INFANT AND CHILD MORTALITY 8

This chapter presents levels, trends, and differentials in neonatal, postneonatal, infant, child, and perinatal mortality. The information is relevant both for understanding population trends—for example, the mortality rates can be used in population projections—and for the planning and evaluation of health policies and programs. Information on child mortality serves the needs of the health sector by identifying population groups that are at high risk. Because the government of Tanzania through the Ministry of Health, is undertaking a number of interventions aimed at reducing child mortality in the country, the analysis in this report provides an opportunity to evaluate the performance of such programs. Furthermore, mortality indicators are useful in assessing the National Strategy for Growth and Reduction of Poverty (NSGRP), as they reflect socioeconomic development and quality of life.

The data for mortality estimation were collected in the birth history section of the Women's Questionnaire. The birth history section began with questions about the respondent's experience with childbearing (i.e., the number of sons and daughters living with the mother, the number who live elsewhere, and the number who have died). These questions were followed by a retrospective birth history in which each respondent was asked to list each of her births, starting with the first birth. For each birth, data were obtained on sex, month and year of birth, survivorship status, and current age, or if the child was dead, age at death. This information is used to directly estimate mortality.

Age-specific mortality rates are categorised and 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 before the first birthday
Child mortality ($_4q_1$):	the probability of dying between the first and fifth birthday
Under-five mortality ($_5q_0$):	the probability of dying between birth and fifth birthday.

All rates are expressed per 1,000 live births, except for child mortality, which is expressed per 1,000 children surviving to 12 months of age.

8.1 LEVELS AND TRENDS IN INFANT AND CHILD MORTALITY

Table 8.1 shows neonatal, postneonatal, infant, child, and under-five mortality rates for successive five-year periods before the survey. For the five years immediately preceding the survey (approximately calendar years 2000-2004), the infant mortality rate is 68 per 1,000 live births. The estimate of child mortality (age 1-4) is lower. The under-five mortality rate for the period is 112 per 1,000. Thus, one out of nine Tanzanian children dies before the fifth birthday.

Table 8.1 Early childhood mortality rates

Neonatal, postneonatal, infant, child, and under-five mortality rates for five-year periods preceding the survey, Tanzania 2004-05

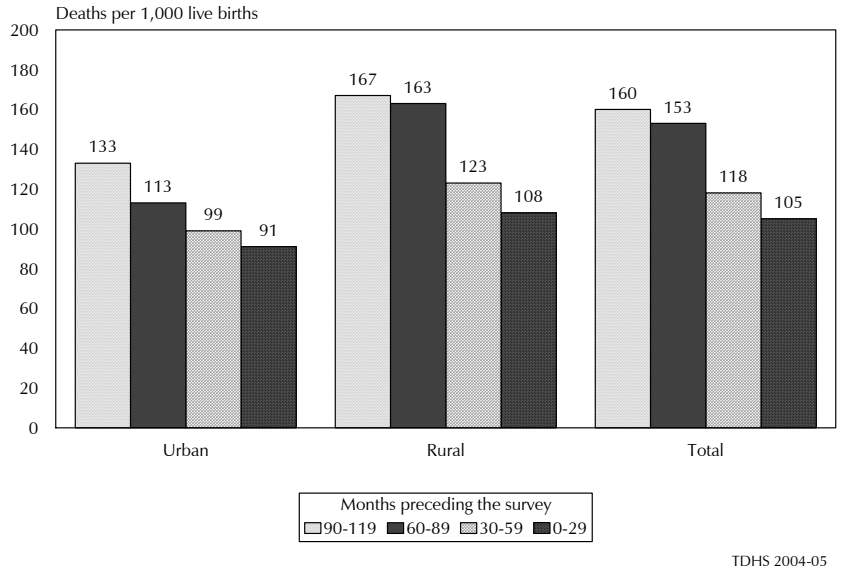
Years preceding the survey	Neonatal mortality (NN)	Postneonatal mortality[1] (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
0-4	32	36	68	47	112
5-9	36	64	100	63	156
10-14	35	59	94	74	161

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

The 2004-05 TDHS data indicate a recent, rapid decline in mortality. Infant mortality estimates show a decline from 100 in the 5-9 year period preceding the survey (approximately 1995-1999) to 68 during the 2000-2004 period. The 2004-05 TDHS estimate for the 5-9 year period preceding the survey is almost identical to the 1999 TRCHS rate of 99 deaths per 1,000 births for the same period (i.e., 0-4 years preceding the survey). Thus, the comparison of the two separate surveys—the 1999 TRCHS and the 2004-05 TDHS—as well as the 2004-05 TDHS data itself, indicate a significant decrease in infant and child mortality rates in recent years. The largest decline has occurred in the postneonatal period.

To gain more insight into the decline in mortality, rates can be calculated for two-and-a-half year periods instead of five-year periods. Figure 8.1 shows the under-five mortality rates for the 10 years preceding the survey by 30-month intervals, according to residence. Although these rates are based on a smaller number of cases and thus expected to be less reliable, the data indicate that although the overall drop in mortality between the late 1990s and early 2000s is large, the decline has actually been taking place gradually over the past ten years.

Figure 8.1 **Trends in Under-Five Mortality**



TDHS 2004-05

8.2 DATA QUALITY

Because of the dramatic decline in infant and child mortality, a thorough review of the 2004-05 TDHS data was conducted. The quality of mortality estimates calculated from retrospective birth histories depends upon the completeness with which births and deaths are reported and recorded. The data show strong internal consistency and support the conclusion that there was a very substantial decline in under-five mortality in Tanzania over the five-year period between the TRCHS and the TDHS. This section highlights selected data quality parameters.

One factor that affects childhood mortality estimates is the quality of reporting of age at death, which may distort the age pattern of mortality. If age at death is misreported, it will bias the estimates, especially if the net effect of the age misreporting results in transference 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, 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.6 shows that for the five years preceding the survey, the number of reported deaths at age 12 months or one year of age is twice the number reported at 13 months and many times the number reported at 11 months. It is likely then that some of these deaths actually occurred before one year of age but are not included in the infant mortality rate. Of course, the excess deaths reported at 12 months and one year of age have no effect on estimates of overall under-five mortality rates.

Another potential data quality problem is the selective omission from the birth histories of births who did not survive, which can lead to underestimation of mortality rates. When selective omission of childhood deaths occurs, it is usually more severe for deaths occurring early in infancy. One way such omissions can be detected is by examining the proportion of neonatal deaths to infant deaths. Generally, if there is substantial underreporting of deaths, the result is an abnormally low ratio of neonatal deaths to infant deaths. However, the proportion of neonatal deaths occurring in the first week of life is high: 73 percent in the period 0-4 years preceding the survey. Furthermore, it appears that early infant deaths among births that occurred longer before the survey have not been severely underreported. More than seven in ten neonatal deaths in the 15 years preceding the survey were early neonatal deaths. The proportion is lower (65 percent) for deaths occurring 15-19 years before the survey, which is not surprising given the greater likelihood of recall errors.

Another potential data quality problem includes 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 live births occurring during the five years preceding the interview are the subject of a lengthy set of additional questions. In the 2004-05 TDHS questionnaire, the cutoff year for these questions was 1999. Appendix Table C.4 shows substantial year-of-birth transference for deceased children from 1999 to earlier years. However, this should have little effect on the estimated mortality rates for the standard five-year DHS mortality period, the calculation of which, unlike the questionnaire, does not conform to calendar years. Because the survey fieldwork began in October 2004, the start of the rolling cut-off for the five year period preceding the survey is October 1999. Thus, most transference occurring during 1999 would not, in fact, be transference from the 0-4 year period preceding the survey into the 5-9 year period preceding the survey.

It is also possible to substantiate the current mortality levels using information from other sources. For example, the 2004-05 TDHS and the 2003-04 THIS estimated the same number of children ever born for women age 15-49 (2.9). Unlike the TDHS, the THIS did not ask additional questions about live births in the five years preceding the survey, thus eliminating the incentive for an interviewer to cheat and decrease her workload. Although the TDHS estimated a slightly lower

proportion of children dead (15 and 16 percent, respectively), the results of the two surveys are remarkably close.

Other data sources, such as the Demographic and Surveillance Sentinel sites, also show a steep decline since approximately the mid- to late 1990s. Furthermore, the results of the 2002 Housing and Population Census also indicate that mortality has been declining.

8.3 SOCIOECONOMIC DIFFERENTIALS IN INFANT AND CHILD MORTALITY

Mortality differentials by place of residence, province, educational level of the mother, and household wealth are presented in Table 8.2. For a sufficient number of births to study mortality differentials across population subgroups, period-specific rates are presented for the ten-year period preceding the survey (approximately 1995 to 2004). As expected, infant mortality rates are generally lower in urban than in rural areas (73 and 85 deaths per 1,000 live births, respectively). The difference is attributed to a significantly higher postneonatal rate in rural areas. Infant mortality ranges from a low of 67 in the Northern zone to a high of 121 in the Southern zone.

Table 8.2 Early childhood mortality rates by background characteristics

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by background characteristics, Tanzania 2004-05

Background characteristic	Neonatal mortality (NN)	Postneonatal mortality[1] (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Residence					
Urban	37	36	73	38	108
Rural	33	52	85	58	138
Mainland/Zanzibar					
Mainland	34	49	83	55	133
Total urban	36	36	72	38	108
Dar es Salaam city	43	34	77	36	110
Other urban	34	37	70	39	107
Total rural	33	52	86	59	139
Zanzibar	(29)	(33)	(61)	(42)	(101)
Unguja	(29)	*	*	*	*
Pemba	*	*	*	*	*
Zone					
Western	23	53	76	67	138
Northern	26	42	67	40	105
Central	38	37	75	59	130
Southern highlands	38	44	82	59	136
Lake	36	54	90	57	142
Eastern	44	40	84	46	126
Southern	47	74	121	36	153
Mother's education					
No education	41	60	101	66	160
Primary incomplete	33	51	84	61	139
Primary complete	30	45	75	49	120
Secondary+	40	16	56	(21)	(76)
Wealth quintile					
Lowest	33	55	88	54	137
Second	39	58	97	65	156
Middle	32	55	88	65	147
Fourth	33	37	70	51	117
Highest	31	33	64	31	93

Note: Rates based on 250 to 499 exposed persons are in parentheses. An asterisk indicates that a rate is based on fewer than 250 exposed persons and has been suppressed.

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

Higher levels of educational attainment are generally associated with lower mortality rates, because education exposes mothers to information about better nutrition, use of contraceptives to space births, and knowledge about childhood illness and treatment. Table 8.2 shows that mother's education has an inverse relationship with infant and under-five mortality. Infant mortality ranges from a high of 101 among children born to women with no education to a low of 56 among those with mothers with at least some secondary education. The association between infant and child mortality and wealth quintile is less clear, although the mortality risk is substantially lower among the fourth and highest quintiles than less wealthy households.

8.4 DEMOGRAPHIC DIFFERENTIALS IN INFANT AND CHILD MORTALITY

The demographic characteristics of both mother and child have been found to play an important role in the survival probability of children. Table 8.3 presents early childhood mortality rates by demographic characteristics (i.e., sex of child, mother's age at birth, birth order, previous birth interval, and birth size).

Table 8.3 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, Tanzania 2004-05

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	39	44	83	56	135
Female	29	53	82	52	130
Mother's age at birth					
<20	45	55	101	62	157
20-29	29	46	75	49	120
30-39	33	52	85	59	139
40-49	45	(37)	(82)	*	*
Birth order					
1	42	47	89	54	139
2-3	27	47	74	51	121
4-6	32	51	82	54	132
7+	42	52	94	63	151
Previous birth interval[2]					
<2 years	63	80	143	64	198
2 years	22	50	72	57	124
3 years	21	34	55	48	101
4+ years	29	33	62	44	103
Birth size[3]					
Small/very small	86	44	131	na	na
Average or larger	26	35	60	na	na

Note: Rates based on 250 to 499 exposed persons are in parentheses. An asterisk indicates that a rate is based on fewer than 250 exposed persons and has been suppressed.
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

As expected, mortality rates are generally higher for boys than for girls. However, girls are more likely than boys to die during the postneonatal period (53 and 44, respectively). There are significant differences in mortality risks associated with mother's age and birth order. The largest differentials are in the neonatal period. Shorter birth intervals are associated with higher mortality,

both during and after infancy. In terms of the length of the preceding birth interval, mortality rates are markedly lower for intervals of at least two years than for shorter birth intervals. A further decrease after a three-year birth interval can be seen in the postneonatal period. In terms of under-five mortality, births following an interval of at least three years are at almost half the risk of death as births occurring within two years of a preceding birth.

Studies have shown that a child's weight at birth is an important indicator of his or her chances of survival. Because only half of mothers had information on their child's exact weight at birth, they were asked instead whether their child was very large, larger than average, average, smaller than average, or small at birth. This has been found to be a good proxy for children's weight. Children reported to be small or very small are more than twice as likely to die by age one as children reported to be average or larger.

8.5 DIFFERENTIALS IN INFANT AND CHILD MORTALITY BY WOMEN'S STATUS

The ability of women to access information, make decisions, and act effectively in their own interest, or the interest of those who depend on them, are essential aspects of the empowerment of women. If women, the primary caretakers of children, are empowered, the health and survival of their infants will be enhanced. In fact, mother's empowerment fits into Mosley and Chen's framework on child survival as an individual-level variable that affects child survival through the proximate determinants (Mosley and Chen, 1984).

Table 8.4 presents mortality rates by three indicators of women's status: participation in household decisionmaking, attitude towards a wife refusing to have sex with her husband, and attitude towards wife beating. These indicators are described in Chapter 3.

Table 8.4 Early childhood mortality rates by women's status

Neonatal, postneonatal, infant, child, and under-five mortality rates for the 10-year period preceding the survey, by women's status indicators, Tanzania 2004-05

Women's status indicators	Neonatal mortality (NN)	Postneonatal mortality[1] (PNN)	Infant mortality ($_1q_0$)	Child mortality ($_4q_1$)	Under-five mortality ($_5q_0$)
Number of decisions in which woman has final say[2]					
0	37	55	91	70	155
1-2	30	48	77	63	136
3-4	37	49	86	48	130
5	35	48	83	44	124
Number of reasons to refuse sex with husband					
0	36	41	77	35	109
1-2	39	61	101	56	151
3-4	33	47	80	55	131
Number of reasons wife beating is justified					
0	36	41	78	55	128
1-2	35	50	85	47	128
3-4	29	52	81	56	132
5	36	60	96	61	151

[1] Computed as the difference between the infant and neonatal mortality rates
[2] Either by herself or jointly with others

Two of the indicators suggest that there is an association between increasing women's status and decreasing levels of mortality. In particular, household decisionmaking is most strongly associated with under-five mortality. Among children born to women who have no final say in any decision, 155 per 1,000 die before their fifth birthday, compared with 124 per 1,000 children born to women who participate in all specified household decisions. Similarly, levels of infant and child mortality are highest among those women who are least empowered on the wife beating indicator (i.e., those

women who agreed with all specified justifications for a man beating his wife). There is no consistent pattern in mortality rates by the number of reasons to refuse sex with the husband.

8.6 PERINATAL MORTALITY

Pregnancy losses occurring after seven completed months of gestation (stillbirths) plus deaths to 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 may be a fine one, often depending on observing and then remembering sometimes faint signs of life after delivery. 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. When the number of perinatal deaths is divided by the total number of pregnancies reaching seven months of gestation, the perinatal mortality rate is derived.

Table 8.5 presents the number of stillbirths and early neonatal deaths, and the perinatal mortality rate for the five-year period preceding the survey. The results indicate that the perinatal mortality rate for the entire country is 42 deaths per 1,000 pregnancies. Because of a small number of cases in some groups, comparisons are difficult to make among some background characteristics.

There are more perinatal deaths in urban than rural areas (56 and 38 per 1,000, respectively). Although the higher levels of mortality would be expected in rural areas, this may be partly the result of recall problems. The same counterintuitive pattern is seen among women by education and wealth quintile.

Assessing perinatal mortality between Mainland Tanzania and Zanzibar, Zanzibar has higher perinatal mortality (56 deaths per 1,000 pregnancies) than Tanzania Mainland (41 deaths per 1,000 pregnancies). Pregnancies in Unguja are at higher risk than those in Pemba.

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, Tanzania 2004-05

Background characteristic	Number of stillbirths[1]	Number of early neonatal deaths[2]	Perinatal mortality rate (per 1,000 pregnancies)[3]	Number of pregnancies of 7+ months duration
Mother's age at birth				
<20	38	49	56	1,540
20-29	88	102	39	4,812
30-39	26	43	32	2,174
40-49	13	13	(70)	364
Previous pregnancy interval in months				
First pregnancy	50	59	59	1,850
<15	14	17	(79)	401
15-26	26	55	40	2,039
27-38	31	33	27	2,410
39+	43	42	39	2,190
Residence				
Urban	41	56	56	1,732
Rural	124	151	38	7,157
Mainland/Zanzibar				
Mainland	157	202	41	8,663
Total urban	38	55	54	1,707
Dar es Salaam city	2	18	*	430
Other urban	36	37	57	1,277
Total rural	119	147	38	6,955
Zanzibar	8	5	56	227
Unguja	6	3	64	138
Pemba	2	2	43	88
Zone				
Western	30	25	28	1,942
Northern	30	27	50	1,151
Central	17	17	46	733
Southern highlands	23	30	41	1,306
Lake	20	45	34	1,888
Eastern	15	36	52	984
Southern	22	22	67	659
Mother's education				
No education	41	64	45	2,359
Primary incomplete	17	34	37	1,395
Primary complete	97	99	41	4,739
Secondary+	9	10	49	396
Wealth quintile				
Lowest	24	37	31	1,998
Second	41	55	51	1,898
Middle	23	37	32	1,889
Fourth	39	42	47	1,719
Highest	38	36	53	1,386
Total	165	207	42	8,889

Note: Rates based on 250 to 499 pregnancies are in parentheses. An asterisk indicates that a rate is based on fewer than 250 pregnancies and has been suppressed.
[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.

8.7 HIGH-RISK FERTILITY BEHAVIOUR

Findings from scientific studies have confirmed that there is a strong relationship between children's chances of dying and certain fertility behaviours. Typically, the probability of dying in early childhood is much greater if children are born to mothers who are too young or too old, if they are born after a short preceding birth interval, or if they are high parity births. Very young mothers may experience difficult pregnancies

and deliveries because of their physical immaturity. Older women may also experience age-related problems during pregnancies and delivery. In this analysis, a mother is considered to be "too young" if she is less than 18 years and "too old" if she is above 34 years at the time of delivery. A "short birth interval" is a birth occurring within 24 months of a previous birth.

Table 8.6 shows the distribution of children born in the five years preceding the survey by risk category. While first births to women age 18-34 are considered an unavoidable risk, they are included in the analysis and are shown as a separate risk category. Column 1 shows that in the five-year period before the survey, 37 percent of births were in a single high-risk category and 18 percent were in a multiple high-risk category. Only 29 percent of births were not in any high-risk category.

Column 2 shows risk ratios for births in various high-risk categories relative to births not having any high-risk characteristics. The risk ratio for children in any avoidable high-risk category (1.03) is just slightly higher (3 percent) than for children not in any high-risk category. In terms of births in a single high-risk category, the risk ratio is .98, meaning that children in a single high-risk category are not necessarily more likely to die than children not in any high-risk category. However, births in multiple high-risk categories are 13 percent more likely to die than births not in any high-risk category.

The last column in Table 8.6 looks to the future and addresses the question of how many currently married women have the potential for having a high-risk birth. The results were obtained by simulating the risk category into which a birth to a currently married women would fall if she were to become pregnant at the time of the survey. For example, a woman who was 37 years old at the time of the survey and had three previous births, the last of which occurred three years earlier, would be classified in the multiple high-risk category for being too old (35 or older) and at risk of having a high-order birth (more than three previous births). Twenty-three percent of currently married women would fall into this category. Seven in ten married women have the potential to give birth to a child with an elevated risk of dying. Four in ten married women (42 percent) have the potential to give birth to children in the multiple high-risk categories.

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, Tanzania 2004-05

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	29.4	1.00	21.8[a]
Unavoidable risk category			
First-order births between ages 18 and 34 years	15.8	1.05	6.0
Single high-risk category			
Mother's age <18	6.5	1.28	1.3
Mother's age >34	0.6	(0.80)	3.4
Birth interval <24 months	5.4	0.95	9.8
Birth order >3	24.6	0.92	16.1
Subtotal	37.1	0.98	30.7
Multiple high-risk category			
Age <18 and birth interval <24 months[\2]	0.3	(2.10)	0.4
Age >34 and birth interval <24 months	0.0	*	0.1
Age >34 and birth order >3	10.6	0.81	23.1
Age >34 and birth interval <24 months and birth order >3	1.0	3.58	4.8
Birth interval <24 months and birth order >3	5.7	1.23	13.1
Subtotal	17.7	1.13	41.5
In any avoidable high-risk category	54.8	1.03	72.1
Total	100.0	na	100.0
Number of births	8,725	na	6,950

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. Figures in parentheses are based on 25-49 unweighted cases. An asterisk indicates that a figure is based on fewer than 25 unweighted cases and has been suppressed.
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