher for deaths that occur very early in infancy. Table C.5 shows data on age at death for early infant deaths. Selective underreporting of early neonatal deaths would result in an abnormally low ratio of deaths within the first seven days of life to all neonatal deaths. Early infant deaths have *not* been severely underreported in the Ethiopia DHS as suggested by the high ratio of deaths in the first seven days of life to all neonatal deaths.¹

Heaping of the age at death on certain digits is another problem that is inherent in most retrospective surveys. Misreporting of age at death biases age pattern estimates of mortality if the net result is the transference of deaths between age segments for which the rates are calculated; for example, child mortality may be overestimated relative to infant mortality if children who died in the first year of life are reported as having died at age one or older. In an effort to minimize misreporting of age at

¹ There are no model mortality patterns for the neonatal period. However, one review of data from several developing countries concluded that at levels of neonatal mortality of 20 per 1,000 or higher, approximately 70 percent of neonatal deaths occur within the first seven days of life (Boerma, 1988).

death, interviewers were instructed to record deaths under one month in days and under two years in months. In addition, they were trained to probe for deaths reported at exactly 1 year or 12 months to ensure that they had actually occurred at 12 months. The distribution of deaths under 2 years during the 20 years prior to the survey by month of death shows that there is definite heaping at 6, 12, and 18 months of age with corresponding deficits in adjacent months (refer to Table C.6 in Appendix C). However, heaping is less pronounced for deaths in the five years preceding the survey, for which the most recent mortality rates are calculated.

8.2 LEVELS AND TRENDS IN INFANT AND CHILD MORTALITY

Table 8.1 presents neonatal, postneonatal, infant, child, and under-five mortality rates for the three recent five-year periods before the survey. Neonatal mortality in the most recent period is 49 per 1,000 live births. This rate is similar to postneonatal deaths (48 per 1,000 live births) during the same period; that is, the risk of dying for any Ethiopian child who survived the first month of life is the same in the next 11 months. Thus, almost one in every ten babies born in Ethiopia (97 per 1,000) does not survive to celebrate the first birthday. Under-five mortality in Ethiopia is also high (166 per 1,000 live births), with one in every six children dying before the fifth birthday.

Data from the Ethiopia DHS show that mortality has declined in Ethiopia over the past 15 years and that this decline is more pronounced over the last 10 years (Table 8.1). Under-five mortality is 21 percent lower now than it was five to nine years ago, with the pace of decline in infant mortality (25 percent) somewhat faster than for child mortality (18 percent). The corresponding decline in neonatal and postneonatal mortality over the same period is 29 percent and 21 percent, respectively.

Years preceding the survey	Neonatal mortality (NN)	Postneonatal mortality ¹ (PNN)	Infant mortality (${}_1q_0$)	Child mortality (${}_4q_1$)	Under-five mortality (${}_5q_0$)
0-4	48.7	48.3	97.0	76.7	166.2
5-9	68.3	61.5	129.8	93.7	211.4
10-14	63.4	69.7	133.0	96.3	216.5

¹ Computed as the difference between the infant and the neonatal mortality rates.

8.3 SOCIOECONOMIC DIFFERENTIALS IN CHILDHOOD MORTALITY

From Table 8.2, it is apparent that infant and child survival is influenced by the socioeconomic characteristics of mothers.² Mortality in urban areas is consistently lower than in rural areas. For example, infant mortality in urban areas is 97 deaths per 1,000 live births, compared with 115 deaths per 1,000 live births in rural areas. The urban-rural difference is especially pronounced in the case of child mortality. It is 34 percent lower in urban areas than in rural areas. Differentials in mortality by region are also pronounced. In general mortality is lower in Addis Ababa and Dire Dawa, the most

Table 8.2 Early childhood mortality by socioeconomic characteristics
Neonatal, postneonatal, infant, child, and under-five mortality for the ten-year period preceding the survey, by socioeconomic characteristics, Ethiopia 2000

Socioeconomic characteristic	Neonatal mortality (NN)	Post-neonatal mortality ¹ (PNN)	Infant mortality (${}_1Q_0$)	Child mortality (${}_4Q_1$)	Under-five mortality (${}_5Q_0$)
Residence					
Urban	46.3	50.2	96.5	57.6	148.6
Rural	59.5	55.3	114.7	87.8	192.5
Region					
Tigray	68.1	35.5	103.6	73.0	169.0
Affar	45.5	83.7	129.2	114.9	229.3
Amhara	59.7	52.7	112.4	80.0	183.4
Oromiya	61.1	55.1	116.2	87.9	193.8
Somali	60.3	39.1	99.4	94.2	184.2
Benishangul-Gumuz	64.5	33.1	97.6	111.0	197.7
SNNP	49.4	64.0	113.4	88.2	191.5
Gambela	57.1	65.6	122.6	126.0	233.2
Harari	54.0	64.3	118.3	82.4	191.0
Addis Ababa	42.6	38.4	81.0	35.4	113.5
Dire Dawa	41.8	63.8	105.6	78.4	175.7
Mother's education					
No education	61.4	57.7	119.1	89.0	197.4
Primary	46.0	39.0	85.0	67.9	147.1
Secondary and higher	24.8	38.7	63.5	27.4	89.2
Number of reasons to justify wife beating					
0	49.2	40.7	89.9	70.2	153.8
1-3	58.7	54.4	113.1	89.0	192.0
4-5	59.8	58.3	118.1	84.8	193.0
Medical maternity care²					
No antenatal or delivery care	53.0	48.2	101.2	NA	NA
Either antenatal or delivery care	35.6	52.1	87.7	NA	NA
Both antenatal and delivery care	4.3	32.6	36.9	NA	NA
Total	58.1	54.8	112.9	84.5	187.8

NA = Not applicable
¹ Computed as the difference between the infant and the neonatal mortality rates
² Rates for the five-year period before the survey. Medical care is that given by a health professional.

² To have a sufficient number of cases to ensure statistically reliable mortality estimates, rates presented in Tables 8.2 and 8.3 are calculated for a ten-year period.

urbanized areas of the country. Nevertheless, even in Addis Ababa, one in nine children dies before the fifth birthday. The corresponding rates are about one in four in the Affar and Gambela regions.

As expected, mortality declines markedly as mother's education increases. Children born to mothers with no education suffered the highest mortality. According to the survey results, educating mothers through secondary and higher levels reduces neonatal mortality by 60 percent, infant mortality by 47 percent, and under-five mortality by 55 percent, compared with mothers who had no education. Children of women who believe that men are not justified in beating their wives for any reason are less likely to die in childhood than children of mothers who believe that men are justified in beating their wives for at least one reason. This is presumably because these women enjoy or perceive themselves to enjoy a higher status than other women and hence are able to exercise greater autonomy in matters pertaining to children's health.

Survival of infants and children is also highly influenced by access to maternal health care. This is clearly evident from the data in Table 8.2 and especially in the case of neonatal death rates, which are 33 percent lower when either antenatal or delivery care is utilized and 92 percent lower when both antenatal and delivery care are utilized than when neither service is utilized.

8.4 DEMOGRAPHIC DIFFERENTIALS IN MORTALITY

Infant and child mortality is also influenced to a considerable extent by demographic characteristics of mothers and children. Table 8.3 and Figure 8.1 show the relationship between infant and child mortality and different demographic variables. With the exception of child mortality, male children in general experience higher mortality than female children. The gender difference is especially pronounced for infant mortality, in which case one in eight boys dies before his first birthday, compared with one in ten girls. The excess mortality among boys is a universal phenomenon presumably due to a higher biological risk of death during the first months of life. Since male mortality is typically higher than female mortality during childhood, the slight excess in female child mortality (4 percent) may reflect some differences in child rearing practices in Ethiopia, presumably in feeding practices and utilization of health care services, that favor boys over girls.

Table 8.3 Early childhood mortality by demographic characteristics

Neonatal, postneonatal, infant, child, and under-five mortality for the ten-year period preceding the survey, by demographic characteristics, Ethiopia 2000

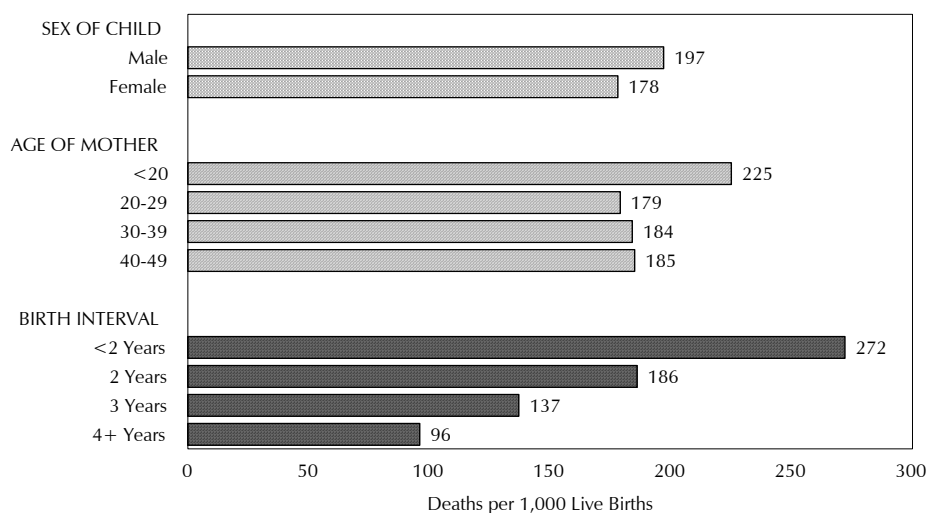
Demographic characteristic	Neonatal mortality (NN)	Post-neonatal mortality ¹ (PNN)	Infant mortality (₁ Q ₀)	Child mortality (₄ Q ₁)	Under-five mortality (₅ Q ₀)
Sex of child					
Male	67.1	57.4	124.4	83.0	197.0
Female	48.6	52.0	100.6	86.1	178.0
Mother's age at birth					
< 20	85.3	63.1	148.5	90.4	225.4
20-29	51.0	53.0	104.0	83.2	178.6
30-39	56.6	52.4	109.0	83.7	183.6
40-49	52.8	61.1	113.9	80.1	184.9
Birth order					
1	84.9	58.7	143.6	72.5	205.6
2-3	49.1	49.6	98.7	87.4	177.4
4-6	46.4	53.9	100.4	90.4	181.7
7+	66.1	60.3	126.4	79.8	196.1
Previous birth interval					
< 2 years	91.8	85.9	177.7	114.6	271.9
2 years	47.7	51.3	99.0	96.7	186.1
3 years	32.8	36.7	69.5	72.9	137.4
4 or more years	24.5	32.8	57.2	41.3	96.2
Birth size²					
Small or very small	46.1	43.4	89.4	NA	NA
Average	43.8	40.8	84.5	NA	NA
Large or very large	54.7	61.7	116.3	NA	NA
Total	58.1	54.8	112.9	84.5	187.8

NA = Not applicable

¹ Computed as the difference between the infant and the neonatal mortality rates.

² Rates for the five-year period before the survey.

Figure 8.1 Under-Five Mortality by Selected Demographic Characteristics



Note: Rates are for the 10-year period preceding the survey.

Ethiopia DHS 2000

As expected, the relationship between maternal age at birth and childhood mortality is generally a U-shaped curve, being relatively higher among children born to mothers under age 20 and over age 40 than among mothers in the middle age groups. This pattern is especially obvious in the case of infant and under-five mortality. In general, first births and births of order seven and higher also suffer significantly higher rates of mortality than births of orders 2 through 6. For example, one in seven first births did not survive to the first year, compared with one in ten second and third order births. Short birth intervals also significantly reduce a child's chances of survival. For example, children born within two years of a preceding birth are more than twice as likely to die within the first month of life as children born after a two-year interval.

Studies have shown that a child's weight at birth is an important determinant of its survival chances. Since most births in Ethiopia occur at home, children's actual birth weights were unavailable for most children. Instead, mothers in the Ethiopia DHS were asked whether their child was very large, larger than average, average, smaller than average, or small at birth since this has been found to be a good proxy for the child's weight. Surprisingly, large or very large children experience the greatest mortality, followed by small or very small children.

8.5 PERINATAL MORTALITY

Perinatal mortality reflects an adverse outcome for pregnancies of at least seven months' gestation. The perinatal mortality rate is obtained by summing all stillbirths and deaths to children within the first week of life (early neonatal deaths) and dividing by the sum of all stillbirths and live births. The perinatal mortality rate captures stillbirths and neonatal deaths, two seemingly different outcomes that result from similar conditions.

The Ethiopia DHS asked women to report on pregnancy losses and their duration if they occurred

at any time during the five years before the survey. This time cutoff was used to minimize recall errors associated with reporting on pregnancy losses. These events are also highly susceptible to omission and/or misreporting. Nevertheless, retrospective surveys provide more representative and complete enumeration of perinatal deaths than do most vital registration systems and hospital-based studies in developing countries.

The perinatal mortality rate for the five years preceding the survey is 52 deaths per 1,000 stillbirths and live births (Table 8.4). Perinatal mortality is significantly higher among women under age 20 than among older women. Pregnancies that occur at less than a 15-month interval are at more than three times the mortality risk of pregnancies that occur after longer intervals. Rural women are more likely to experience pregnancy losses than urban women, as are women who reside in the Benishangul-Gumuz Region. Educated mothers are less likely to experience pregnancy losses than uneducated mothers.

Table 8.4 Perinatal mortality

Number of stillbirths and early neonatal deaths, and perinatal mortality rate for the five-year period preceding the survey, by background characteristics, Ethiopia 2000

Background characteristic	Number of stillbirths ¹	Number of early neonatal deaths ²	Perinatal mortality rate ³	Number of pregnancies of 7 or more months duration
Mother's age at birth				
<20	53	82	74.3	1,823
20-29	109	198	48.3	6,357
30-39	53	124	49.6	3,576
40-49	19	17	48.0	738
Previous pregnancy interval				
No previous pregnancy	68	106	76.0	2,283
<15 months	44	53	129.3	748
15-26 months	28	84	42.3	2,641
27-38 months	42	99	38.6	3,647
39+ months	52	80	41.6	3,175
Residence				
Urban	19	41	46.3	1,296
Rural	215	380	53.1	11,198
Region				
Tigray	17	25	52.8	805
Affar	1	3	33.9	127
Amhara	67	95	49.6	3,269
Oromiya	100	196	58.0	5,099
Somali	2	3	33.6	144
Benishangul-Gumuz	5	7	91.3	129
SNNP	37	84	45.8	2,639
Gambela	0	1	39.2	29
Harari	0	1	37.7	26
Addis Ababa	4	4	47.5	187
Dire Dawa	1	1	47.0	41
Mother's education				
No education	202	359	54.7	10,265
Primary	27	50	47.7	1,624
Secondary and higher	4	12	26.5	605
Total	234	421	52.4	12,494

¹ Stillbirths are fetal deaths to pregnancies lasting seven or more months.

² Early neonatal deaths are deaths among live-born children age 0 to 6 days.

³ Perinatal mortality rate is 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 BEHAVIOR

The survival of infants and children depends in part on the demographic and biological characteristics of their mothers. Typically, the probability of dying in infancy is much greater among children born to mothers who are too young (under age 18) or too old (over age 34), children born after a short birth interval (less than 24 months after the preceding birth), and children born to mothers of high parity (more than three children). The risk is elevated when a child is born to a mother who has a combination of these risk characteristics.

Table 8.5 shows the percent distribution of children born in the five years before the survey and of currently married women by these risk factors. Only 22 percent of births were in a “risk-free” category. Fourteen percent were first births—considered an unavoidable risk category—while 39 percent of births were in a single high-risk category, and 24 percent were in a multiple high-risk category. The most common single high-risk category was births of order 3 and above (27 percent), while the most common multiple high-risk category was births to mothers older than 34 years and of birth order 3 and above (15 percent).

The risk ratios displayed in the second column of Table 8.5 denote the relationship between risk factors and mortality. In general, risk ratios are higher for children in a multiple high-risk category than in a single high-risk category. Most vulnerable are children born to women under age 18 at the time of birth and less than 24 months after a preceding birth; they are nearly four times as likely to die as children not in any high-risk category. Fortunately, less than 1 percent of births fall into this category. At the same time, 7 percent of births occurred at a birth interval of less than 24 months to mothers who have 3 or more children. These children are nearly twice as likely to die as children not in any high-risk category.

Four in five married women have the potential to give birth to a child with an elevated risk of mortality, as shown in the final column of Table 8.5. Twenty-eight percent of these women are or would be relatively old and have or would have too many children.

Table 8.5 High-risk fertility behavior

Percent distribution of children born in the five years preceding the survey by category of elevated risk of dying 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, Ethiopia 2000

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	22.4	1.00	14.5 ^a
Unavoidable risk category			
First-order births between age 18 and 34	14.1	1.54	6.5
Single high-risk category			
Mother's age <18	5.4	1.80	2.0
Mother's age >34	0.4	1.34	2.9
Birth interval <24 months	6.2	1.82	9.8
Birth order >3	27.0	1.04	17.7
Subtotal	39.0	1.27	32.3
Multiple high-risk category			
Age <18 & birth interval <24 months ²	0.6	3.81	0.3
Age >34 & birth order >3	14.7	1.22	28.0
Age >34 & birth interval <24 months and birth order >3	2.2	2.42	6.3
Birth interval <24 months and birth order >3	6.9	1.83	12.0
Subtotal	24.4	1.56	46.7
In any avoidable high-risk category	63.4	1.39	79.0
Total	100.0	NA	100.0
Number of births	12,260	NA	9,789

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 combined categories age <18 and *birth order* >3.

^a Includes sterilized women