CHAPTER 7

INFANT AND CHILD MORTALITY

According to the 1980 Census of Population and Housing, over 20 percent of Zambia's population consists of children below the age of five. This proportion is large enough to draw attention to any analysis on the situation of children's health. Furthermore, infant and particularly childhood mortality rates are basic indicators of a country's socioeconomic situation in terms of the quality of life. This is because children are the most vulnerable members of any society.

This chapter presents information on childhood mortality in Zambia, especially on levels, trends and differentials in neonatal, postneonatal, infant and child mortality. Disaggregation of this information by sex, socioeconomic characteristics, province and other factors helps in identifying segments of the population requiring special attention. This makes health programme monitoring and evaluation easier. Mortality estimates can also prove useful in making population projections and in identifying those sectors of the child population that are at high risk.

7.1 Assessment of Data Quality

The estimates of infant and child mortality are based on information from the birth histories of interviewed individual women. For each reported live birth, information was collected on the month and year of birth, sex, survivorship status and among dead children, age at death.

This information has been used to calculate the following period probabilities of dying for three five-year periods—1977-81, 1982-86, and 1987-91:

Neonatal mortality:	the probability of dying within the first month of life;
Postneonatal mortality:	the difference between infant and neonatal mortality;
Infant mortality:	the probability of dying before the first birthday;
Child mortality:	the probability of dying between the first and fifth birthday;
Under-five mortality:	the probability of dying between birth and the fifth birthday.

The reliability of mortality estimates calculated from retrospective birth histories depends upon the completeness with which deaths of children are reported and the extent to which birth dates and ages at deaths are accurately reported and recorded. Since the ZDHS data imply that childhood mortality has increased in the 15 years prior to the survey, it is important to look at some basic quality checks of the data. Although ZDHS data relating to infant and child mortality are in general of good quality, they may still suffer from several deficiencies which could lead to biased interpretation of the results.

Underreporting of infant deaths in particular is usually most severe for deaths which occur very early in infancy. If early neonatal deaths are selectively underreported, the result would be an abnormally low ratio of deaths under seven days to all neonatal deaths and an abnormally low ratio of neonatal to infant mortality. Changes in these ratios over time can be examined to detect the hypothesis that underreporting of early infant deaths is more common for births that occurred longer before the survey.

Results from Table 7.1 suggest that early infant deaths have *not* been severely underreported in the ZDHS, since the ratios of deaths in the first 6 days to all neonatal deaths (top row) are quite high (a ratio of less than 25 percent is often used as a guideline to indicate underreporting of early neonatal deaths). However, the ratios increase substantially over time, from 49 to 67 percent, implying that some early infant

deaths were not reported by older women. The percentages of infant deaths that occurred during the neonatal period (lower row in Table 7.1) are reasonable and show no evidence of selective underreporting over time.

Table 7.1 Indices for detecting underreporting of infant deaths

Percentage of neonatal deaths reported to occur at age 0-6 days and percentage of infant deaths reported to occur at age under one month for five-year periods preceding the survey, Zambia 1992

Percentage of deaths	Time period of death (years preceding survey) 0-4	5-9	10-14
Percentage of neonatal deaths occurring at 0-6 days of age	67.4	57.5	48.7
Percentage of infant deaths occurring under one month of age	42.4	42.1	40.2

Misreporting of age at death will bias estimates of the age pattern of mortality if the net result of the misreporting is the transference of deaths between age segments for which rates are calculated; for example, an overestimate of child mortality relative to infant mortality may result if children dying during the first year of life are reported as having died at age one or older. There was some misreporting of age at death due to preference for reporting ages at death of 7, 14, and 21 days, corresponding to one, two, and three weeks respectively (see Appendix Table C.5). In fact, the preference for reporting deaths at age 7 days is stronger for the period 10-14 years before the survey and accounts for some of the apparent increase over time in the percentage of neonatal deaths occurring at ages 0-6 days. There was surprisingly little "heaping" on particular *months* of death, and due to strong emphasis during training, there were very few deaths reported to have occurred at age one year (see Appendix Table C.6),[1] making any adjustment in infant and child mortality rates unneccessary.

This brief check on internal consistency of the ZDHS childhood mortality data indicates that there is no serious underreporting of deaths during the time periods for which the mortality rates are estimated and that though there is some evidence of heaping in age at death at certain ages, the bias in infant and child mortality rates arising from this heaping is negligible.

It is seldom possible to establish, with confidence, mortality levels for a period more than 15 years before a survey. Even within the recent 15-year period considered here, apparent trends in mortality rates should be interpreted with caution, for several reasons. First, there may exist differences in the completeness of death reporting related to the length of time before the survey. Second, the accuracy of reports of age at death and of date of birth may deteriorate systematically with time. The third reason relates to truncation of mortality rates further back in time, because women age 50 and over who were bearing children during these periods were not included in the survey. This truncation particularly affects mortality trends. For example, for the period 1977-1981 (10-14 years before the survey), the rates do not include any births for women 40-49 since these women were over 50 at the time of the survey and not eligible for interview. Since these excluded births to older women were likely to be at a somewhat greater risk of dying than births to younger women, the mortality levels for the period may be slightly underestimated. However, the ratio for later periods are less affected by the truncation bias since fewer older women are excluded. Thus, without a detailed evaluation of birth history data quality (which is not attempted in this report), conclusions regarding changes in mortality should be considered preliminary. However, attempts should be made later to compare estimates from the 1990 census with those from the ZDHS.

[1] Interviewers in the ZDHS were instructed to record the age at death in months for all children who died under age two years and in days for all children who died under one month of age.

Finally, it is important to note that the use of birth histories to estimate childhood mortality rates probably results in underreporting of deaths due to mutually fatal congenital diseases such as AIDS. This is because the respondent for the information on child deaths is the mother herself; if her child has died of AIDS, she herself may also have died and thus, the child's death cannot be reported. The methodology of measuring childhood mortality through mothers' birth histories rests on the assumption that maternal mortality is low and that there is little or no correlation between the mortality risks of mothers and their children. In countries with high death rates due to AIDS, these assumptions do not hold and the resulting childhood mortality rates are probably underestimated to some degree.

7.2 Levels and Trends in Infant and Child Mortality

In the five years preceding the survey (i.e., in the period 1987-1991), nearly 1 in 5 Zambian children died before their fifth birthday (see Table 7.2). Child mortality (at age 1-4 years) is almost as high as the level of infant mortality (94 vs. 107).

Table 7.2 Infant and child mortality

Infant and child mortality rates by five-year periods preceding the survey, Zambia 1992

Years preceding survey	Neonatal mortality (NN)	Postneonatal mortality (PNN)	**Infant mortality** ($_1q_0$)	Child mortality ($_4q_1$)	**Under-five mortality** ($_5q_0$)
0-4	42.5	64.7	107.2	93.6	190.7
5-9	37.1	50.5	87.6	81.7	162.2
10-14	31.6	47.9	79.5	78.8	151.9

One of the most striking findings from the ZDHS is the apparent downturn in child survival prospects over the last decade. From 1977-81 to 1987-91, under-five mortality has risen 15 percent from 152 to 191 per 1000 live births. Much of this increase resulted from an increase in mortality under the age of one year. Both neonatal and postneonatal mortality increased by 35 percent in the 15-year period before the survey. In this same period child mortality increased by almost 20 percent.

The infant mortality rate of 107 calculated from the ZDHS data is also considerably higher than the rate of 97 estimated from the 1980 census (see Table 1.1). The rate had been projected to drop to 90 by 1990. Analysis of the actual 1990 census data should shed some light on levels and trends in childhood mortality.

These findings may signal the beginning of an era of increased early childhood mortality in Zambia (and perhaps in other parts of sub-Saharan Africa) in which deteriorating economic conditions, coupled with the spread of new infections such as HIV/AIDS, have led to the breakdown of infrastructures and institutions that at one time supported the downward trend in childhood mortality. In summary, child survival in Zambia is much worse today than it was 10 years ago.

7.3 Socioeconomic Differentials in Infant and Child Mortality

This section presents early childhood mortality indicators by selected background characteristics of the mother for the 10-year period preceding the survey. A 10-year reference period is used to allow adequate numbers of events in each population subgroup. Early childhood mortality rates are shown in Table 7.3 by urban-rural residence, province (grouped for more reliable estimates), mother's level of education and medical maternity care.

Table 7.3 Infant and child mortality by background characteristics

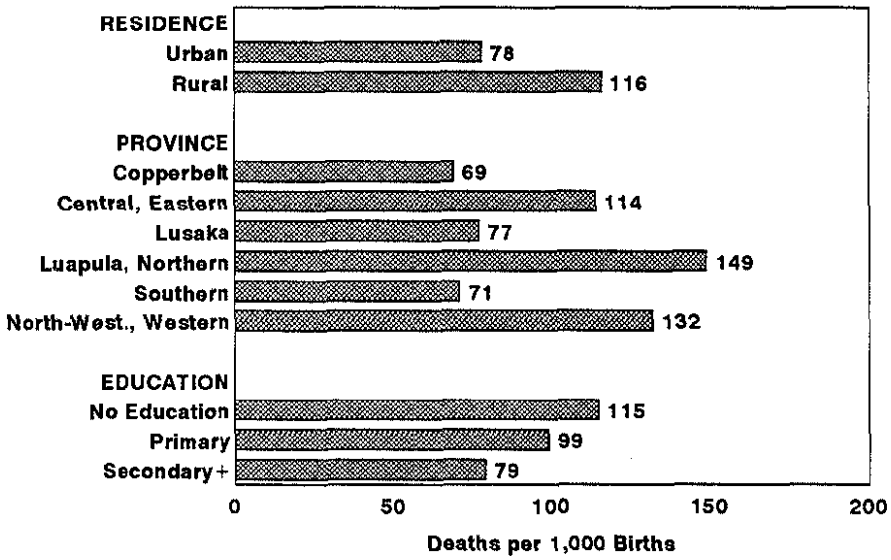
Infant and child mortality rates for the ten-year period preceding the survey, by selected background characteristics, Zambia 1992

Background characteristic	Neonatal mortality (NN)	Postneonatal mortality (PNN)	**Infant mortality** ($_1q_0$)	Child mortality ($_4q_1$)	**Under-five mortality** ($_5q_0$)
Residence					
Urban	31.7	46.3	78.0	78.9	150.8
Rural	47.3	68.5	115.8	96.6	201.2
Province					
Copperbelt	22.3	46.6	68.9	80.8	144.2
Eastern, Central	50.6	63.5	114.1	108.2	210.0
Lusaka	32.0	44.7	76.8	69.3	140.8
Luapula, Northern	55.1	93.4	148.5	112.6	244.4
Southern	33.7	36.8	70.5	68.5	134.2
North-Western, Western	59.9	72.1	132.0	90.2	210.3
Education					
No education	46.7	68.1	114.9	101.2	204.4
Primary	39.5	59.2	98.7	92.1	181.7
Secondary+	35.0	44.3	79.4	60.2	134.8
Medical maternity care[1]					
No antenatal/delivery care	(79.9)	(108.9)	(188.8)	*	(299.5)
Either antenatal or delivery	41.8	62.3	104.1	88.9	183.7
Both antenatal & delivery	38.2	63.1	101.3	83.0	175.8
Total	40.0	58.2	98.2	88.1	177.6

Note: Rates based on 250-499 cases (exposed children) are enclosed in parentheses. Rates based on fewer than 250 cases are suppressed and marked with an asterisk.
[1]Rates for the five-year period before survey. Medical care is that given by a doctor, nurse, trained midwife or received in a hospital, clinic or health centre.

Children in rural areas of Zambia experience 33 percent higher risk of dying before their fifth birthday than urban children. This urban-rural differential is larger during infancy (50 percent higher rural risk) than during the 1 to 5 year age period (22 percent), and may be explained by the relative unavailability of antenatal and delivery services in the more remote, rural settings. In other words, whereas one in 13 children in urban areas dies before their first birthday, the ratio for the rural areas is one in 9 children (see Figure 7.1).

Figure 7.1
Infant Mortality Rates by Background Characteristics



ZDHS 1992

Differences in mortality rates by province are also quite marked. Childhood mortality is highest in Northern/Luapula Provinces, where almost 25 percent of children do not live to see their fifth birthday. Eastern/Central and North-Western/Western Provinces also have high childhood mortality. Mortality is lowest in Southern Province with an estimate of 134 deaths under age five per 1000 live births. The pattern of higher infant than child mortality is common among all Zambia's provinces except Copperbelt Province. The pattern in Copperbelt Province might be due to the fact that the bulk of the work force in this province obtains health care through the copper mining companies; this may have a more favourable effect on infant than on child mortality.

All early childhood mortality rates are higher for women with little or no education, presumably in part because they have more limited access to basic health services. Children born to uneducated mothers are 50 percent more likely to die before their fifth birthday than their counterparts born to mothers with secondary or higher education. The strength of the relationship increases with increasing age of the child at risk.

Maternal care during pregnancy and delivery is associated with childhood mortality. Children born to women who obtained both antenatal and delivery care from a medically-trained person have lower mortality rates at every age than children whose mothers received only antenatal *or* delivery care. (Although the sample of children whose mothers received neither type of care is small, the rates are so high as to be compelling.)

7.4 Demographic Differentials in Infant and Child Mortality

This section examines differentials in early childhood mortality by various demographic characteristics of both the child and the mother. Table 7.4 presents mortality rates for the ten years preceding the survey by sex of child, age of mother at birth, birth order, length of the previous birth interval and size of the child at birth.

Table 7.4 Infant and child mortality by demographic characteristics

Infant and child mortality rates for the ten-year period preceding the survey, by selected demographic characteristics, Zambia 1992

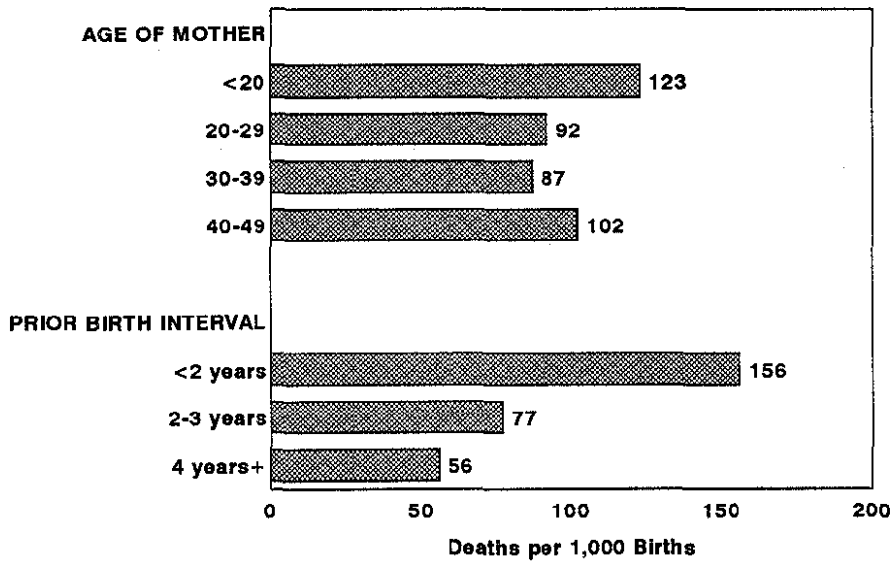
Demographic characteristic	Neonatal mortality (NN)	Postneonatal mortality (PNN)	**Infant mortality** ($_1q_0$)	Child mortality ($_4q_1$)	**Under-five mortality** ($_5q_0$)
Sex of child					
Male	46.3	59.9	106.2	91.3	187.8
Female	33.9	56.5	90.3	85.1	167.8
Age of mother at birth					
< 20	53.3	69.8	123.2	110.1	219.7
20-29	36.0	56.4	92.4	85.0	169.5
30-39	34.4	52.7	87.1	76.2	156.6
40-49	(53.8)	(47.7)	(101.5)	(79.8)	(173.2)
Birth order					
1	50.8	70.8	121.5	104.6	213.4
2-3	35.2	60.9	96.2	92.6	179.8
4-6	35.3	50.7	86.0	74.8	154.4
7+	42.6	51.3	93.9	84.9	170.8
Previous birth interval					
< 2 yrs	70.0	85.8	155.8	104.5	244.0
2-3 yrs	28.3	48.2	76.5	80.1	150.5
4 yrs +	20.1	36.0	56.1	69.5	121.7
Size at birth[1]					
Very small	*	*	*	*	*
Smaller than average	122.2	(78.3)	(200.5)	(131.6)	305.8
Average or larger	28.4	64.1	92.4	84.4	169.0

Note: Rates based on fewer than 250-499 cases (exposed children) are enclosed in parentheses. Those based on fewer than 250 cases are suppressed and marked with an asterisk.
[1]Rates for the five-year period preceding the survey.

It is well established that male children are at increased mortality risk both before and shortly after birth, presumably due to genetic factors. This is true of Zambian male children who are 12 percent more likely to die before their fifth birthday than their female counterparts. Although male mortality exceeds female mortality for every age interval studied, the differences are largest for the neonatal period; during the first month of life, male children are 37 percent more likely to die than female children (46 vs. 34 deaths per 1000 births). Afterwards, the differential diminishes to negligible levels. Male children are only 18 percent more likely to die during infancy than their female counterparts.

The relationship between mother's age at the time of birth and childhood mortality exhibits the expected curvilinear pattern. In other words, the highest mortality occurs for children of very young mothers and mothers nearing the end of their reproductive lives (see Figure 7.2). This pattern can be observed for all

Figure 7.2
Infant Mortality Rates by Demographic Characteristics



mortality rates in Table 7.4 except for postneonatal mortality, where the rate is slightly lower for women age 40-49 than that of women 30-39. This pattern is most pronounced in the first month of life and much less pronounced during the 1 to 5 year age period. Rates for the oldest women should be viewed with caution, since they are based on a relatively small number of births.

Since birth order of the child and maternal age are highly correlated, it is not surprising to find mortality risks to be greater among first births (which are generally to young mothers) and births of order seven or higher (which are generally to older mothers). Mortality differentials by birth order are more pronounced among neonates and infants where first births are 44 and 26 percent more likely to die than second and third children, respectively.

Shorter birth intervals are associated with higher mortality both during and after infancy. This is particularly true within the first month of life, when children born less than two years after a previous birth are three and a half times more likely to die than babies born four or more years after the previous birth. The birth interval effect on mortality risk persists after the neonatal period, but with diminished strength. During infancy, children born less than two years after a previous birth are almost three times more likely to die than their counterparts born four or more years after the previous birth. These differentials suggest that mortality risks for Zambian children, particularly those born to young mothers, would be substantially reduced if birth intervals were increased, possibly through family planning.

Children who are perceived by their mothers to be smaller than average at birth experience higher mortality rates than children perceived to be average or larger, particularly in their first month of life and in infancy. The pattern is consistent among all rates in the table. Since only two percent of babies are considered to be very small at birth (see Table 8.6 in next chapter), there are too few cases to make reliable mortality estimates.

7.5 High-Risk Fertility Behaviour

Infants and children have a greater probability of dying if they are born to mothers who are too young or too old, if they are born after a short birth interval or if they are of high birth order. Table 7.5 presents the distribution of children born in the five years preceding the survey according to the above categories of increased risk of infant and child mortality. In this analysis, a mother is classified as "too young" if she is less than 18 years of age and "too old" if she is over 34 years of age at the time of delivery. A "short birth

Table 7.5 High-risk fertility behaviour

Percent distribution of children born in the five years preceding the survey who are at elevated risk of mortality, and the percent distribution of currently married women at risk of conceiving a child with an elevated risk of mortality, by category of increased risk, Zambia 1992

Risk category	Births in last 5 years preceding the survey		Percentage of currently married women[a]
	Percentage of births	Risk ratio	
Not in any high-risk category	37.4	1.0	24.7[b]
Single high-risk category			
Mother's age < 18	9.0	1.2	1.4
Mother's age > 34	0.1	*	1.5
Birth interval < 24	6.2	(1.3)	11.3
Birth order > 3	28.0	0.8	18.9
Subtotal	43.2	0.9	33.0
Multiple high-risk category			
Age <18 & birth interval <24[c]	0.5	*	0.5
Age >34 & birth interval<24	0.0	*	0.0
Age >34 & birth order>3	11.0	0.7	21.0
Age >34 & birth interval <24 & birth order >3	1.6	*	5.9
Birth interval <24 & birth order >3	6.3	(1.4)	14.8
Subtotal	19.4	1.0	42.2
In any high-risk category	62.6	0.9	75.3
Total	100.0	NA	100.0
Number	6215	NA	4457

Note: Risk ratio is the ratio of the proportion dead of births in a specific high-risk category to the proportion dead of births *not in any high-risk category*. Figures in parentheses are ratios based on 250-499 cases. An asterisk means the data are based on fewer than 250 cases and have been suppressed.
NA = Not applicable
[a]Women were assigned to risk categories according to the status they would have at the birth of a child, if the child were conceived at the time of the survey: age less than 17 years and 3 months, age older than 34 years and 2 months, latest birth less than 15 months ago, and latest birth of order 3 or higher.
[b]Includes sterilised women
[c]Includes the combined categories *Age <18 and birth order >3*.

interval" means the birth occurred less than 24 months after the previous birth and a child is considered of "high birth order" if the mother had previously given birth to three or more children. In the table, births are divided into two major categories: those falling into a *single* high-risk category (such as those born to mothers below the age of 18 or over the age of 34, those born after an interval of less than 24 months and those of birth order 4 or higher) and those falling into a *multiple* high-risk category (such as those born to mothers below the age of 18 and born after an interval of less than 24 months or those born to mothers over the age of 34 and of birth order over 3).

The data show that, while 63 percent of children in Zambia are at elevated risk of mortality due to their mother's fertility behaviour, only 37 percent are free from such risk. Births in the single high-risk categories (43 percent) are more than double those in the multiple high-risk categories (19 percent).

It is evident from the table that birth order higher than 3 is the major factor contributing to elevated mortality risks. Almost half of the births (47 percent) are at risk because of high birth order. An even larger proportion of married women (61 percent) are at risk of conceiving a child of birth order over three.

Fifteen percent of babies born in Zambia are at elevated risk of mortality because they are born after an interval of less than 24 months. Thirteen percent of babies are at risk because their mothers are over age 34 when they are born and a further 10 percent are at risk because their mothers are under age 18.

The table also presents the relative risk of mortality of children born in the last five years by comparing the proportion dead of births in each risk category to the proportion dead of births with no risk factor. This risk ratio is shown in the second column of Table 7.5. The ratios show no significant differences among categories.

It is interesting to note that three-quarters of currently married women are at risk of conceiving a child with an elevated risk of mortality. This proportion is higher than that for births.

To reduce the number of high-risk births, there is need for a concerted effort to generate demand for family planning, particularly to limit births of higher parity. This, together with improved availability of contraceptive methods to couples, would reduce high risk births, which in turn would reduce childhood mortality.