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Mortality in Lesotho: A Study of Levels, Trends and Differentials Based on Retrospective Survey Data

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The WFS is being undertaken, with the collaboration of the United Nations, by the International Statistical Institute in cooperation with the International Union for the Scientific Study of Population. Financial support is provided principally by the United Nations Fund for Population Activities and the United States Agency for International Development.
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1 Introduction

The Lesotho Fertility Survey (LFS) was conducted by the Bureau of Statistics of the Government of Lesotho in 1977. It formed part of the World Fertility Survey (WFS) programme of research undertaken by the International Statistical Institute. As its name implies, the survey was concerned primarily with fertility but it also collected a wealth of information upon a number of other topics. One such topic is mortality. The data gathered in the LFS upon mortality are far more detailed than those available from other sources and represent a very important source of information upon the subject. This paper presents a demographic study of mortality levels, differentials and trends in Lesotho that makes full use of the new estimates that can be obtained from the LFS.

In Lesotho, as in most African countries, the only data that can be used to study mortality have been gathered in surveys and censuses. These have included two prospective studies designed to register deaths soon after they occurred. However most mortality estimates for the country have been obtained by applying indirect methods to information collected in retrospect. Such methods estimate mortality indices from the responses to simple questions. These only involve ages at death or dates for recent events but require the application of sophisticated techniques of analysis to the data.[1] Indirect methods have been used very widely in Africa but have revealed little about mortality trends and differentials. Recent methodological advances are leading to more detailed study in these areas. On the other hand, a number of authors have revived the debate about whether indirect methods can provide anything more than the crudest estimates of mortality. For example, Garenne (1982) has suggested that our ignorance about age patterns of mortality in childhood in Africa makes it impossible to estimate conventional indices of childhood mortality from proportions dead amongst children ever born. Moreover, one of the originators of methods for estimating the level of mortality in adulthood by indirect means has expressed doubts about the performance of such techniques under conditions of changing mortality (Zlotnik and Hill 1981).

Because so much of our knowledge of mortality conditions in Africa has been obtained using indirect methods, the surveys conducted in Lesotho and other African countries as part of the WFS are of particular interest. First, they include a very different source of estimates. The surveys collected complete birth histories from women of childbearing ages. These included questions about whether each child had died and, for those who had, about ages at death. When combined with information on birth dates, such data permit the direct estimation of levels of, and trends in, infant and child mortality. Unlike those obtained by indirect means, estimates such as these can be obtained without the application of models or of assumptions about fertility. However, their usefulness is dependent upon the ability of interviewers to collect accurately the detailed information involved. The results can be of great interest, particularly for the study of age patterns of mortality and mortality differentials within infancy and childhood. This potential of the WFS birth history data has already been exploited in a number of single-country and comparative studies of mortality at young ages (see, eg Meegama 1980 and Rutstein 1983). Secondly, in addition to these data, a number of countries, of which Lesotho is one, incorporated the WFS mortality module in an expanded household survey. This module includes the entire range of retrospective questions that are usually employed in the indirect estimation of mortality. These yield a variety of independent measures of mortality levels and trends and, in particular, several series of estimates of adulthood mortality. Comparison of these estimates with one another, with those obtained by direct methods and with those obtained from other surveys can represent a powerful check upon the performance of the indirect methods. This fact, together with the large samples covered by such household surveys, makes them a particularly useful source of data.

Mortality estimates based upon a preliminary analysis of the LFS data have already been published in the First Report upon the survey and elsewhere (Bureau of Statistics 1981a, 1981b). There are two main directions in which the present study is intended to advance this work. First, recently developed techniques for locating indirect mortality estimates in time are applied to the data. Not only do these permit the measurement of mortality trends but they also greatly facilitate comparison of data from different sources. The importance of this for evaluation of particular questions and techniques has already been mentioned. The approach is likely therefore to improve the final estimates of mortality that are produced. Secondly, this study is concerned with mortality differentials, a subject about which very little is known either in Lesotho or for Africa in general. In particular the wealth of information upon mortality differentials at young ages that can be obtained from the birth histories is examined in some detail.

1.1 THE COUNTRY

Lesotho is a small, independent nation in Southern Africa. It is landlocked and is surrounded completely by the Republic of South Africa. The country was a British

[1] The body of the text assumes some familiarity on the part of the reader with the techniques discussed and employed. A brief discussion of the approaches to analysis that are used, together with references, is provided in appendix A.

colony from 1868 to 1966 when it regained its independence. Lesotho's population was 970 000 according to the 1966 Census and had grown to 1217 000 by the time of the 1976 Census. This suggests an annual rate of growth of 2¼ per cent.

In a number of ways that are relevant to the study of mortality Lesotho is quite unlike most of sub-Saharan Africa. The country lies at a high altitude; all of it is above 1500 m and in the east and north the terrain is rugged and mountainous. Frosts and snow are common in winter. The rainfall is modest, about 700 mm per annum over most of the country, and is concentrated in the summer months. The altitude and climate affect patterns of disease. Malaria transmission does not occur and other tropical diseases such as schistosomiasis and sleeping sickness are totally absent from the country.

On topographical and ecological grounds Lesotho is usually divided into four regions: the Lowlands in the west of the country, the Foothills, the Mountains in the east and the Orange River Valley. However, for most demographic purposes the country can be considered a homogenous unit. Its inhabitants are almost all members of the Basotho people and share a common language and culture. Moreover, Lesotho is overwhelmingly rural in character; over 80 per cent of domestic employment is in agriculture. The only major urban area is centred on the capital, Maseru. It is growing rapidly, but its population remained less than 70 000 at the time of the 1976 Census. Lesotho is a very poor country. It has few resources and little industry. Most households are involved in farming, but a shortage of agricultural land, a history of overcropping and associated problems mean that the country cannot feed its population. The two main staple crops are maize and sorghum. Cattle raising is also important. The economy is dominated by labour migration to South Africa. This takes place on a very large scale with remittances, for example, exceeding the gross domestic product. The migrant labourers are mostly male and intersperse periods of work in South Africa of, most frequently, one year with spells at home. About 80 per cent of them go to the mines (Murray 1981). Most men consider such work their main occupation – in the LFS individual survey 83 per cent of respondents' husbands were reported to be skilled manual workers. According to the household survey, about 60 per cent of absentees were men aged between 15 and 49. It can be seen from table 1 that some 40 per cent of all men in this age range were enumerated as absent at the time of the survey.[2] The survey data suggest that migrant labourers are drawn from all regions and educational groups. Such labour migration to South Africa is a long established tradition in Lesotho. It has grave consequences for family life (Murray 1981) and political implications for the country as a whole.

Compared with most of Africa, the population of Lesotho is highly educated. As is shown in table 2, not only have 61 per cent of all men over the age of 15 been to school but, even more strikingly, the same is true of 84 per cent of women. The school system was originally developed by the missions and widespread school attendance is not a recent development. About half of the men and two-thirds of the women in their late fifties have some schooling. The lower rates of school attendance among boys result from the shortage of male labour created by their fathers' absence abroad. Not surprisingly, relatively few people have gone on to secondary or higher education, 9.3 per cent of men aged 15 or more and 8.5 per cent of women. Nevertheless, the numbers involved are not insignificant. Moreover they are much higher in the younger cohorts.

Table 1 Percentage of absentees in the *de jure* population by age group and sex, LFS household survey

Age	Male	Female
0–4	5.3	5.3
5–9	4.6	4.5
10–14	6.7	5.2
15–19	21.5	10.5
20–24	52.3	11.5
25–29	51.0	10.0
30–34	49.6	10.0
35–39	46.7	9.0
40–44	39.7	8.5
45–49	37.3	8.4
50–54	27.3	6.5
55–59	21.1	5.2
60–64	17.5	4.4
65–69	11.8	2.8
70–74	9.6	2.6
75+	7.7	2.4
All	22.8	7.1

The population has the young age structure typical of the developing countries. According to the household survey, 40 per cent of it is under 15 years of age and only 4 per cent of it older than 65. As this suggests, the level of fertility is high, although moderate by African standards. Various estimates, based on the LFS and earlier surveys, indicate that the total fertility rate is between 5.4 and 5.7 births per woman (see, eg Bureau of Statistics 1981b).

There is no evidence of any significant trend in the level of fertility and, with the exception of low fertility in Maseru and among women with secondary schooling, differentials in fertility are small. Almost everyone marries eventually in Lesotho but the mean age at first marriage of women is quite high for Africa. The household survey data yield a singulate mean age at marriage of 20.1 for women and of 24.8 for men. Equivalent statistics calculated from the 1976 Census data are identical (Bureau of Statistics 1981a).

1.2 SOURCES OF DATA

Before the LFS three other large-scale surveys were conducted in Lesotho that collected demographic data that can be used to study mortality. These are also considered in this

[2]Most, but not all, absentees enumerated by the survey will be migrant labourers. The *de jure* sex ratios obtained in the household survey suggest that some absentee males have been omitted from the enumeration (Timæus and Balasubramanian 1984).

Table 2 Per cent distribution of the adult population according to level of schooling by age and sex, LFS household survey

Age	Male				Female			
	None	Lower primary	Upper primary	Secondary +	None	Lower primary	Upper primary	Secondary +
15–19	27.1	44.2	19.0	9.7	4.0	39.2	41.2	15.6
20–24	31.6	34.7	19.7	14.1	6.0	33.1	44.4	16.5
25–29	32.5	33.2	21.2	13.1	5.9	38.8	43.7	11.6
30–34	33.8	36.6	20.1	9.5	8.9	41.5	41.2	8.4
35–39	35.1	36.3	19.8	8.9	10.0	48.9	40.1	5.0
40–44	44.0	33.1	17.0	5.9	18.2	48.2	29.4	4.1
45–49	41.8	35.3	16.0	6.9	18.2	51.5	30.0	3.4
50–54	44.3	34.0	16.0	5.6	21.7	52.6	23.4	2.3
55–59	51.0	31.2	13.0	4.8	32.9	50.2	15.4	1.5
60–64	52.2	28.9	14.5	4.4	39.2	45.5	14.3	1.0
65–69	57.2	26.1	13.8	2.9	45.1	41.4	12.5	0.9
70–74	61.5	23.6	10.8	4.1	48.3	40.3	10.9	0.5
75+	70.1	20.3	6.2	3.4	68.2	25.0	6.6	0.2
15+	39.1	36.5	15.1	9.3	16.1	41.9	33.6	8.5

study.[3] Although their scope is far more limited than that of the LFS, they can yield useful estimates of the overall level of, and trend in, mortality.

The LFS itself was conducted in three separate stages. The first phase was a large-scale household survey conducted by male enumerators. The second was a smaller, more detailed survey of ever-married women aged 15–49. This was conducted by female interviewers. Finally, the third phase was a post-enumeration survey designed to examine response reliability. The household survey was conducted on both a *de jure* and a *de facto* basis. It included questions upon age, sex, education and marital status; upon the lifetime fertility and most recent birth of all women aged 15 and over; and upon mortality. The latter section comprised questions on deaths of children ever born, on the survival of the parents of all respondents aged 15 or more, on the survival of the first spouse of everyone married more than once and on deaths of members of the household during the two years before the survey. Almost all occupied dwellings included in the sample were enumerated successfully. This resulted in a *de jure* sample of 86 744 individuals or about 7 per cent of the total population. The individual survey was necessarily a *de facto* one as it involved interviewing the respondents in person. The subjects covered included the respondent's and her current or last husband's background, a birth and a marriage history, contraceptive knowledge and use and information on other factors affecting fertility. The data on infant and child mortality were collected in the birth histories. Questions were asked on the date of birth and the sex of each of the respondent's children and on the age at death of all children who had died. The individual survey interviewed all eligible women in a subsample of 5548 of the households that had been enumerated in phase one. This produced a sample of 3603 women. It should be noted that this is only about 72 per cent of the number of respondents that had been expected. An analysis of the causes and consequences of this shortfall concluded that the sample includes too few women in their forties and too few uneducated women but that this does not affect aggregate demographic estimates greatly (Timæus and Balasubramanian 1984).

The most recent of the previous surveys was the Demographic Survey conducted by the Bureau of Statistics in 1971–3. This was a national, multi-round survey covering a self-weighting area sample of some 115 000 individuals. Its main purpose was to collect prospective information upon births and deaths. Additionally retrospective questions upon fertility and mortality were asked in the first round. These included questions upon deaths of children ever born and questions on maternal and paternal orphanhood. The analysis reported on here draws upon that carried out by J.G.C. Blacker (undated) at the request of the Government of Lesotho. So does the analysis of the third survey considered by this study, the demographic component of the 1967–9 Rural Consumption and Expenditure Survey (Bureau of Statistics 1973). This was a single-round survey that covered a sample of 127 000 individuals. For the purposes of fieldwork the country was divided into three areas which were enumerated in three separate stages during 1968–9. The questions upon mortality covered the same topics as the 1971 survey. However, usable data upon orphanhood are only available for one of the three areas and information upon infant and child mortality only for the two sexes combined.[4] Finally, mortality data from a

[3] In addition, mortality estimates can be obtained using the intercensal survival technique and from the childhood mortality question included in the 1976 Census. Such estimates are presented in the census report (Bureau of Statistics 1981a). Work done by J.G.C. Blacker (1982) suggests that child deaths were under-reported severely in the 1976 Census.

[4] As Maseru and some other urban districts were excluded from the sampling frame and as the sampling fraction differed slightly between the areas, the results are not true national figures. However they will be close approximations to them. In the analysis all the data are treated as having been collected at the mean date of fieldwork.

prospective study carried out in 1962–6 are also examined here. This study formed part of a WHO tuberculosis control programme conducted in the western Lowlands region of Lesotho. It covered a sample of about 32 000 people who were followed for 67 000 person years during the study (WHO Epidemiological Centre 1967).

2 Infant and Child Mortality

Estimates of the overall level of infant and child mortality in Lesotho have been derived from each of the demographic surveys conducted there. Apart from such estimates, little useful statistical information upon patterns of morbidity and mortality among infants and children is available. An early attempt to measure the infant mortality rate used data on deaths in the previous three months that had been collected in a sample enquiry conducted in conjunction with the 1956 Census. It arrived at a rate of 181 per 1000 births (United Nations 1962). Even if mortality was once this high, data collected during the 1970s suggest that it is now far lower. The 1976 Census Report considered a wide range of evidence and produced estimates of the infant mortality rate that range between 103 and 122 per 1000 births (Bureau of Statistics 1981a). The First Report on the LFS arrived at similar estimates and concluded that the infant mortality rate is almost certainly over 110 per 1000 births (Bureau of Statistics 1981b).

While there is broad agreement as to the level of mortality in infancy and childhood in the mid 1970s, less is known about whether and how much such mortality had declined before this. In this chapter both the LFS and the earlier surveys are reanalysed and the evidence they offer about mortality trends is considered. The study then examines the age pattern of infant and child mortality and seasonal variations in mortality. Information on these topics comes mainly from the birth history data collected in the LFS. Finally both direct and indirect estimates from the LFS are used to document demographic and socio-economic differentials in infant and child mortality.

The scope of studies such as this is limited by the inability of either the direct or the indirect approach to the estimation of mortality from retrospective survey data to reveal much about the factors that influence mortality. In particular, large-scale surveys cannot gather useful information about causes of death. Without such data, refined investigations into the determinants of mortality patterns cannot be conducted. Demographic surveys are also unsuited to the collection of detailed information about many of the subjects that directly affect the incidence and severity of diseases. For example, none of the surveys considered in this paper collected information upon nutrition, upon the availability and use of medical services or upon factors related to hygiene such as water supplies and toilet facilities. Moreover even data that are collected about the characteristics and circumstances of respondents in retrospective surveys usually refer to the present, while the deaths that are reported may have occurred a long time before the survey. Therefore, although the documentation of mortality differentials and trends inevitably raises questions and suggests hypotheses about the influences at work, the analysis of demographic surveys can discover little about the determinants of the patterns that it finds.

2.1 LEVELS OF, AND TRENDS IN, MORTALITY BEFORE AGE FIVE

Life table probabilities of infant and child death estimated directly from the LFS individual survey birth histories are shown in table 3. They measure mortality for successive five-year periods up to the time of the survey. Ages at death were not reported for 6 per cent of all children who had died before the mother was interviewed. It is impossible to determine whether these were in fact mainly deaths at very young ages or whether they are distributed across all ages. As table 3 is intended to provide the best estimates of the overall level of mortality, such deaths have been included in the calculations. Failure to record either zero for neo-natal deaths or ages in months for other deaths in the first year seems to be the most likely explanation of most of the non-statement of ages at death. Therefore all such deaths have been assumed to be infant deaths. As most child deaths do occur in infancy, any bias that results is probably small.

The use of rates for five-year periods conceals any year-to-year fluctuations in mortality at young ages. However, the small size of the individual survey sample means

Table 3 Mortality rates in infancy and childhood for five-year periods before the survey, LFS individual survey[a]

Probability of death	Years before the survey				
	0–4	5–9	10–14	15–19	20–24
Infant ($_1q_0$)	0.1258	0.1333	0.1475	0.1211	0.1418
Early childhood ($_1q_1$)	0.0290	0.0309	0.0320	0.0229	0.0456
Late childhood ($_3q_2$)	0.0265	0.0297	0.0295	0.0341	(0.0499)
Overall ($_5q_0$)	0.1737	0.1850	0.1992	0.1705	(0.2218)

[a]This table has been extracted from Rutstein (1983). All deaths for which age at death is unknown are assumed to be infant deaths. Estimates in parentheses are based upon less than 500 children exposed.

that sampling errors rather than genuine trends would dominate rates that referred to shorter intervals. The estimates indicate that, underlying any such short-term fluctuations, there was a slow steady decline in the level of infant and child mortality in Lesotho from the mid-1960s on. In the period 10–14 years before the survey the probability of a child dying by its fifth birthday waa about 20 per cent. By the period 0–4 years before the survey, it had declined to about 17½ per cent. The rates for particular age groups are slightly erratic. Nevertheless, it is clear that the decline in mortality was contributed to by all age groups. Taking these figures at face value, the infant mortality rate fell from 148 per 1000 births to 126 between the periods 10–14 and 0–4 years before the survey. Mortality at age one and over appears to have declined proportionally slightly less. Of course assigning all deaths at unknown ages to infancy is liable to result in overestimation of the infant mortality rate. However, the pattern of mortality decline is unlikely to be an artifact of this procedure as such deaths are distributed evenly across the different periods. Moreover in general one would expect all these direct estimates of mortality to be too low. Underreporting of dead children does not appear to be a major problem (Timæus and Balasubramanian 1984) but apart from any such tendency it has already been mentioned that older and uneducated women are underrepresented in the individual survey sample. The children of both groups might be expected to suffer from above average mortality.

The mortality trends indicated by the direct estimates for periods more than 15 years before the survey are less plausible. They suggest that mortality before age two rose sharply in the early 1960s and that child mortality fell abruptly from very high levels in the late 1950s. Neither change is likely to have occurred and there are good reasons to expect these rates to be unreliable. They are based upon reports by women in their thirties and forties about the survival of their early births. First, the dating of events that occurred so long ago is bound to be poorer than that of recent events. Secondly, the estimates are based on a greatly reduced sample of births. They are therefore subject to greater sampling errors than those for recent periods. Thirdly, the sample of older women is subject to biases and is less educated than the sample of younger women. The reports of this group may be inaccurate even for the recent past. However, as they have had relatively few births recently, any bias might only have a noticeable effect on estimates for longer ago. Lastly, the estimates for more distant periods are increasingly based upon births to young mothers. Not only are the ages of mothers when their children are born likely to be directly related to the chances of survival for their children, but older cohorts probably had different socio-economic characteristics from those that are covered.[5] Some of these errors and biases might be expected to cancel out. Nevertheless the direct estimates seem unlikely to be reliable for the more distant past and the implausible trends observed for periods more than about 15 years before the survey should be ignored.

The LFS household survey, the 1971 round of the Demographic Survey and the 1968–9 survey included questions on womens' lifetime fertility and on the numbers of their children who have died. Infant and child mortality can be estimated indirectly from the answers to those questions. There appear to be far fewer problems with these data than with the birth histories. All three surveys have samples that are far larger than the number interviewed in the individual survey. Moreover, there is no evidence of biases in the samples of women covered by the enumerations. Perhaps most important of all, the questions involved are far simpler and reporting appears to have been for the most part accurate. Proportions of children ever born that have died according to the age of their mothers when interviewed are shown in table 4. In general they rise steadily as the age of the mothers (and therefore the average period of exposure to the risk of death experienced by the children) increases. In both the more recent surveys women of all age groups report that more of their sons than of their daughters have died. This indicates that there are mortality differentials that favour girls. The proportions of dead children reported in the LFS household survey are consistently lower than those found by the earlier surveys. This tends to suggest that there has been some decline in mortality. However, although these proportions seem plausible, inspection of the reported mean parities of each age group, shown in table 5, reveals that there was some omission of births by women in their forties. In the two earlier surveys, visual inspection makes it obvious that the mean parities calculated from the reports of older women are too low. The LFS household survey data seem more plausible but detailed evaluation suggests that, here too, the reported mean parities of women in their forties are slightly underestimated (Timæus and Balasubramanian 1984). It is probable that women fail to report dead children more often than they do those who are still living. Therefore the proportions dead amongst children ever born obtained for the oldest age groups in each survey might be somewhat too low.

The conversion of proportions dead into conventional indices of mortality can be carried out in a number of ways. All the approaches use information about the timing of fertility as measured by parity at young ages. Table 5 reveals that similar patterns of fertility up to age 35 were reported in all three surveys. Mortality rates, corresponding indices of the level of mortality and estimates of the dates to which these apply are shown in table 6. They have been obtained from the proportions in table 4 using Brass's method.[6]

The alpha values measure the level of mortality relative to that in the General Standard (Brass 1971). The three surveys yield three overlapping series of estimates of the level of child mortality. These indicate its trend for a period stretching from the mid-1950s to the mid-1970s. The estimates refer to particular dates but are based upon the mortality of groups of children over much longer periods. Therefore, like the direct estimates, they will tend to smooth out any short-term fluctuations in mortality. Moreover indirect estimates can only measure the overall level of infant and child mortality considered together. To obtain them one must make assumptions about the age

[5]This bias will affect all except current estimates. It seems unlikely to have a substantial effect when only the small number of births to older women are being omitted.

[6]The principles involved are discussed briefly in appendix A.

Table 4 Proportions of children that have died by age of mother, 1968 survey, 1971 survey, LFS household survey

Age	1968 survey	1971 survey			LFS household survey		
	Both sexes	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.1188	0.1601	0.1145	0.1373	0.1308	0.1218	0.1263
20–24	0.1534	0.1880	0.1489	0.1685	0.1459	0.1337	0.1402
25–29	0.1739	0.2011	0.1732	0.1872	0.1756	0.1624	0.1691
30–34	0.1925	0.2174	0.1944	0.2059	0.2016	0.1817	0.1918
35–39	0.2148	0.2280	0.2075	0.2178	0.2016	0.1823	0.1919
40–44	0.2318	0.2366	0.2238	0.2302	0.2386	0.2147	0.2268
45–49	0.2651	0.2815	0.2652	0.2734	0.2544	0.2349	0.2446

Table 5 Mean parities by age group of women, 1968 survey, 1971 survey, LFS household survey

Age	1968 survey	1971 survey[a]	LFS household survey[b]
15–19	0.123	0.115	0.154
20–24	1.083	1.009	1.145
25–29	2.438	2.437	2.372
30–34	3.633	3.661	3.667
35–39	4.365	4.636	4.622
40–44	4.761	5.162	5.236
45–49	4.779	5.053	5.550

[a] *De facto*.

[b] Women with parity not stated included as zero parity.

pattern of mortality. Estimates of the infant mortality rate in particular are sensitive to errors in these assumptions. Probabilities of death between birth and exact age five are affected less and these are shown in the table. In figure 1 they are portrayed graphically and compared with one another and with the direct estimates. Indices based upon the experience of teenage mothers may reflect excess mortality of their children. In addition, they can easily be distorted by deviations in patterns of fertility and mortality from those assumed by the estimation technique. Therefore they should not be taken to indicate the trend in mortality over time and have been omitted from the figure.

The indirect mortality estimates obtained from the LFS household survey data agree closely with the direct measures yielded by the individual survey. They confirm that the probability of death by age five declined steadily from just under 20 per cent in the mid-1960s to about 17½ per cent a decade later. The points fluctuate erratically. This is probably for the most part because of biases in the statement of age. Considering that the two surveys adopted very different approaches to the collection of data and to its analysis, the close agreement between the estimates finally produced of both the level and the trend in child mortality is striking. The earlier estimates from both sources also agree closely with those calculated from the responses of younger women in the 1968–9 survey. However, the 1971 survey data suggest that appreciably higher mortality levels prevailed in the second half of the 1960s. They yield probabilities of death by age five for this period that lie in the range 21–22 per cent. In general, deaths tend to be under-reported in all demographic enquiries and mortality estimates to be too low. This does not seem to be a good reason to prefer the estimates obtained from the 1971 survey to those obtained from the LFS. They disagree with the results of all the other surveys while the other surveys not only agree generally about the level of mortality, but also yield three consistent series of measures of the trend in mortality. Moreover the estimates from the 1971 survey appear internally inconsistent. Whereas all the other evidence indicates that mortality has declined steadily, they suggest that it increased during the 1960s. While the reason for such a bias remains unclear, the most plausible explanation is that the proportions dead amongst

Table 6 Estimates of childhood mortality rates ($_xq_0$) and mortality levels (α), 1968 survey, 1971 survey, LFS household survey

Age (x)	1968 survey				1971 survey				LFS household survey			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	0.123	–0.115	0.193	1967.7	0.157	0.025	0.240	1970.3	0.125	–0.106	0.196	1976.4
2	0.160	–0.115	0.193	1966.2	0.183	–0.033	0.219	1969.0	0.142	–0.183	0.172	1974.8
3	0.176	–0.117	0.192	1964.4	0.194	–0.058	0.211	1967.2	0.169	–0.143	0.184	1972.9
5	0.195	–0.106	0.195	1962.2	0.213	–0.053	0.213	1965.1	0.193	–0.115	0.193	1970.7
10	0.220	–0.083	0.203	1959.8	0.227	–0.064	0.209	1962.7	0.195	–0.161	0.179	1968.2
15	0.233	–0.084	0.202	1957.2	0.235	–0.076	0.205	1960.1	0.225	–0.107	0.195	1965.5
20	0.266	–0.053	0.213	1953.9	0.280	–0.018	0.225	1956.9	0.242	–0.116	0.192	1962.2

children ever born reported by younger women in 1971 were too large.

The direct estimates of mortality yielded little information about mortality more than 15 years before the survey. Figure 1 emphasizes the size of the fluctuations in the direct estimates of $_5q_0$ for such periods. However, indirect estimates calculated from the results of the 1968–9 survey do reveal something about mortality trends in the years prior to 1965. According to these figures, mortality decline was slower than it was to become in the following decade and in the mid-1950s the probability of dying before age five was about 21 per cent. However, we have already mentioned that there was substantial omission of children by older women in this survey. This suggests that declines in child mortality could well have been faster than this. For example, although they should not be relied upon, estimates obtained from older respondents in the 1971 survey fall in line with the trend observed in the following decade. Thus it is difficult to quantify the rate of mortality decline before about 1965. However it does seem reasonable to conclude that a slow but steady decline in mortality at young ages had begun by the mid-1950s.

2.2 THE AGE PATTERN OF MORTALITY AT YOUNG AGES

Little is known about age patterns of mortality within infancy and childhood in Africa because indirect methods of estimation cannot measure the relative contributions of deaths at different ages to the overall proportions dead amongst children ever born that mothers report. It is widely believed that the high mortality tropical countries are characterized by relatively heavy mortality in infancy and childhood compared with mortality in adulthood. A major reason for this is thought to be the prevalence of diarrhoeal disease in such countries (Sullivan 1973; Preston 1976). Such patterns of mortality will broadly resemble those found in the Coale and Demeny (1966) South model life tables. Therefore it has been suggested that regressions based on this family of models should be used to estimate mortality in such countries (Sullivan 1973). However, studies in West Africa have revealed a pattern of mortality in which the risk of death remains very high during the second and third years of life (see, eg Garenne 1981) and it is thought that heavy child mortality after age one compared with mortality in infancy is generally characteristic of Africa. Therefore the Coale and Demeny North family of model life tables is sometimes felt to be best suited to African applications. A relatively high level of child mortality is characteristic of this family of life tables. Thus a recent United Nations study of infant mortality used the regressions based upon these models to obtain the estimates for Africa (Bucht and Chamie 1982). Moreover, to concentrate on Lesotho, the report on the 1976 Census of the country argues that it has a North pattern of mortality (Bureau of Statistics 1981a).

Mortality rates for infants and children by single years of age are presented in table 7. They have been calculated on a cohort basis from the LFS individual survey birth history data. A pooled cohort of all births in the fifteen years up to the time of the survey was used. In this way the rates

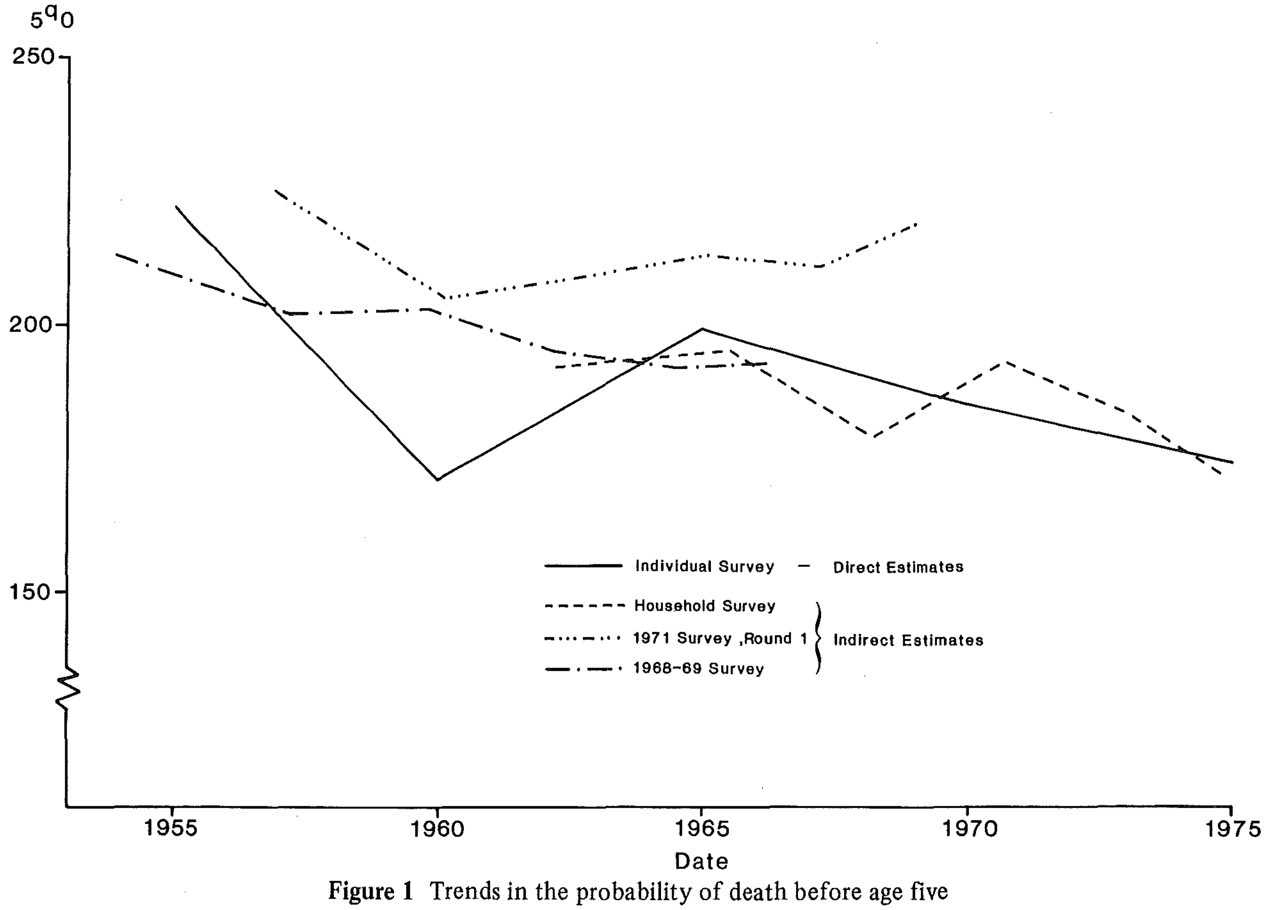

Figure 1 Trends in the probability of death before age five

Table 7 Mortality rates for children born in the last 15 years and corresponding Coale and Demeny model life tables, LFS individual survey

Age (x)	Rate ($_1q_x$)	Level of mortality							
		West		North		East		South	
		Female	Male	Female	Male	Female	Male	Female	Male
0	0.1243	12.6	14.0	11.4	13.0	14.5	16.0	13.7	15.0
1	0.0287	14.4	14.5	14.2	14.7	14.2	14.5	16.7	17.0
2	0.0142	14.0	13.9	15.7	16.2	13.5	13.6	16.5	16.8
3	0.0088	14.3	14.3	17.0	17.4	13.9	13.8	15.8	16.1
4	0.0053	15.8	15.6	18.3	18.8	14.8	15.0	15.6	15.7

have been based on a reasonably large sample of births but data which are known to be substantially affected by reporting errors have been discarded. Although there has been some decline in mortality over the 15 year period, it will have had little effect on age patterns of mortality within childhood as it has affected all age groups more or less in proportion. Dead children whose age at death was not reported present a more serious problem. As this and subsequent sections are concerned with patterns of and differentials in mortality and not its overall level they are excluded from the calculations.

The table also shows the levels of the model life tables in each of the Coale and Demeny families that correspond to the observed mortality rates. A low Coale and Demeny level is indicative of relatively high mortality. Families in which the levels of mortality fitted to the rates for different ages are similar have an age pattern of mortality like that found in Lesotho.

The comparisons in table 7 reveal that the age pattern of mortality up to age five is unlike that in either the North or the South families of model life tables. Lesotho does not exhibit the relatively light mortality in infancy that characterizes the North and, to a lesser extent, the South families. In fact, in relation to mortality after age one, infant mortality is heavier than in the West model life tables which are often regarded as representing some sort of average pattern of mortality. Moreover the child mortality rates estimated from the birth histories show neither the high mortality at ages two and three found in the South models nor the high mortality in later childhood that is characteristic of the North ones. Instead the age patterns of mortality in Lesotho appears to lie between that in the West models for males and that in the East models for females. These families bracket the relationship between mortality in infancy and childhood that is found in the birth history data. They also both describe the pattern of mortality after age one fairly well. Mortality in the fifth year of life is lighter than in either family of models, but whether or not this is a genuine feature of the data cannot be determined easily.

These conclusions are unlikely to stem from errors in the birth history data. If anything these will have led to underestimation of the extent to which deaths at young ages are concentrated in infancy. First, there is considerable heaping of reported ages at death on exact ages in years. For the calculation of the rates, it was assumed that the entire explanation of this was that respondents seldom reported exact ages in completed months as well as years when children were more than one year old. If in fact some of the heaping results from ages being rounded up to the nearest year, too many deaths will have been included in the later age intervals. Secondly, the exclusion of the 6 per cent of deaths for which age at death is unknown from the calculation of the rates in table 7 is, in terms of the pattern of mortality, more or less equivalent to assuming that they are distributed in proportion to other deaths. As has been suggested already, if anything, age at death is more likely not to have been reported when the child died early in infancy. Thirdly, if there was any tendency among respondents to omit to report on some of their children altogether, this is also likely to have occurred most often when the child died very young. Thus the pattern of mortality at ages below five in Lesotho could be even more like that of the East model life tables than these estimates suggest.

It is also possible to examine the age pattern of mortality within the first year of life. Life table mortality rates for each of the first three months of life and for each of the next three quarters are shown in table 8. The apparently low mortality of children aged 9–11 months might in part reflect a tendency to round ages of death up to a value of 12 months. However, any such bias must be slight for mortality in the second year of life is not notably high. Thus it seems safe to assume that the peak in mortality at about ages 9–15 months that has been observed in West Africa (Leridon and Cantrelle 1971; McGregor, Williams, Billewicz and Halliday 1979) is not found in Lesotho. The table also suggests that almost 50 per cent of all deaths in infancy are neo-natal deaths. As there are no suitable standards for comparison, the significance of this is hard to

Table 8 Mortality rates in infancy according to age in months for children born in the last 15 years, LFS individual survey (per 10 000)

Age in months	Rate
0	618
1	122
2	92
3–5	195
6–8	172
9–11	104

assess. While about the average value found by WFS surveys (Rutstein 1983) this proportion seems high considering the overall level of mortality. Such a conclusion in turn tentatively suggests that the contrast between high infant and relatively low child mortality might better be characterized as one between high neo-natal mortality and relatively low mortality after the first month of life.

It is perhaps unsurprising that the pattern of mortality in infancy and childhood in Lesotho is unlike that thought to be typical of sub-Saharan Africa. As was outlined in the introduction, both the physical environment and economic and social conditions are very different from those prevailing in the majority of the continent. Despite this, there are snippets of information that suggest that a similar pattern of mortality might characterize other parts of Southern Africa (Bucht and Chamie 1982; Blacker forthcoming). However, without much more data, it seems unwise to conclude that these results will also apply elsewhere. What they do emphasize is that generalizations about African patterns of mortality should be regarded with caution.

The lack of comparable data also makes any attempt to account for this distinctive age pattern of mortality almost entirely speculative. It is not even clear, given the environmental conditions and overall level of development of the country, whether it is the high level of early infant mortality or the low level of mortality at later ages in childhood that should excite our interest. Nevertheless some general remarks about the kind of factors that must be involved are worth making. The one infectious disease that can take a very heavy toll in the first month of life is tetanus. It does not appear to be an important cause of death in Lesotho. A detailed breakdown of the causes of all deaths in hospitals in Lesotho during 1974 was published by Feachem *et al* (1978). These represent only a small proportion of all deaths and are unlikely to be representative of the overall pattern of causes of death. Nevertheless, it seems significant that none of the 281 infant deaths and only 1 of the 1023 other hospital deaths were caused by tetanus. In addition the quality of care that women receive at birth seems to be better than in many underdeveloped countries. By the mid-1970s almost all pregnant women attended an ante-natal clinic at least once and one-third of births were professionally attended (Ministry of Health 1977). It therefore seems likely that the high level of neo-natal mortality is related to factors that influence prematurity and the viability of the child. In particular, the health and nutritional status of prospective mothers might be important. Unfortunately, without direct measurements of birth weights such hypotheses cannot be tested rigorously.

The main factors influencing levels of mortality in childhood after the first few weeks of life are infectious disease and nutrition. They form an inter-related syndrome in which successive attacks of one or more diseases can weaken a child and contribute to his or her eventual death. One important cause of death in childhood that is not found in Lesotho is malaria. Garenne (1981) has argued that the direct and indirect effects of this disease are essential elements in the constellation of factors that produce extremely high child mortality in West Africa. Despite large-scale supplementary feeding programs for children, malnutrition is known to be a major problem in Lesotho. However its prevalence and severity are difficult to assess. One piece of evidence is that it was recorded as the cause of as many as 28 per cent of the deaths in hospital of those aged 1–4 in 1974. Moreover diarrhoeal disease, high rates of which have been associated with particularly heavy mortality in early childhood (Sullivan 1973; Preston 1976), is known to be a significant cause of death (Feachem *et al* 1978). Thus the country shares the most obvious features of those that have a South pattern of mortality. It therefore seems unlikely that the age pattern of deaths can be explained merely in terms of the presence or absence of various factors that influence mortality.

2.3 SEASONAL VARIATIONS IN INFANT MORTALITY

Because the LFS birth history data include the month and year when births occurred, one can examine the chances of survival of children born at different times of the year. Moreover age at death was usually reported in months as well as years for children that died in the first year of life. This makes it possible to examine seasonal variations in infant mortality directly. Only average seasonal patterns, based on all births during the 15 years prior to the survey, are considered here.

The time of the year when children are born has a lasting impact upon whether they are likely to survive to adulthood. About 18½ per cent of all children born in the autumn and winter months (March–August) during the 15 years before the LFS died before reaching age five.[7] Children born in spring or summer had better chances of survival. Only 16 per cent of them died in the first five years of life. Mortality rates for different ages within infancy according to season of birth are presented in table 9. Children born in autumn and winter continue to be more likely to die after their first birthday. Nevertheless the table largely explains their reduced chances of survival to age five. The neo-natal mortality rate is at its highest in autumn and winter and children born at this time of the year also experience heavier mortality in late infancy than children born in other seasons. Between about one and six months such children are less likely to die than those born in spring and summer. However this does not compensate them for the large absolute differential in mortality in the first month of life.

In figure 2 the same information is presented in a somewhat different way. The figure shows the per cent difference between each of the rates in table 9 and the overall mortality rate for that age group. The estimates for births in each quarter run down the diagonals and the horizontal axis indicates the time of the year at which the deaths occurred. I have already pointed out that neo-natal mortality is high in autumn and winter and is low in spring and summer. Post-neonatal mortality has a different seasonal pattern. In all age groups it is high in summer and autumn and low in winter and spring. It appears to reach a peak in about February and March and to be at its lowest around August and September. The overall pattern of seasonal variation in infant mortality seems similar to that documented for the black population of the Republic of South Africa by Crook and Dyson (1980).

[7] The terms summer and winter are as appropriate as those wet-season and dry-season as a way of characterizing Lesotho's climate.

Table 9 Mortality rates by age within infancy according to season of birth for children born in the last 15 years, LFS individual survey (per 10 000)

Age in months	Spring	Summer	Autumn	Winter
	Sept–Nov	Dec–Feb	Mar–May	Jun–Aug
0	532	543	695	673
1	151	142	102	100
2	91	105	89	85
3–5	247	202	152	186
6–8	123	113	220	216
9–11	86	84	134	108

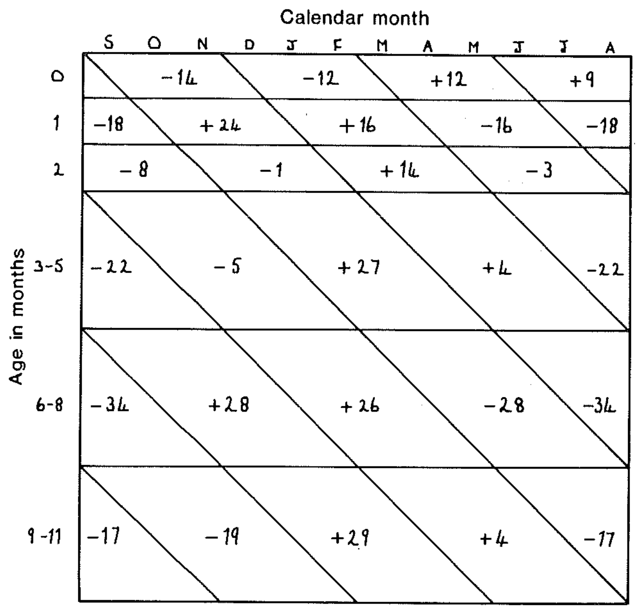

Figure 2 Per cent differences between the mortality of infants born in each season and the annual rates by age in months

Seasonal fluctuations in the level of post-neonatal mortality probably reflect seasonal changes in the prevalence of disease and in the nutritional status of children. A similar pattern could well affect mortality amongst older children. Summer in Lesotho is the wet season as well as the hot season. Infectious disease is likely to be most prevalent at this time of the year.[8] In particular, a detailed study of water-related disease in Lesotho concluded firmly that diarrhoeal disease is a significant component of all disease among the under-fives and that it is highly concentrated in the wet season (Feachem *et al* 1978). Moreover summer is also the hungry season in Lesotho. A nutrition survey – conducted in 1956–60 but probably indicative of conditions more recently – found that adults lost 7 per cent of their body weight during the summer months (May and McLellan 1971). In Lesotho most children are breastfed for considerably longer than a year. Nevertheless, such seasonal food shortages might affect the nutritional status of young children either directly, in terms of the supplementary food they receive, or indirectly, through reducing the quality and quantity of breast milk that mothers can supply.

The contrasting pattern of seasonal variation in the level of neo-natal mortality emphasizes that it is influenced by different factors from those that affect post-neonatal mortality. Deaths from infections of the new born probably do vary seasonally, but they represent only a small proportion of all neo-natal deaths and may well follow a seasonal pattern that resembles that of deaths from infections at older ages. Moreover, the quality of the medical care that women receive at birth is unlikely to vary much over the course of the year. Seasonal variations in the health and nutritional status of pregnant women seem to be the most plausible explanation of the increase in neo-natal mortality experienced in the period March–August. Disease and malnutrition are most prevalent in summer and the effects of this on pregnant women could explain why neo-natal mortality is at its highest soon after the harvest. Moreover, the 1956–60 nutrition survey found that women did not experience the weight gains during pregnancy that one would expect in a well-nourished population (May and McLellan 1971).[9] This suggests that they would be vulnerable to the effects of greater hardship in particular seasons. On the other hand, there is no direct evidence that the birth weights of children are lower in autumn and winter and, even if such data did exist, it would be difficult to establish firmly that they were linked to the nutritional status of women.

2.4 DIFFERENTIALS IN INFANT AND CHILD MORTALITY

Both direct and indirect methods can be used to study differentials in infant mortality in Lesotho. However, as with the national data, indirect methods produce only summary indices of the level of mortality in infancy and childhood considered together. In contrast direct methods can be used to study mortality differentials in particular age groups. The usefulness of the indirect approach is also limited by the small amount of information collected in the household survey on factors that influence mortality. The main subgroups to which it can be applied are the two sexes, children in different regions of the country and children whose mothers have differing levels of schooling. Direct estimates of mortality at young ages can also be produced for these categories of children. Moreover the individual survey also collected information on a wide variety of other socio-economic characteristics of the respondents and their families. But the homogeneity of Lesotho's population means that the impact of most of these on mortality is hard to measure and of little significance. For example, as was discussed in the introduction, most Basotho live in rural areas and the husbands of most respondents are skilled manual workers. The small samples involved make it difficult to estimate the mortality of

[8]This is a sweeping generalization that will not be true of every disease. The association of many infectious diseases with hot and/or wet season is documented in the papers in chapter 6 of Chambers, Longhurst and Pacey (1981).

[9]Women did gain weight rapidly during the first three months of breastfeeding. Local belief emphasizes the importance of women eating well at this time.

children in urban areas or the mortality of children whose fathers belong to other occupational groups. Apart from those factors for which indirect estimates of mortality are available, the only socio-economic characteristic examined using direct estimates is the level of education of the father. However the birth history data are of great interest for what they reveal about demographic differentials in infant and child mortality. In particular they can be used to study the inter-related effects of parity, the age of the child's mother at its birth and birth intervals on mortality.

Differences between the mortality of male and female children are found in nearly all populations. In most societies boys are more likely to die than girls at all ages. Lesotho conforms to this pattern. Direct estimates of infant and child mortality according to sex are shown in table 10. As in the previous sections, these and the direct estimates presented subsequently have been calculated from data on a pooled cohort of all births in the last 15 years. These estimates can be compared with the indirect ones obtained from the household survey data and presented in table 11. The latter yield slightly higher estimates of the probability of dying before age five. One reason is that children whose age at death is unknown were not included in the data used to calculate table 10. Despite this discrepancy, both sources indicate a very similar differential between male and female mortality in infancy and childhood. They suggest that just under 2 per cent more boys than girls die between birth and exact age five. To put this in a different way, boys are about 10 per cent more likely to die before their fifth birthday than girls. There is no evidence that the excess mortality of male children is concentrated in particular age groups. The direct estimates in table 10 show that female mortality is lower than that of males at all ages: the rather small differential by sex in the post-neonatal mortality rate can be ascribed to sampling errors. Turning to the indirect estimates in table 11, these further suggest that differences between the mortality of male and female children altered little during the 15 years before fieldwork for the LFS.

Although Lesotho is a small and homogenous country, the regions differ from one another in ways likely to affect levels of infant and child mortality. The east and north of the country are more remote and experience more severe conditions in winter. On the other hand, they do not have the very high population density, by African standards, found in the Lowlands region. Direct and indirect estimates of infant and child mortality by region are presented in tables 12 and 13 respectively.[10] The regions are those that women were living in at the time of the survey. Some children will have been born and have lived their early life elsewhere. Both sets of results suggest that mortality is higher in the Mountains and the Orange River Valley than in the Lowlands or Foothills. According to the birth history data, this differential is small and statistically insignificant. However the indirect estimates obtained from the household survey data suggest that the differences are larger, although still modest. They indicate that 3–4 per cent more children die between birth and exact age five in the Mountains and Orange River Valley than in the Lowlands and Foothills. It is possible that the indirectly estimated mortality differentials are distorted by regional differences in age patterns of fertility or mortality. Alternatively the directly calculated results could underestimate differentials because response and reporting errors were concentrated in the Orange River Valley and Mountain regions. Whatever the reason for the discrepancy between the two sets of results, it is probably safe to conclude that infant and child mortality are slightly higher in the eastern half of Lesotho than in the Lowlands and Foothills.

The relationship between women's education at the time of the survey and the mortality of their children is much stronger. However once again the indirect estimates of the probability of dying between birth and age five, shown in table 15, indicate larger differentials than the direct esti-

[10]The proportions of dead children among those ever-born used to calculate the indirect estimates are shown in table B1.

Table 10 Mortality in infancy and childhood according to sex for children born in the last 15 years, LFS individual survey (per 1000)

Sex	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
Male	65	62	33	31	182	4264
Female	59	63	25	26	165	4304

Table 11 Estimates of childhood mortality rates (1000 $_xq_0$) and mortality levels (α) according to sex, LFS household survey

Age (x)	Male				Female			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	127	–0.095	199	1976.4	123	–0.117	192	1976.4
2	148	–0.161	179	1974.7	136	–0.208	165	1974.8
3	175	–0.121	191	1972.8	162	–0.165	177	1972.9
5	202	–0.085	202	1970.6	183	–0.148	183	1970.7
10	204	–0.131	188	1968.2	185	–0.192	170	1968.3
15	236	–0.075	206	1965.5	213	–0.141	185	1965.6
20	251	–0.092	200	1962.1	233	–0.142	184	1962.3

Table 12 Mortality in infancy and childhood according to region of residence of mother for children born in the last 15 years, LFS individual survey (per 1000)

Region	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
Lowlands	57	63	32	27	172	3548
Foothills	70	52	22	33	170	2000
Orange R. Valley	52	66	42	28	179	1131
Mountains	64	75	22	22	177	1528

Table 13 Estimates of childhood mortality rates (1000 $_xq_0$) and mortality levels (α) by region of residence of mother, LFS household survey

Age (x)	Lowlands				Foothills			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	146	–0.016	225	1976.4	94	–0.269	149	1976.4
2	124	–0.263	151	1974.8	142	–0.183	173	1974.6
3	151	–0.209	165	1973.0	153	–0.201	167	1972.6
5	178	–0.163	178	1970.8	179	–0.160	179	1970.4
10	182	–0.200	168	1968.4	195	–0.159	179	1967.9
15	210	–0.151	182	1965.7	221	–0.116	193	1965.1
20	226	–0.160	179	1962.4	228	–0.155	181	1961.8
Age (x)	**Orange River Valley**				**Mountains**			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	127	–0.097	198	1976.3	119	–0.133	187	1976.3
2	154	–0.138	186	1974.8	175	–0.060	210	1974.9
3	205	–0.022	223	1972.8	201	–0.035	219	1973.0
5	220	–0.031	220	1970.6	221	–0.030	221	1970.8
10	225	–0.068	208	1968.2	200	–0.142	184	1968.4
15	258	–0.015	226	1965.5	235	–0.077	205	1965.7
20	260	–0.069	207	1962.2	279	–0.020	224	1962.4

mates, shown in table 14.[11] According to the direct estimates, about 20 per cent of the children of women who never went to school die before age five compared with 15 per cent of the children of women who attended secondary school. Equivalent indices obtained by indirect methods are about 24 per cent and 12 per cent. It should be borne in mind that uneducated respondents are perhaps most likely to have supplied inaccurate data and, in particular, to have been unable to answer the detailed individual questionnaire. Moreover the rapid expansion in the numbers of educated women makes it difficult to estimate the mortality of their children indirectly. It implies that any index of the timing of the fertility among younger women is unlikely to be applicable to the fertility of older cohorts. However, even if one concentrates on the two groups of women with differing levels of primary education, who comprise the great majority of the population, the indirect estimates continue to suggest that larger differences exist between the mortality of the children of the more and less educated than are indicated by the direct estimates. Averaging the two sets of results, the estimated proportion of children dying before age five is about 16–17 per cent for the more educated group of mothers and 18–19 per cent for the less educated group. Concentrating on table 14, the mortality rates for particular age groups suggest that neo-natal mortality levels are more or less unaffected by the mothers' level of schooling. After the first month of life though, the relationship becomes increasingly strong. According to these data, the children of women with no schooling are more than twice as likely to die between exact ages two and five as the children of women with secondary schooling. The national data indicated that infant and child mortality have declined slowly but steadily. The estimates in table 15 offer little evidence that mortality has declined within educational groups. This could reflect merely the approximate nature of these results. However it does suggest that it has been changes in the educational structure of Lesotho's population and closely related factors that have brought about the overall decline in infant and child mortality. Estimates calculated from the responses of women with secondary education indicate that the mortality of this group's children has fallen appreciably. However, as has already been pointed out, the rapid expansion in the numbers of such women could well have distorted these results.

[11] The proportions of dead children among those ever born used to calculate the indirect estimates are shown in table B2.

Table 14 Mortality in infancy and childhood according to the highest level of school attended by mother for children born in the last 15 years, LFS individual survey (per 1000)

Level of schooling	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
No schooling	61	83	32	39	204	692
Lower primary	65	62	30	29	177	3989
Upper primary	58	61	26	26	164	3497
Secondary or higher	68	45	25	16	149	390

Table 15 Estimates of childhood mortality rates (1000 $_xq_0$) and mortality levels (α) by education of mother, LFS household survey

Age (x)	No schooling				Lower primary			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	219	0.233	323	1975.9	120	–0.132	188	1976.4
2	208	0.047	248	1974.0	150	–0.153	181	1974.6
3	225	0.036	244	1972.0	173	–0.127	189	1972.6
5	248	0.046	248	1969.7	203	–0.082	203	1970.4
10	238	–0.032	220	1967.2	212	–0.108	195	1967.9
15	267	0.009	234	1964.2	227	–0.099	198	1965.2
20	284	–0.007	229	1960.7	239	–0.124	190	1961.8

Age (x)	Upper primary				Secondary +			
	$_xq_0$	α	$_5q_0$	Date	$_xq_0$	α	$_5q_0$	Date
1	88	–0.301	141	1976.4	155	0.020	238	1976.4
2	133	–0.224	161	1974.7	71	–0.568	88	1974.6
3	163	–0.165	178	1972.7	111	–0.387	122	1972.6
5	174	–0.176	174	1970.5	139	–0.310	139	1970.4
10	166	–0.259	152	1968.1	125	–0.425	114	1968.0
15	194	–0.199	168	1965.3	145	–0.374	125	1965.2
20	209	–0.209	165	1962.0	194	–0.258	152	1961.8

The strong relationship between maternal education and infant mortality revealed by these estimates is not necessarily a causal one. Education must be considered, to some extent, a measure of socio-economic status. Other aspects of this, such as income, might explain most of these differences in mortality. On the other hand, in the view of some authors, within any society maternal education itself, rather than standards of living in general, is the key factor affecting levels of mortality among children (Caldwell 1979). Using the birth history data one can explore the relative importance of these two factors by examining the relationship between paternal education and mortality in infancy and childhood. In general education of the mother's current or last husband will be a better indicator of the status and income of the household than maternal education. However it is maternal education that seems more likely to improve feeding and care of children and use of medical services on their behalf. Direct estimates of infant and child mortality according to the father's level of schooling are shown in table 16. Although the extreme groups are larger in size, the relationship between paternal education and mortality up to age five is as strong as that between maternal education and infant and child mortality. About 18 per cent of children with uneducated fathers die between birth and age five. For children with fathers who attended secondary school the equivalent index is only 14 per cent. While there is no relationship between maternal education and mortality very early in life, neo-natal mortality is substantially lower among the children of educated men than among those of the less educated. It has already been suggested that neo-natal mortality in Lesotho may be associated with the health and nutritional status of mothers. These results further suggest that excess neo-natal mortality is concentrated in the poorer households.

Table 17 examines the relationship between infant and child mortality and maternal and paternal education. It suggests that each of them has an independent effect on the level of mortality after controlling for the other. If paternal education can be interpreted as a proxy for the household's standard of living and socio-economic status and the level of schooling of the mother as indicating the effects of education itself net of these, it can be seen that the former has a larger effect on the probability that a child will die between birth and age five than the latter. Moreover in Lesotho the two factors appear to have a multiplicative effect on mortality rather than an additive one. Especially

Table 16 Mortality in infancy and childhood according to the highest level of school attended by mother's current or last husband for children born in the last 15 years, LFS individual survey (per 1000)

Level of schooling	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
No schooling	66	62	31	29	178	3386
Lower primary	64	66	30	34	185	3010
Upper primary	55	62	24	20	156	1598
Secondary or higher	46	51	24	18	134	574

Table 17 Mortality in infancy and childhood according to the highest level of school attended by mother and her current or last husband for children born in the last 15 years, LFS individual survey (per 1000)

Level of schooling	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
Both lower primary or no schooling	68	65	31	29	184	3968
Mother – upper primary+; father – lower primary or none	61	62	29	35	178	2428
Mother – lower primary or none; father – upper primary +	45	66	29	38	170	713
Both upper primary +	56	56	22	8	138	1439

after age two, children whose parents both attended the upper grades at primary school experience much lower mortality than the other groups.

While region and education must be considered, at least in part, proxy variables for other environmental and socio-economic factors that influence infant and child mortality, the birth history data enable one to measure the more important demographic determinants of mortality at young ages directly. However birth order, age of mother and birth intervals are closely associated and cannot be examined in isolation (Gray 1981).

Infant and child mortality rates according to the age of the child's mother at its birth are shown in table 18. The overall estimates of mortality between birth and age five vary only slightly according to the mother's age and what is more fluctuate rather erratically. However, women are less likely to lose children they bear in their twenties than those they have in their teens and thirties. It is possible that the estimate obtained for the children of mothers aged 40 or more has been biased downwards by the omission of some dead children. In addition it is based on a rather small sample. Examining the mortality rates for particular age groups, it appears that neo-natal deaths are more common among the children of mothers aged more than 30 but that it is young mothers who tend to lose their children later in life. However, again these differences are small and the pattern is not very clear.

As can be seen from table 19, infant and child mortality also vary only slightly according to the order of birth of the child. Overall the mortality of second births is lower than that of first or subsequent births. After the second birth mortality tends to increase with birth order. A striking feature of these results is that neo-natal mortality is much heavier among sixth or higher order births than among other births.

A factor that appears to have a far greater impact than birth order or their mother's age on children's chances of survival is the length of the birth interval terminated by the birth of the child in question. Direct estimates of mortality according to the length of this previous interval are shown in table 20. The table reveals that birth intervals tend to be rather long in Lesotho. Only about 20 per cent of births occur less than two years after the women bore her previous child. This small group of children are much more likely to die at young ages than those whose birth occurred more than two years after that of the previous child. Overall 26 per cent of them die between birth and age five compared with about 14 per cent of children whose birth was preceded by a longer interval. The estimates in table 20 also suggest that children born two or three years after their next older sibling suffer from slightly higher risks of death than those whose birth is preceded by yet longer intervals. However this difference is small: about 1 per cent more of these children die before age five. Thus only the shortest birth intervals greatly affect the chances of survival of the subsequent child. The mortality rates for the different age groups within childhood in table 20 indicate that the effect of birth intervals is largest at very young ages and declines as children grow older. Almost 12 per cent of infants born less than two years after a previous

Table 18 Mortality in infancy and childhood according to the age of the mother at the child's birth for children born in the last 15 years, LFS individual survey (per 1000)

Age of mother (years)	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
Less than 20	59	72	30	36	187	1260
20–24	62	59	33	28	174	2538
25–29	57	59	24	22	156	2068
30–34	66	71	33	29	190	1540
35–39	69	57	19	33	171	874
40+	60	51	25	9	142	288

Table 19 Mortality in infancy and childhood according to birth order for children born in the last 15 years, LFS individual survey (per 1000)[a]

Birth order	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
First	55	56	26	36	165	1999
Second	51	48	39	22	153	1700
Third	65	67	26	34	183	1391
Fourth and fifth	53	76	23	27	173	1944
Sixth or higher	90	67	29	20	198	1534

[a]The order of birth of multiple births has been taken as the order in which they are found in the standard recode file.

Table 20 Mortality in infancy and childhood according to the length of previous birth interval, second or higher order births during the last 15 years, LFS individual survey (per 1000)

Length of interval (completed years)	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
Less than two	116	94	40	29	264	1312
Two	46	57	29	28	153	2446
Three	47	56	19	18	136	1545
Four or more	41	46	30	27	139	1122

birth die in the first month of life. Less than 5 per cent of other children die so young. In contrast after age two any relationship between birth intervals and mortality is at most very slight.

Short birth intervals are more likely to occur when the death of the previous child curtails the otherwise prolonged periods of breastfeeding or postpartum sexual abstinence or both that are usual in Lesotho. It also seems probable that women who have lost one child will be more likely to lose another. Because of this, the relationship between birth intervals and infant and child mortality is examined in table 21 controlling for the mortality of the previous child. These mortality estimates reveal that women who have lost one child are much more likely to lose the subsequent one. In part this is why children who are born less than two years after an earlier birth die in infancy more frequently than other children. However, both when the previous child died before age two and when it survived at least that long, children born less than two years afterwards remain much more likely to die at young ages. After controlling for the survival of the previous child, it appears that 6–8 per cent more of all births after a short interval die before exact age five.

The age pattern of the mortality differentials according to birth interval and the fact that they persist even when the next older sibling died at a young age suggest that in Lesotho birth intervals affect mortality by means of innate influences and not because the children concerned received poorer care or less food after their birth. If they survive the first year or two of life, children born soon after the previous child appear to overcome their initial disadvantages. Two main factors are therefore probably important. First, the relatively small number of children born after a birth interval of less than two years in Lesotho will include a fairly high proportion of prematurely born children. These are much more likely to die young than other children. Secondly, women who become pregnant while still nursing their previous child may be less well nourished and perhaps unhealthier than other women. If so, their children, even if not premature, may tend to have low birth weights and be less likely to survive the first months of life.

Short birth intervals are liable to be concentrated among certain groups of women and types of birth. For example, birth intervals usually lengthen as a woman's age increases, women with very large families must have had short intervals and birth spacing patterns may differ between edu-

Table 21 Mortality in infancy and childhood according to the length of the previous birth interval and survival of previous child, second or higher order births during the last 15 years, LFS individual survey (per 1000)

Length of interval (completed years)	Neo-natal	Post-neonatal	Early childhood ($_1q_1$)	Late childhood ($_3q_2$)	Overall ($_5q_0$)	Number of births
A Previous child survived to age 2						
Less than two	67	89	36	20	202	802
Two or more	42	51	26	25	138	4690
B Previous child died before age 2						
Less than two	193	103	49	37	355	510
Two or more	115	103	41	31	273	526

cational groups. Thus it is possible that factors such as these are related to levels of mortality in infancy and childhood because of their association with the length of birth intervals. In table 22 the relationships between intervals, mortality and each of birth order, age of mother and maternal and paternal education are examined. The table presents only overall measures of mortality between birth and age five. Moreover, because of sampling errors, more attention should be paid to the overall pattern than to individual rates. In each of the subgroups large differences exist between the mortality of children born after a birth interval of less than two years and that of other children. Perhaps rather more surprisingly, the relationship between mortality and each of the other factors persist in their strength and direction both among children born after birth intervals of less than two years and among those born after longer ones. The increase in mortality with birth order, the U-shaped relationship with mother's age and the effects of maternal and paternal education do not result from any association with birth intervals. Only women's ages are closely associated with interval lengths but this suppresses rather than accentuates the relationship between mother's age and child mortality. The effects of paternal education on mortality up to age five are much larger when births are separated by a period of under two years than they are otherwise. This suggests that it is children from households with a low socio-economic status and standard of living that are most vulnerable to the effects of short birth intervals. This could be either because premature and low-weight births are more likely to result from short intervals in such households or because poorer parents are less able to care for such children after they have been born.

The length of the interval between the birth of two children can affect the chances of survival of the earlier born child as well as that of the later one. In particular, if a woman becomes pregnant she may wean any child that she is breastfeeding at the time at a younger age than she would have otherwise. However the effect of the length of the succeeding birth interval on childhood mortality is awkward to measure. When the earlier child dies before the later one is conceived, this is likely to reduce the interval until the next birth: the causal link between intervals and mortality works in both directions. Moreover, women with one short birth interval may tend to have others. Thus the effects of the preceding and succeeding interval have to be examined together. Child mortality rates according to the length of the succeeding birth interval are shown in table 23. To avoid problems of reverse causation only mortality at ages which were reached at least three months after the next child was conceived is considered. Concentrating first on the bottom rows of the two panels of the table, it is clear that, if a woman becomes pregnant within nine months of bearing a child, the chances of that child dying in its second year of life are very much higher than they would be otherwise. About 9 per cent of all such

Table 22 Mortality between birth and age five ($_5q_0$) by length of previous birth interval according to various characteristics, second or higher order births during the last 15 years, LFS individual survey (per 1000)[a]

Length of interval (completed years)	Birth order			
	Second	Third	Fourth and fifth	Sixth +
Less than two	221	272	270	290
Two or more	137	162	146	167
	Age of mother at child's birth			
	<20	20–24	25–29	30+
Less than two	(293)	265	217	289
Two or more	(173)	156	141	155
	Highest level of schooling of mother			
	None, lower primary		Upper primary +	
Less than two	271		247	
Two or more	157		144	
	Highest level of schooling of father			
	None, lower primary		Upper primary +	
Less than two	280		203	
Two or more	158		132	

[a]Estimates based on less than 250 births are indicated by parentheses.

Table 23 Mortality in childhood according to length of preceding and succeeding birth intervals, single births during the last 15 years, LFS individual survey (per 1000)[a]

Length of preceding interval	Early childhood mortality ($_1q_1$) by length of succeeding interval		
	<18 months	18 months or more	
Less than 24 months	(35)	41	
24 or more months	(119)	22	
All, including first, births	(92)	26	
	Later childhood mortality ($_3q_2$) by length of succeeding interval		
	<18 months	18–29 months	30 months or more
Less than 24 months	(104)	(14)	26
24 or more months	(31)	31	24
All, including first, births	(50)	33	26

[a]Estimates based on less than 250 children indicated by parentheses.

children who survive to exact age one die before their second birthday as opposed to 2½ per cent of other children. Moreover, children whose birth is followed shortly by that of a younger sibling are also more likely to die between ages two and five than other children although the differentials at these ages are proportionately smaller than those at age one. The small samples of births involved make it difficult to measure the relationship between mortality and the length of the succeeding birth interval for children whose birth was preceded by an interval of under two years. However, the mortality rates for children whose birth was preceded by an interval of at least two years reveal that the length of the succeeding interval has an independent effect on mortality levels. The relationship does not stem from a close association between the lengths of adjacent birth intervals. As 75 per cent of children are breastfed for more than one year in Lesotho and 40 per cent for at least two years, the effects of early weaning probably explain much of the impact of short succeeding intervals on mortality. However, the persistence of mortality differentials beyond the second year of life suggests that other aspects of child care may also be adversely affected by the birth of another child.

3 Adult Mortality

Less is known about adult mortality in Lesotho than about infant and child mortality. The First Report on the LFS published estimates of survival in adulthood obtained by indirect means from data on orphanhood and widowhood. It noted that these indicated a low level of mortality compared with mortality in infancy and childhood (Bureau of Statistics 1981b). The 1976 Census Report examined data from a number of sources. On the basis of information about intercensal survival it concluded that the overall expectation of life at birth was about 49 years. The Report argued that, considering the level of adult female mortality, the level of adult male mortality was much higher than would normally be expected (Bureau of Statistics 1981a).

There are a number of reasons why it is difficult to discover much about adult mortality even when survey data on the subject have been collected. On the one hand, compared with questions on child deaths, other approaches to the collection of information on mortality often perform poorly. Thus both direct and indirect estimates of adult mortality are frequently unreliable. On the other, even when the quality of the basic data is reasonably good, there are limitations to what can be learnt from them that do not apply to data on deaths at young ages. Direct estimates of adult mortality can be obtained either by means of retrospective questions on deaths in the households surveyed or by the registration of deaths soon after they occur in a prospective study. Either way the data refer to a period of a few years at most and information from a single survey reveals nothing about trends in mortality. Indirect estimates are obtained from answers to questions about the survival of respondents' parents and first spouses. Recently techniques have been developed that enable one to locate such estimates in time and thereby to examine mortality trends. However, they have not yet been applied widely. A second limitation of survey data on mortality is that they can seldom be used to study age patterns of mortality in adulthood. Death rates are much lower at adult ages than in childhood and estimates for particular age groups can be greatly distorted by sampling errors. Moreover, reporting of the ages and ages at death of adults is often poor. In particular their exaggeration for the elderly usually introduces massive biases into mortality rates for older age groups. Thirdly, the use of survey data to study differentials in adult mortality is also obstructed by several difficulties. There are technical problems involved in attempts to measure levels of mortality among subgroups of a population using either direct or indirect methods. Moreover, little is usually known about the characteristics and circumstances of individuals who have died. While the same is true of data on child mortality, it is reasonable to expect the characteristics of parents to influence directly their children's chances of survival. In contrast, the characteristics of those who answer questions on adult mortality are less likely to have a major impact upon the chances of survival of the relatives concerned and will only be correlated imperfectly with factors that are immediately important.

In this chapter adult mortality is examined in as much detail as possible. Mortality estimates for the two sexes are calculated directly from data collected in each of the four large-scale demographic surveys conducted in Lesotho. Indices of male and female mortality and estimates of the dates to which they apply are also obtained indirectly from the results of the three more recent surveys. Considered together, those two different series of results provide a fairly clear picture of trends in adult mortality. Differentials in the level of mortality among adults are also examined. However far less can be discovered about these than could about differentials in infant and child mortality.

3.1 DIRECT ESTIMATES OF THE LEVEL OF ADULT MORTALITY

Information upon deaths in the enumerated households was gathered retrospectively in the LFS household survey and in the 1968–9 survey. The prospective studies conducted in 1962–6 and in 1971–3 also collected such information. The 1962–6 survey was confined to part of the Lowlands area of Lesotho. It gathered these data on a *de facto* basis, while the other three surveys did so on a *de jure* basis. Thus between them the surveys used a variety of different strategies to collect these data. All of them obtained the ages and sexes of those who had died. This is the only information that is available on the characteristics of the dead.

Whatever strategy is used to collect the data, numbers of deaths reported in response to questions about recent events in the household are often far too small. Brass (1975) has developed a method to assess the extent to which under-reporting is occurring that is based upon the growth balance equation. It examines the relationship between two sets of ratios. These are, for different ages y, the ratios of the population aged y to the population aged y+ and the ratios of deaths among those aged y+ to the population aged y+. They are known as partial birth rates and partial death rates respectively. If the completeness of reporting is constant and if the age structure of the population is undistorted by biased age reporting, migration or fertility change, a graph of one against the other should form a straight line. The slope of this line then indicates the completeness with which deaths were reported in the survey concerned.

Partial birth and death rates according to each of the demographic surveys conducted in Lesotho have been plotted in figure 3.[12] If there were no reporting errors and the population was a stable one growing at 2.3 per cent a year, the points would fall on the solid lines added to the graphs. In practice all the eight series of points are somewhat erratic. A variety of straight lines that would represent different assumptions about the completeness of death reporting could be fitted to each of them. In particular, all the points bend upwards at young ages and back downwards at ages twenty to forty five. This pattern of distortion is typical of those produced by the effects of emigration on the age structure. It is unsurprising that it affects estimates for Lesotho. As might be expected, the *de facto* data for males which were collected in 1962–6 are most affected. Despite these problems, and with the possible exception of the 1971–3 survey, all the graphs are consistent with the hypothesis that deaths are not being underreported. In other words, lines with a slope of one (such as those added to the plots) represent a reasonable fit to each of the graphs. So, while in this application the growth balance method does not establish that the data are complete, on the other hand it offers no strong evidence that they are incomplete.

Estimates of the survival of men and women obtained from each of the four surveys are shown in table 24. They measure the probability of someone aged 25 surviving to a series of older ages. Chaining death rates for individual age groups in this way produces a single, stable index of the level of adult mortality. No corrections have been made to the reported data. The table also includes values of alpha that correspond to these conditional probabilities of survival. They measure the level of mortality relative to that in Brass's General Standard (Brass 1971) and enable one to compare indices of survival for different age ranges.

The most reliable estimates in table 24 seem to be those of survival from age 25 to ages between 50 and 60. In all the surveys reported mortality among older women is very light. In the LFS this is also true of mortality among older men. Death rates for these age groups are probably biased downwards by differential exaggeration of ages and ages at death. Although the surveys were conducted over a 15-year period and although the 1962–6 estimates refer only to part of the country, they yield very similar estimates of mortality. The estimates for women decline slightly over the period. For example, the probability of surviving from 25 to 55 rises from 82 per cent to 85 per cent between the early 1960s and the mid-1970s. The estimates for men do not reveal even this slight improvement. Instead the probability of surviving from 25 to 55 fluctuated around 70 per cent. This is because the LFS household data yield lower estimates of the survival of males than the 1968–9 and 1971–2 surveys. Mortality among males might have increased while mortality among females declined, but it seems more plausible that the trend in adult male mortality is distorted by greater omission of deaths in the earlier surveys than in the LFS. Thus male mortality may or may not have fallen slightly. Having said this, it is possible that all these estimates of the level and trend in mortality have been distorted by under-reporting of deaths. For example, improvements in coverage could be offsetting the effects of mortality decline. This seems unlikely. The simplest explanation of the consistency of the direct mortality estimates from the different surveys is that they are more or less accurate.

One feature of the results in table 24 that is highly unlikely to be an artifact of variations in the completeness of death reporting is the large differential between adult male and female mortality. Except in the earliest survey the data were collected on a *de jure* basis. As there are large numbers of absent men one would, if anything, expect male deaths to be under-reported more than female deaths. Yet the results indicate that men are twice as likely to die as women at the central adult ages. For example, according to the LFS, the probability of dying between ages 25 and 55 is 31 per cent for men but only 15 per cent for women.

It is notable that the retrospective surveys appear to have collected data that are just as complete as, or more complete than, the data obtained in the more prolonged and complex prospective studies. Moreover the plots in figure 3 suggest that ages and ages at death were reported rather more accurately in the retrospective surveys than in the 1971–3 study. It is the latter which yield the most erratic series of points. Although it is likely that most deaths were reported in these surveys, the direct mortality estimates are almost certainly somewhat too low. If appreciable numbers of male deaths were omitted in 1968–9 and 1971–3, reporting in the other surveys is unlikely to be perfect. Moreover, when a death initiated the breakup of the household concerned it is unlikely to have been reported. However, in Lesotho retrospectively obtained data on deaths do not appear to be massively distorted by a reluctance to speak of death as has often been observed elsewhere in Africa.

3.2 INDIRECT ESTIMATES OF ADULT MORTALITY

Indirect estimates of adult mortality can be obtained from the data on the survival of parents that are available from the three more recent of the surveys conducted in Lesotho. They can also be obtained from data on the survival of first spouses collected in the LFS household survey. The orphanhood data from the 1968–9 survey only refer to the northern third of the country. This area crosscuts the ecological zones into which Lesotho is commonly divided for regional analysis.

Proportions of respondents according to sex whose mothers are still alive are presented in table 25. Equivalent data on the survival of fathers are shown in table 26. The data are not available for male and female respondents separately in the report on the 1968–9 survey. In both the 1971 survey and the LFS household survey men report higher proportions of surviving parents than women in most age groups. This might be indicative of greater under-reporting of orphanhood by men. Alternatively it might mean that male respondents tend to exaggerate their ages or women to understate theirs. The discrepancies in the data on maternal orphanhood are greater than those in the data on paternal orphanhood. This suggests that over-reporting of paternal survival by males is part of the explanation. The discrepancies also tend to be greater at older ages. This could well mean that errors in the reporting of age are also distorting the proportions.

[12] The data on which these graphs are based are presented in tables B3–B6. The principles underlying this method, together with references are outlined in appendix A.

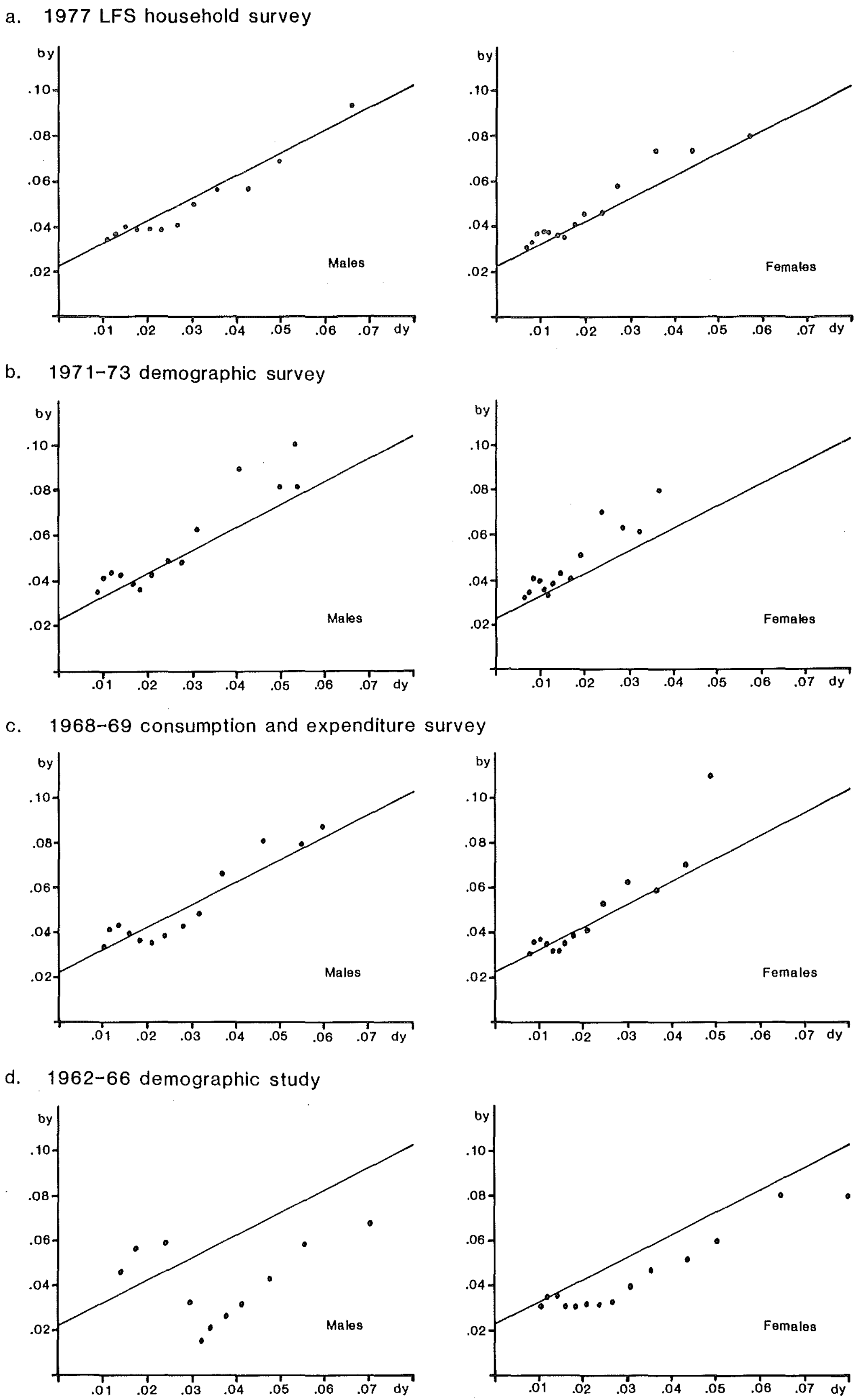

Figure 3 Partial birth rates (by) and partial death rates (dy) over ages y

Table 24 Survivorship from age 25 and mortality level (α) according to data on recent deaths, LFS household and earlier surveys

Age (N)	1962–6		1968–9		1971–2		1976–7	
	l_N/l_{25}	α	l_N/l_{25}	α	l_N/l_{25}	α	l_N/l_{25}	α
A Males								
30	0.949	0.109	0.977	–0.439	0.968	–0.229	0.959	–0.061
35	0.917	–0.047	0.952	–0.427	0.934	–0.217	0.930	–0.175
40	0.855	0.058	0.916	–0.359	0.902	–0.252	0.878	–0.089
45	0.813	–0.008	0.855	–0.219	0.845	–0.168	0.821	–0.049
50	0.734	0.054	0.794	–0.181	0.787	–0.153	0.770	–0.085
55	0.667	0.016	0.728	–0.186	0.734	–0.206	0.691	–0.063
60	0.580	0.003	0.631	–0.147	0.657	–0.224	0.620	–0.116
65	0.453	0.051	0.508	–0.107	0.534	–0.176	0.520	–0.140
70	0.316	0.112	0.409	–0.180	0.405	–0.168	0.399	–0.150
B Females								
30	0.987	–0.784	0.976	–0.413	0.976	–0.413	0.995	–1.310
35	0.970	–0.700	0.947	–0.364	0.944	–0.328	0.959	–0.519
40	0.944	–0.612	0.915	–0.351	0.919	–0.383	0.946	–0.633
45	0.903	–0.502	0.897	–0.460	0.900	–0.480	0.906	–0.523
50	0.861	–0.478	0.870	–0.522	0.876	–0.553	0.888	–0.616
55	0.824	–0.532	0.832	–0.561	0.845	–0.618	0.846	–0.624
60	0.752	–0.505	0.785	–0.612	0.800	–0.662	0.814	–0.712
65	0.677	–0.548	0.730	–0.692	0.731	–0.695	0.752	–0.758
70	0.587	–0.615	0.615	–0.680	0.660	–0.789	0.692	–0.869

Table 25 Proportions of respondents with mother alive by sex, 1968 survey, 1971 survey, LFS household survey

Age	1968 survey	1971 survey			LFS household survey		
	Both	Male	Female	Both	Male	Female	Both
5–9	0.9675	0.9776	0.9730	0.9753	–	–	–
10–14	0.9476	0.9551	0.9548	0.9549	–	–	–
15–19	0.9278	0.9315	0.9274	0.9294	0.9372	0.9362	0.9367
20–24	0.8887	0.8984	0.8839	0.8911	0.9138	0.8887	0.9003
25–29	0.8462	0.8546	0.8243	0.8394	0.8719	0.8357	0.8530
30–34	0.7637	0.7791	0.7642	0.7716	0.8005	0.7559	0.7775
35–39	0.6820	0.7034	0.6636	0.6835	0.7068	0.6723	0.6898
40–44	0.5448	0.5966	0.5686	0.5826	0.6130	0.5498	0.5807
45–49	0.4585	0.4827	0.4469	0.4648	0.4948	0.4601	0.4773
50–54	0.3227	0.3311	0.3105	0.3208	0.3650	0.3390	0.3509
55–59	0.2232	0.2403	0.2170	0.2287	0.2703	0.1964	0.2301
60–64	0.1524	–	–	–	0.1707	0.1186	0.1419

In order to calculate conventional indices of mortality from such proportions one must have an estimate of the timing of the parents' fertility. The measure used is the mean age at childbearing ($\overline{M}$). Inaccurate values of it can severely distort any estimate of mortality that one obtains. It is usually assumed that parents had children at the same ages as respondents to the survey. All three surveys collected the data needed to calculate the mean age of childbearing of women. The two more recent surveys yield very similar values of $\overline{M}$ but the 1968–9 survey one that is about a year later. It is not certain that the recent estimates are more accurate and so the latter figure has been used to estimate female adult mortality from the 1968–9 survey orphanhood data. If, as seems possible, it represents too high a value the results will tend to underestimate mortality. The 1971 survey also collected the data required to estimate directly the mean age at childbearing of men. The LFS individual survey included a question on the age of the respondents' husband. From this one can calculate the mean age difference between spouses and, by adding this to the mean age at childbearing of women, obtain a second index of the timing of male fertility. The two estimates are very similar.

Table 26 Proportions of respondents with father alive by sex, 1968 survey, 1971 survey, LFS household survey

Age	1968 survey	1971 survey			LFS household survey		
	Both	Male	Female	Both	Male	Female	Both
5–9	0.8948	0.8880	0.8967	0.8924	–	–	–
10–14	0.8517	0.8286	0.8361	0.8324	–	–	–
15–19	0.7789	0.7583	0.7598	0.7591	0.7598	0.7449	0.7520
20–24	0.6774	0.6759	0.6655	0.6707	0.6846	0.6434	0.6624
25–29	0.5495	0.5569	0.5521	0.5545	0.5761	0.5577	0.5665
30–34	0.4515	0.4316	0.4620	0.4468	0.4487	0.4552	0.4520
35–39	0.3337	0.3291	0.3275	0.3283	0.3510	0.3380	0.3446
40–44	0.2159	0.2467	0.2276	0.2372	0.2357	0.2231	0.2292
45–49	0.1500	0.1530	0.1415	0.1473	0.1797	0.1570	0.1682
50–54	0.0840	0.0923	0.0793	0.0858	0.1116	0.0839	0.0966
55–59	0.0504	0.0521	0.0453	0.0487	0.0568	0.0423	0.0489

The former was used to obtain indices of male mortality from the 1968–9 survey data.

Life table measures of survival in adulthood calculated from the data on orphanhood are presented in table 27 for females and table 28 for males. Each represents the probability of surviving to some older age for a young adult. Because the cause of the discrepancies between the reports of male and female respondents remains unclear and because the data from the 1968–9 survey are only available in this form, the responses of the two sexes were pooled to obtain these results. The tables also include the values of alpha, the expectation of life at age 15 and the dates to which the estimates apply. Alpha is a measure of the level of mortality relative to that in the General Standard (Brass 1971). The measures of life expectancy were obtained from the model life tables defined by alpha.

In all three surveys the oldest respondents provide data that yield rather low estimates of both male and female mortality. This is almost certainly because they tend to exaggerate their ages. Apart from this each series of indices is very consistent and the results of the different surveys also agree closely. In particular there is no evidence that orphanhood among young respondents is under-reported because of an 'adoption effect'. Like the direct estimates, those from orphanhood data indicate that there has been very little decline in the level of mortality experienced by adults. Moreover they also suggest that considerable differences exist between men's and women's chances of survival in adulthood. In terms of life expectancy at age 15 these appear to be in the region of nine years: while men live another 44–45 years on average, women can expect to live for 53–54 years more.

Widowhood data were collected only in the LFS household survey. They are potentially very useful as they yield indirect estimates of adult mortality during the recent past. Proportions of ever-married respondents, according to sex, whose first spouse remained alive at the time of the survey are shown in table 29. Only those who had been married more than once were explicitly asked this question. As a result it is impossible to determine whether the first spouse of currently separated or divorced respondents who have been married once only is still alive. Such individuals have been excluded from both the numerators and the denominators. Conventional indices of adult mortality can also be estimated from these data. They are presented in table 30. As with the results presented already, the table also

Table 27 Estimates of female survivorship from age 25 and mortality level (α) from orphanhood data, 1968 survey, 1971 survey, LFS household survey

Age (N)	1968 survey				1971 survey				LFS household survey			
	l_{25+N}/l_{25}	α	$\mathring{e}_{15}$	Date	l_{25+N}/l_{25}	α	$\mathring{e}_{15}$	Date	l_{25+N}/l_{25}	α	$\mathring{e}_{15}$	Date
10	0.961	–0.559	52.4	1964.8	0.968	–0.675	54.2	1967.2	–	–	–	–
15	0.944	–0.616	53.3	1962.9	0.949	–0.670	54.1	1965.2	–	–	–	–
20	0.926	–0.668	54.1	1961.1	0.925	–0.657	53.9	1963.4	0.932	–0.721	54.9	1969.5
25	0.891	–0.636	53.6	1959.5	0.889	–0.623	53.4	1961.8	0.898	–0.680	54.3	1967.9
30	0.857	–0.669	54.1	1958.2	0.840	–0.595	53.0	1960.4	0.854	–0.657	53.9	1966.6
35	0.778	–0.589	52.9	1957.0	0.775	–0.579	56.0	1959.3	0.782	–0.600	53.0	1965.4
40	0.706	–0.625	53.4	1956.3	0.685	–0.570	52.6	1958.3	0.692	–0.588	52.9	1964.5
45	0.556	–0.543	52.1	–	0.577	–0.593	52.9	1957.8	0.577	–0.592	52.9	1963.9
50	0.454	–0.668	54.1	–	0.432	–0.617	53.3	–	0.450	–0.659	54.0	–
55	0.295	–0.737	55.2	–	0.278	–0.691	54.5	–	0.295	–0.738	55.2	–
$\bar{M}$		28.37				27.40				27.44		

Table 28 Estimate of male survivorship from age 32½ and mortality level (α) from orphanhood data, 1968 survey, 1971 survey, LFS household survey

Age (N)	1968 survey				1971 survey				LFS household survey			
	$l_{35+N}/l_{32.5}$	α	$\mathring{e}_{15}$	Date	$l_{35+N}/l_{32.5}$	α	$\mathring{e}_{15}$	Date	$l_{35+N}/l_{32.5}$	α	$\mathring{e}_{15}$	Date
10	0.880	–0.080	44.5	1964.3	0.871	–0.023	43.6	1966.7	–	–	–	–
15	0.836	–0.178	46.1	1962.5	0.817	–0.080	44.5	1964.9	–	–	–	–
20	0.765	–0.177	46.1	1960.6	0.747	–0.107	45.0	1963.0	0.736	–0.067	44.3	1969.0
25	0.662	–0.130	45.3	1958.7	0.656	–0.113	45.1	1961.3	0.647	–0.081	44.6	1967.1
30	0.528	–0.075	44.5	1956.7	0.531	–0.083	44.6	1959.2	0.536	–0.098	44.8	1965.2
35	0.406	–0.103	44.9	1954.9	0.401	–0.088	44.7	1957.3	0.404	–0.099	44.8	1963.4
40	0.252	–0.058	44.2	–	0.265	–0.109	45.0	–	0.258	–0.083	44.6	–
45	0.148	–0.176	46.1	–	0.145	–0.159	45.8	–	0.164	–0.258	47.4	–
50	0.067	–0.326	48.6	–	0.070	–0.356	49.1	–	0.075	–0.401	49.8	–
$\bar{M}$		35.00				35.00				34.69		

Table 29 Proportions of ever-married respondents with first spouse alive by sex, LFS household survey[a]

Age	Female respondents	Male respondents
15–19	0.9934	0.9835
20–24	0.9811	0.9949
25–29	0.9669	0.9908
30–34	0.9293	0.9752
35–39	0.8965	0.9692
40–44	0.8110	0.9358
45–49	0.7287	0.9120
50–54	0.6365	0.8886
55–59	0.5071	0.8569
60–64	0.3839	0.8344
65–69	0.3257	0.7763

[a]Those currently divorced or separated from their first spouse are excluded from both the numerator and denominator.

includes corresponding values of alpha and life expectancy at age 15 and estimates of the dates to which the indices refer. While both series of indices are more erratic than those calculated from data on orphanhood, the estimates of the level of adult female mortality are very similar to those obtained from other sources. In contrast, the estimates of adult male mortality indicate that it declined rapidly during the 1960s and 1970s from a level higher than other sources suggest to one lower than they suggest.

The indirect estimates of adult mortality obtained from data on orphanhood and widowhood are compared with each other and with the direct estimates in figure 4. The figure emphasizes the implausibility of the series of estimates of male mortality based upon the widowhood of female respondents. These contradict both the direct and the orphanhood-based estimates of male mortality. The former, in particular, are highly unlikely to overestimate mortality but indicate heavier mortality than the widowhood-based estimates. These also conflict with the estimates of female mortality because it is improbable that the experience of the two sexes followed such radically different trends. Three main points should be made about the other results. The first is how consistent they are. This is most striking when it comes to the indices obtained from data on orphanhood. These agree very closely but indicate slightly lighter mortality than the direct estimates from the 1962–6 survey. This might indicate that the orphanhood technique has tended to underestimate mortality or it might mean that the area in which the 1962–6 survey was conducted experiences heavier mortality than average. Other minor exceptions to the close agreement of these results are the rather light direct estimates of male mortality obtained in the 1968–9 and 1971–3 surveys. It has already

Table 30 Estimates of conditional survivorship and mortality level (α) from widowhood, LFS household survey

Age (N)	Male mortality				Female mortality			
	$l_{N+5}/l_{27.5}$	α	$\mathring{e}_{15}$	Date	$l_{N-5}/l_{17.5}$	α	$\mathring{e}_{15}$	Date
25	0.983	–0.173	46.0	1976.7	0.992	–0.515	51.7	1976.9
30	0.965	–0.452	50.6	1974.0	0.976	–0.595	53.0	1974.2
35	0.926	–0.340	48.8	1971.6	0.970	–0.770	55.7	1972.1
40	0.884	–0.306	48.2	1969.2	0.943	–0.614	53.3	1970.0
45	0.793	–0.115	45.1	1966.9	0.919	–0.590	52.9	1968.1
50	0.700	–0.044	44.0	1964.8	0.898	–0.614	53.3	1966.5
55	0.586	0.027	42.8	1962.8	0.872	–0.640	53.7	1965.2
60	0.444	0.115	41.5	1960.6	0.846	–0.701	54.6	1964.2
65	0.349	0.027	42.8	1959.2	0.810	–0.753	55.4	1963.6

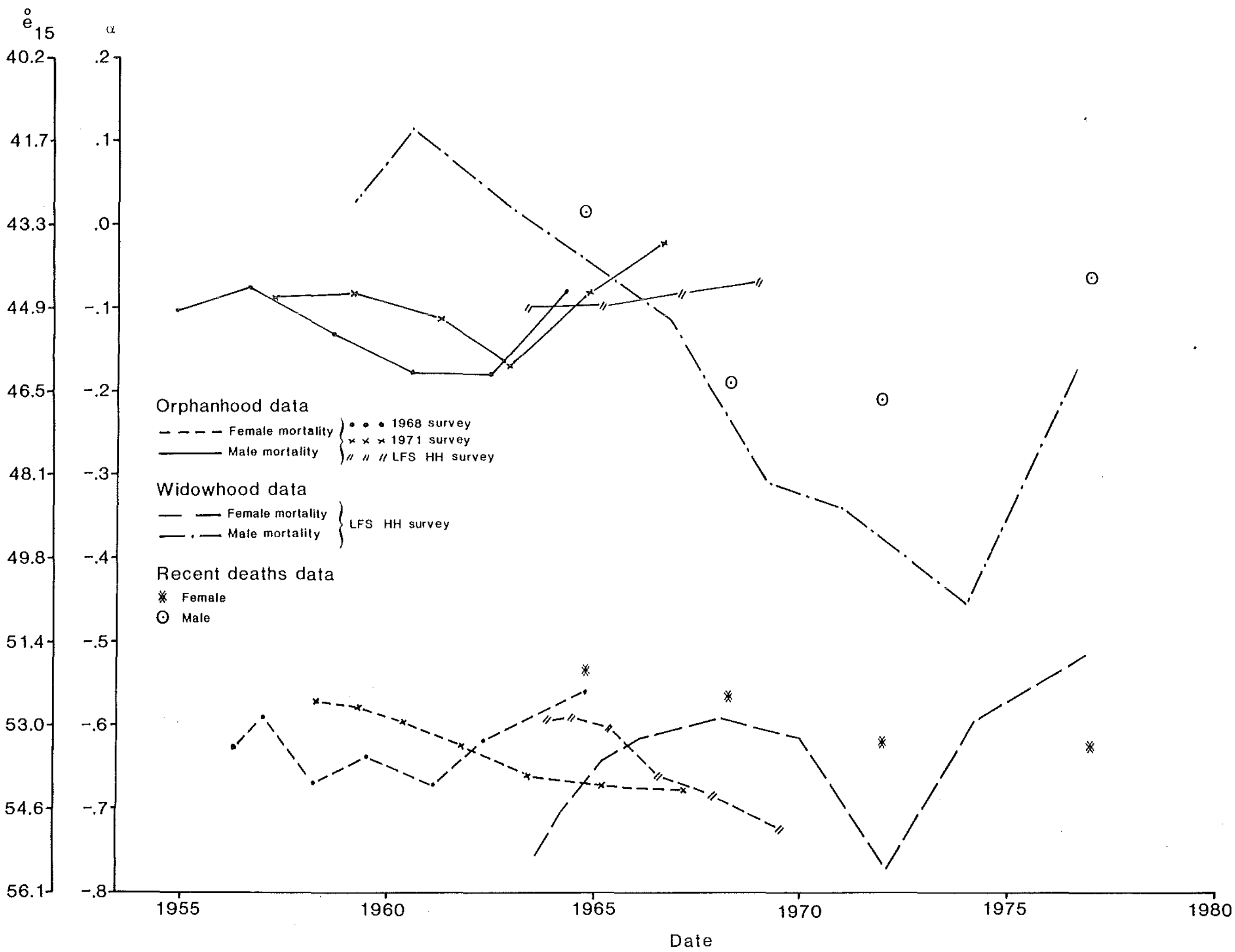

Figure 4 Trends in adult mortality by sex

been suggested that male deaths were under-reported in these surveys. The second striking feature of the figures is that there does not appear to have been any significant decline in the level of adult mortality during the two decades between 1956 and 1976. There is a slight downwards trend in the indices of female mortality but the improvement in life expectancy at age 15 indicated by it is trivial, at most two years over the entire period. On the assumption that the direct estimate from the LFS is the most reliable of those for the 1970s, the indices of male mortality do not even indicate that slight improvements of this type have occurred. The third aspect of the results which is worthy of emphasis is that the different sources of information agree about the large differential that exists between the level of adult mortality experienced by men and women. In terms of the expectation of life at age 15, all the surveys and questions yield estimates of the size of this differential that vary between seven and ten years. Most of them cluster in the centre of this range. Overall, it seems probable that the direct estimates from the LFS are fairly accurate measures of the level of adult mortality in the mid-1970s. They suggest that the expectation of life at age 15 of males was about 45 years and of females was about 55 years. Mortality has declined little and equivalent statistics for the mid-1960s are unlikely to have been more than a year lower than this.

The widowhood method has a number of theoretical advantages over the orphanhood method for the measurement of levels and differentials in adult mortality (Hill 1977; Brass 1979). However in Lesotho it seems to have performed rather poorly while the orphanhood method has given results that seem very reliable. The exclusion of the currently divorced from calculation of the proportions is unlikely to be the reason. It can be seen from table 31 that they are few in number. Moreover their spouses are unlikely to have experienced mortality very different from the rest of the population. Where marital breakdown and remarriage are common, widowhood maybe under-reported because respondents tend to think of their current, rather than their first, spouse. However, despite the frequency of widowhood and divorce in Lesotho, it can be seen from table 31 that few women remarry. Therefore this is unlikely to be the explanation of the biases that exists in the estimates of male mortality. Knowledge of marriage customs in Lesotho helps explain why younger women might be under-reporting widowhood even if they have not remarried. Most marriages between Basotho involve large bridewealth payments spread over a number of years. Until these are completed the couple are not considered to be fully married (Murray 1981). Clearly on the whole women report themselves as married during this period but, if their husband dies, they might redefine their status as being

Table 31 Per cent distribution according to marital status of the ever-married population, LFS household survey

Age	Males				Females			
	Married once only			Married more than once	Married once only			Married more than once
	Married	Widowed	Divorced/separated		Married	Widowed	Divorced/separated	
15–19	91.3	1.7	7.5	0.0	95.6	0.5	3.0	0.9
20–24	95.7	0.5	2.3	1.5	92.7	1.5	4.4	1.3
25–29	94.0	0.5	3.4	2.0	88.0	2.5	6.8	2.6
30–34	89.0	0.9	3.7	6.4	83.7	5.7	7.7	3.0
35–39	87.4	1.2	3.3	8.1	81.7	8.6	6.5	3.2
40–44	80.6	1.6	4.7	13.2	73.8	16.1	5.9	4.2
45–49	78.7	2.7	4.1	14.6	67.3	24.5	5.0	3.2
50–54	74.5	3.1	4.2	18.2	60.0	33.2	4.4	2.5
55–59	71.6	4.6	4.2	19.6	47.7	44.5	4.6	3.3
60–64	71.2	7.1	3.3	18.4	36.8	58.4	2.7	2.1
65–69	66.6	8.0	3.6	21.8	30.9	64.9	2.5	1.7
70–74	61.8	13.8	2.2	22.0	22.5	74.9	1.7	1.0
75+	56.7	17.6	2.8	22.8	13.2	84.6	1.1	1.1
All 15+	81.9	3.0	3.7	11.4	70.8	21.8	5.0	2.4

single. Older women, whose bridewealth transactions have been completed, would not do this. Whether or not this hypothesis is true, Lesotho is a country in which the entry into marriage is a process rather than a single event; in which divorce is common; and in which labour migration has had deep and adverse effects on family life. It is perhaps unrealistic to expect the widowhood method of estimating adult mortality to perform well.

3.3 DIFFERENTIALS IN ADULT MORTALITY

Direct estimates of infant and child mortality provided a wealth of information on mortality differentials. Direct estimates of adult mortality are of far less use for the study of differentials. As has already been pointed out, the main reason for this is that rather little information is usually collected on the characteristics of those who have died. However, there are other problems. Methods for evaluating the completeness of death reporting, such as that based on the growth balance equation, assume that the population concerned has a quasi-stable age structure. This is often true of national populations but is highly unlikely to be true of subgroups within a society. Thus such techniques cannot be used to correct mortality rates calculated for particular groups. Moreover it will not usually be reasonable to assume that different sections of the population report deaths with equal completeness. In Lesotho the data appear to be of a high quality. However, if certain groups tend to omit to report deaths in the household, this might distort estimates of differentials without affecting those of the overall level of mortality greatly.

It is possible to produce direct estimates of the level of mortality in the different regions of Lesotho using data collected in the LFS household survey. These are shown for the two sexes in table 32. To reduce the impact of sampling errors and age misstatement on the results, mortality rates for individual age groups have been chained to produce a single estimate of the probability of survival from age 25–60. Values of alpha and the expectation of life at age 15 that correspond to these are also shown in the table. The estimates of mortality in the Lowlands, Foothills and Orange River Valley are similar to one another. Those for males and for females are ordered differently and it seems likely that the small differences that do exist between them can be ascribed to sampling and other errors. In the Mountains adult mortality appears to be much lighter than in other regions. This is an unexpected finding and could well result from reporting errors. (One would be more inclined to accept evidence that one region had much heavier mortality than the others.) Without information from other sources it is difficult to assess whether or not it can be relied upon.

Table 32 Estimates of adult mortality levels from recent deaths by region of residence, LFS household survey

Region of residence	l_{60}/l_{25}	α	$\mathring{e}_{15}$
A Male mortality			
Lowlands	0.576	0.014	43.0
Foothills	0.549	0.098	41.7
Orange River Valley	0.627	–0.136	45.4
Mountains	0.832	–0.781	55.8
B Female mortality			
Lowlands	0.784	–0.608	53.2
Foothills	0.833	–0.785	55.9
Orange River Valley	0.733	–0.445	50.5
Mountains	0.924	–1.258	62.0

Indirect estimates of adult mortality can also be produced for different subgroups of the population using data obtained in the LFS household survey. Both orphanhood-based and widowhood-based estimates can be produced for respondents living in different regions and for respondents with differing levels of education. The fact that these are characteristics of the respondent, rather than of the relatives concerned, means that differentials measured in this way are somewhat difficult to interpret. For example, one would expect the parents of educated respondents to be more educated than is usual in the population as a whole but to be less educated on average than their children. The increase over time in the numbers of educated people further complicates this picture. In general such difficulties of interpretation are less severe for widowhood-based estimates of mortality differentials than for orphanhood-based ones. Spouses belong to approximately the same generation, they are likely to have similar characteristics and, because they almost always live in the same household, the characteristics of one may have a direct impact upon the chances of survival of the other in a way which is less often true of the characteristics of children and the mortality of their parents. Unfortunately, the widowhood method of estimating mortality did not perform well in the LFS although it is possible that it might provide some useful information on differentials even if it estimates poorly the overall level of mortality. In addition to difficulties in the interpretation of the results, other problems are involved merely in estimating indirectly adult mortality for subgroups of the population. It is difficult to determine the timing of the fertility of the parents of subgroups of respondents or the timing of the marriages of their spouses. In general one would expect these to lie in between estimates for the population as a whole and estimates for groups with the same characteristics as the respondents. For example one would expect the mean age of childbearing of the mothers of educated respondents to lie in between that of all female respondents and that of educated respondents. However, the results presented here were produced using very simple assumptions. Those based on orphanhood data used the overall estimates of the male and female mean ages at childbearing. This approach will minimize differentials in mortality. In contrast, those based on widowhood data assume that all spouses of respondents have the same characteristics as the respondents themselves. This approach tends to exaggerate mortality differentials.

It would be possible to examine trends through time in the level of adult mortality reported by particular groups of respondents using indirect methods. However, in light of the problems that have just been outlined, attempts at such detailed study do not appear to be justified. Instead a single estimate of the level of mortality reported by each different subgroup of the population has been produced. To do this the results obtained from respondents in several adjacent age groups were averaged.[13] The age groups were selected so that the results refer to approximately equivalent periods. Adult mortality appears to have declined so little in Lesotho that no reasonable procedure is likely to distort the pattern of differentials obtained.

Estimates of the level of mortality experienced by the mothers and the fathers of respondents living in different regions are presented in table 33. They are expressed in terms of alpha, the level parameter of the relational model life table family based on the General Standard, and corresponding expectation of life at age 15. To help assess whether or not the results can be relied upon, they have been produced separately from the data supplied by male and female respondents. Moreover, estimates of the mortality of the spouses of respondents living in each region are also presented. These are also expressed in terms of alpha and life expectancy at age 15. The message of these results is clear and consistent. Adult mortality varies very little between the regions. However, the orphanhood-based estimates consistently suggest that the expectation of life

[13] Proportions orphaned and widowed among each subgroup of the population and detailed indirect estimates of adult mortality obtained from these can be found in tables B7–B16.

Table 33 Adult mortality differentials in the late 1960s by region of residence, LFS household survey

Region of residence	Orphanhood data[a]				Widowhood data[b]	
	Male respondents		Female respondents			
	α	$\mathring{e}_{15}$	α	$\mathring{e}_{15}$	α	$\mathring{e}_{15}$
A Male mortality						
Lowlands	–0.096	44.8	–0.032	43.8	–0.054	44.2
Foothills	–0.154	45.7	–0.089	44.7	–0.066	44.3
Orange River Valley	0.002	43.2	0.024	42.9	–0.068	44.4
Mountains	–0.218	46.8	–0.147	45.6	–0.191	46.3
All respondents	–0.118	45.1	–0.058	44.2	–0.109	45.0
B Female mortality						
Lowlands	–0.732	55.1	–0.630	53.5	–0.672	54.2
Foothills	–0.683	54.3	–0.624	53.3	–0.599	53.0
Orange River Valley	–0.604	53.1	–0.549	52.2	–0.631	53.5
Mountains	–0.813	56.3	–0.516	51.7	–0.611	53.2
All respondents	–0.714	54.8	–0.594	52.9	–0.636	53.6

[a] Estimated from male respondents aged 15–39 and female respondents aged 15–44.
[b] Estimated from male respondents aged 40–64 and female respondents aged 35–39.

at age 15 is one or two years lower in the Orange River Valley than in the other regions. The data on child mortality also tended to suggest that it was slightly higher in this area. What is conspicuously absent from these results is any evidence of very light mortality in the Mountains. It seems likely that the direct estimates indicated this because of under-reporting of recent deaths in the household by respondents living in this area.

Estimates of the type just discussed are shown for respondents with differing levels of schooling in table 34. These results are also very consistent. The trend in all the series of estimates is monotonic. They show that the parents and the husbands and wives of men and women with different levels of education experience very different levels of mortality. Estimates obtained from respondents of different sexes and the orphanhood-based and widowhood-based estimates indicate rather different levels of mortality. However they all suggest that there is a differential of at least six years between the expectation of life at age 15 of the relatives of respondents with no formal education and that of the relatives of respondents with secondary or higher education. Moreover the results consistently show that the relatives of respondents with secondary or higher schooling experience much lower mortality than anyone else. In contrast mortality differentials between other groups appear to be fairly small. Both conclusions apply equally to the estimates of male and female mortality. These results do not permit one to measure the mortality of groups of adults with varying levels of education. Moreover any tendency for the relatives of educated respondents to be educated themselves is probably only a minor part of the explanation of why they experience relatively low mortality. What the results do emphasize is that socio-economic factors have a large impact upon the chances of survival of adult men and women in Lesotho and that there is a small section of the population that experiences very much lower adult mortality than the rest.

Table 34 Adult mortality differentials in the late 1960s by education, LFS household survey

Education	Orphanhood data[a]				Widowhood data[b]	
	Male respondents		Female respondents			
	α	$\mathring{e}_{15}$	α	$\mathring{e}_{15}$	α	$\mathring{e}_{15}$
A Male mortality						
No education	–0.011	43.4	0.118	41.5	0.010	43.2
Lower primary	–0.106	45.0	0.012	43.1	–0.073	44.4
Upper primary	–0.166	45.9	–0.092	44.7	–0.208	46.6
Secondary +	–0.352	49.0	–0.226	46.9	–0.380	49.5
All respondents	–0.118	45.1	–0.058	44.2	–0.109	45.0
B Female mortality						
No education	–0.589	52.9	–0.297	48.1	–0.620	53.4
Lower primary	–0.731	55.1	–0.535	52.0	–0.631	53.5
Upper primary	–0.804	56.2	–0.630	53.5	–0.708	54.7
Secondary +	–0.982	58.7	–0.923	57.9	–1.038	59.5
All respondents	–0.714	54.8	–0.594	52.9	–0.636	53.6

[a]Estimated from male respondents aged 15–39 and female respondents aged 15–44.
[b]Estimated from male respondents aged 40–64 and female respondents aged 35–59.

4 Conclusions

Different questions and methods are used to estimate childhood and adult mortality by means of survey data. So far this paper has examined separately the level of, and trend in, mortality at young ages and at adult ages. There has been a long but slow decline in the level of infant and child mortality in Lesotho. It commenced at least as early as the mid-1950s and continued until the mid-1970s, the latest date for which information is available. A similar slight drop in levels of adult mortality may have occurred over the same period. The data on adult women indicate that some advances were made. However, estimates for adult men suggest that their chances of survival stagnated or worsened during the 1960s and 1970s. While the available estimates do not allow us to determine the exact trend in adult mortality, the more important point is clear. Lesotho has not experienced a rapid fall in mortality over the last 30 years comparable to those from which many of the less developed countries have benefited.

By combining estimates of infant, child and adult mortality, life tables can be constructed that summarize mortality patterns in Lesotho. The direct estimates from the LFS appear to be of a fairly high quality. They can be used to calculate up-to-date life tables that are based on data referring to the 1970s. It has already been concluded that for the 15 years before the LFS the birth history data yield reliable measures of the level and pattern of mortality at young ages. Rutstein (1983) produced estimates of mortality up to age five according to sex for the period 0–4 years before the survey. These have been incorporated in the life tables presented in table 35. It seems reasonable to assume that mortality between the ages of five and fifteen is influenced by similar factors to mortality between ages one and five. Moreover the results in table 7 revealed that the pattern of mortality between ages one and five was adequately fitted by both West and East model life tables. Here mortality rates for children aged 5–15 have been obtained from a West model fitted to Rutstein's estimates of the probability of dying between exact ages one and five. Direct estimates of adult mortality obtained from data collected in the LFS household survey refer to the year before the survey, not to a five-year period like the estimates of child mortality. However, any trend that exists in adult mortality levels is so slight that these estimates apply equally well to the whole of the 1970s. Because the mortality rates for individual age groups are very erratic and those for older respondents seem low, they have not been incorporated directly into the final life table. Instead a one-parameter relational model life table based on the General Standard (Brass 1971) was fitted to the probability of surviving from ages 25–55. The fitted model was then used to complete the life table. Examination of the direct estimates of adult mortality for the different regions and

Table 35 Abridged life table for Lesotho for the mid-1970s

Age (x)	Male		Female	
	l_x	$\mathring{e}_x$	l_x	$\mathring{e}_x$
0	1000	45.7	1000	55.2
1	871	51.4	878	61.8
5	818	50.6	835	60.9
10	801	46.6	822	56.8
15	789	42.3	813	52.4
20	762	38.7	802	48.1
25	727	35.5	788	43.9
30	692	32.1	774	39.7
35	657	28.7	758	35.4
40	621	25.2	740	31.2
45	580	21.8	719	27.1
50	532	18.6	692	23.0
55	475	15.5	656	19.2
60	407	12.7	607	15.5
65	327	10.1	538	12.2
70	240	7.9	445	9.2
75	151	6.1	322	6.8
80	76		185	
85	27		73	
90	6		16	

comparison of these with indirect estimates strongly suggest that recent deaths were under-reported in the Mountains. To allow for this the national estimate of adult mortality has been adjusted upwards. Any such adjustment is inevitably arbitrary and this was done simply by taking an average of the estimates for the other regions weighted by their share in the total population. This produces an estimate of survival from ages 25–55 of 65.3 per cent for males and 83.2 per cent for females. The alpha parameters of the model life tables that fit these estimates are 0.0625 and –0.5625 respectively. It should be noted that these measures are higher than almost any of those calculated directly from the data. This is despite the fact that they assume that all deaths are reported in the other regions, which is unlikely to be entirely true.

The final life tables in table 35 emphasize the two distinctive features of mortality in Lesotho that have already been noted. The first is the high level of infant, compared with child, mortality. The second is the large differential between adult male and adult female mortality. According to these estimates, the expectation of life at birth of males is just under 46 years while that of females is 9½ years greater – just over 55. This difference between the life expectancy of the two sexes increases rather than diminishes during childhood. By age 15 it is almost 10 years.

In table 36 the overall measures of life expectancy are compared with those arrived at on the basis of earlier surveys conducted in Lesotho. The estimate of male mortality obtained from the LFS suggests that it is slightly heavier than is indicated by most of the other surveys. In contrast the estimates presented here suggest that female mortality is slightly lighter than other sources indicate. Two factors underlie these net differences in life expectancy. According to the LFS, mortality at young ages is lighter than earlier enquiries concluded. In part this reflects a continuing secular decline. On the other hand the LFS data yield appreciably higher estimates of adult male mortality than those collected in earlier surveys. Perhaps more striking than the differences between these results is their consistency. Blacker (no date) constructed his life table on the basis of indirect mortality estimates. The life tables in the census volume was calculated using intercensal survival. Despite this the final results are similar to those obtained using direct estimates from the LFS.

In table 37 mortality indices extracted from the life tables in table 35 are compared with the most recent comparable measures for Botswana and Swaziland. Botswana, Lesotho and Swaziland are often referred to collectively as the BLS countries. They are geographically close to one another. Moreover their histories as British colonies were in many ways similar and they all supply the Republic of South Africa with large numbers of migrant labourers. Table 36 reveals that, both overall and in infancy and adulthood considered separately, mortality levels in Lesotho fall between the moderate levels found in Botswana and the heavier ones found in Swaziland. All three countries are characterized by larger differences between the mortality of adult men and women than is usual. However Lesotho is more extreme than the other two countries in this respect. In Lesotho women aged 15 could expect to live almost ten years longer than men according to the mortality rates prevailing around 1975. In Swaziland the difference is less than six years, while in Botswana it is less than five.

The factors that might underlie the relatively high level of infant mortality in Lesotho were discussed in chapter 2. At least 50 per cent of infant deaths occur in the first month of life. Moreover this will be true of considerably more than 50 per cent of such deaths if one believes that most child deaths at unknown ages are neo-natal deaths. Neo-natal mortality reaches a peak at the end of the hungry season. Moreover rates are much higher for children whose mothers already have a large family and children whose mothers had a previous child less than two years earlier. Although the evidence is circumstantial, it seems likely that the health and nutritional status during pregnancy of large numbers of women in Lesotho is sufficiently poor for this to affect the chances of their newly born children surviving the first few weeks of life. After these first few weeks the combined effects of infectious disease and malnutrition are known to be the biggest killers of children in underdeveloped countries. To some extent all children in Lesotho probably benefit from the absence of various tropical diseases prevalent elsewhere in Africa. Moreover the socio-economic status of a child's family, as measured by the education of its parents, has a large impact on the chances of its dying at these ages. The strong relationship between paternal education and mortality, even after controlling for maternal education, suggests that the direct effects of poverty at a household level, as well as the underdevelopment of the country as a whole, are responsible for a large number of child deaths in Lesotho.

Table 36 Estimates of life expectancy in Lesotho from various surveys[a]

Survey		Male	Female
1962–6	Demographic Study	49.8	55.5
1968–9	Rural Consumption and Expenditure Survey	49.6	53.6
1971–3	Demographic Survey	43.2	51.6
1976	Census	46.7	51.7
1977	Lesotho Fertility Survey	45.7	55.2

[a]The estimates obtained on the basis of the earlier enquiries have been extracted from WHO Epidemiological Centre, Nairobi (1967), Bureau of Statistics (1973), Blacker (no date) and Bureau of Statistics (1981a).

Table 37 Mortality indices for the BLS countries

Country	$\mathring{e}_0$		${}_1q_0$		$\mathring{e}_{15}$	
	Male	Female	Male	Female	Male	Female
Lesotho (1977 survey)	45.7	55.2	0.129	0.122	42.3	52.4
Botswana (1971 census)	52.5	58.6	0.103	0.091	50.2	54.8
Swaziland (1976 census)	42.9	49.5	0.165	0.146	43.1	49.0

The difficulties involved in the measurement of adult mortality using survey data limit the scope for testing hypotheses about the causes of the large differential that exists between the mortality of the two sexes. Mortality differentials according to the education of the respondent suggest that socio-economic status has a large impact upon adult mortality in Lesotho. In particular there appears to be a small, privileged group who experience much lower mortality than the rest of the population. However even the groups of adult males which have the lowest death rates experience higher mortality than the least favoured groups of women. A very plausible explanation of this pattern is that working in the South African mines adversely affects the health of large numbers of male Basotho. Excess mortality among mineworkers had been documented repeatedly in other parts of the world. Moreover other factors that have occasionally been mentioned as possibly responsible, such as the heavy drinking of many Basotho men and high levels of violence, must, insofar as they are true, be related to the effects of labour migration on the society. It has already been pointed out that excess mortality among adult males is also found, to a lesser extent, in Botswana and Swaziland. Labour migration to the

Republic of South Africa from these countries is also important, although it does not occur on the same scale as it does from Lesotho. Equally there could be some other factor that these countries share in common that underlies this pattern. Information on the causes of death of adult Basotho men would help establish whether the effects of working in the mines entirely explains their high mortality. However detailed studies would also have to involve longitudinal information on individuals' work histories.

With the exception of the widowhood technique, both direct and indirect methods of mortality estimation have worked well in Lesotho. Not only are respondents willing to report deaths, they also supply fairly accurate dates for when births and deaths occurred. As a result the birth history data yield fairly reliable information on mortality levels and trends among children during the last 15 years and questions on deaths in the household have provided fairly complete information on recent adult mortality. However both sources of direct estimates suffer from a number of limitations. Ages at death were not reported for an appreciable minority of dead children and also older women may have omitted to report on some dead children altogether. In addition the estimated rates may be distorted by the biases that exist in the individual survey sample (Timæus and Balasubramanian 1984). One problem with the latter results is that they have to be smoothed using models because the ages of many adults, in particular those who have died, are not known accurately. In particular reported ages of the elderly tend to be exaggerated. Secondly, in the LFS household survey at least, reporting of deaths was less complete in the Mountains than elsewhere. Moreover in the earlier surveys adult male deaths were under-reported. This probably reflects the absence abroad of large numbers of men of working age. The prospective study conducted in 1971–3 failed to obtain more complete information than the retrospective surveys conducted before and since. Moreover age reporting was particularly poor in this survey.

The indirect methods for estimating child mortality and for estimating adult mortality from orphanhood have performed well in Lesotho. This is perhaps unsurprising as the more detailed information required to measure mortality directly has also been collected successfully. However it provides yet further confirmation of the basic soundness of the approach, something that is occasionally questioned for the child mortality technique and more often for the orphanhood one. As with the direct estimates, many of the erratic fluctuations in the estimates appear to result from inaccuracies in the reporting of the ages of adults. Data on child mortality gathered in the 1971 round of the Demographic Survey and in the 1976 Census were far less satisfactory than those obtained in the 1968–9 Consumption and Expenditure Survey and the 1977 LFS household survey. This emphasizes the importance of the quality of fieldwork when collecting even simple demographic statistics. Our final estimates of the level of adult mortality suggest that all the measures of maternal and paternal orphanhood used in this study have been rather too low. Much of the explanation of this is probably that the discrepancies between the reports of male and female respondents arise because orphanhood is understated by males. Many men are absent abroad and their wives or others will have supplied information on their parents' survival. In future it might be advisable to use only the information supplied by women to estimate mortality from orphanhood data in Lesotho.

The poor performance of the widowhood method for estimating adult mortality has already been discussed at length. The exact reasons for it remain unclear. It is worth repeating that the coexistence of traditional marriage, Christian marriage and 'elopement', the large exchanges of wealth involved in traditional marriage, marital instability and divorce and the frequent and long-term absence of women's husbands abroad must inevitably make it difficult to gather reliable information on this topic in Lesotho within the framework of a large-scale survey.

This study has used recently developed methods for locating indirect estimates in time to measure trends in adult and child mortality. These have worked well. Of course there has been little downward trend in mortality in Lesotho, but the methods reveal this. The orphanhood method, and perhaps also the child mortality method, tends to underestimate mortality. However this applied more or less equally to indices calculated from data supplied by respondents of different ages. As a result the inferences drawn from series of estimates obtained in a single survey agree with those suggested by the comparison of the results of different surveys. In addition the direct mortality estimates suggest very similar trends to the indirect mortality estimates. Calculation of the dates to which mortality estimates apply is essential if the consistency of those provided by different sources is to be examined carefully. The variety of information available on mortality in Lesotho has made it possible to evaluate the accuracy of the estimates in some detail.

The data collected in the LFS are of a very high quality. The direct estimates appear to measure mortality in the mid-1970s accurately. All measures of mortality are more likely to be underestimates than overestimates. In particular adult male mortality could be even heavier than we have suggested here. However the life tables presented in table 34 are the most reliable and up to date that can be produced at present.

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Appendix A – Techniques of Analysis

This appendix briefly describes both the principles underlying the techniques used in this study and important aspects of their practical application. Idiosyncratic features of the analysis and presentation of the results are given most attention.

A1 DIRECT ESTIMATION OF INFANT AND CHILD MORTALITY

The birth histories collected in the individual survey include information about the date of interview of the respondent, the date of birth of each child and the age at death in completed years and months of those children who have died. From this data it is possible to calculate numbers exposed and deaths in any age group at any time prior to the survey. Thus one can derive both cohort and period life tables measuring infant and child mortality. The construction of cohort life tables from WFS birth history data is discussed in Smith (1980) and the construction of period life tables in Rutstein (1983). Most of the life table measures presented in this paper were calculated on a cohort basis. The period life tables that are considered were extracted from tables in Rutstein's paper.

Unlike some WFS surveys, the LFS data on ages at death refer to exact ages in completed years and months. They have not been recoded to refer to wider intervals. Thus in theory it is possible to calculate life tables based on monthly intervals. In practice this would not be justified. Inspection of the data makes it clear that ages in completed months as well as years were seldom reported for deaths at age one and over. Therefore, deaths at age one were grouped into quarterly intervals and death at older ages into yearly ones and life tables calculated on this basis. Summary mortality rates, for example the post-neonatal mortality rate and ${}_3q_2$, were obtained from these and not by constructing more abridged life tables.

When calculating life tables using retrospective survey data, one must allow for censoring. Births are observed for varying periods of exposure dependent upon how long before the interview they occurred. If children survive until the time of interview only their minimum possible age at death is known. Such cases are referred to as censored. Censoring could be dealt with by omitting all births potentially affected by it from the calculations. However this entails rejecting large amounts of data that are likely to be among the more reliable available. It is also unnecessary. Censored observations can be included in the calculations, so long as the numbers exposed to risk in each age interval are reduced progressively to allow for censoring as well as to allow for earlier deaths.[14] Partial exposure in an age interval of those interviewed during it and the corresponding deaths of those who would otherwise have been censored later in the same age interval raise complications. Here such data were included in the calculations on the assumption that censored cases were exposed for half the final interval. However the LFS data are particularly awkward. Ages at interview of censored observations have to be calculated from dates of birth and of interview in years and months. Therefore they are not known exactly but span a range of two months. For this study it was assumed that all such births were censored at the younger of these two ages. This was more convenient than attempting randomly to allocate ages at interview to the two possible values. To avoid bias, the corresponding group of deaths were also omitted from the calculations. These are deaths that occurred at an exact age equal to the older of the two possible ages of interview for the child.

A2 ADJUSTMENT OF DIRECT ESTIMATES OF ADULT MORTALITY

Reports of recent deaths among household members are available from the LFS and all three earlier surveys. When a survey has a large enough sample size for significant numbers of events to be reported, as is the case in all the surveys discussed here, such data yield direct estimates of adult mortality for a period close to the time of the survey. However the estimates usually require evaluation and adjustment by the growth balance equation or related techniques to correct for reference period errors and for under-reporting of deaths (Brass 1975). The growth balance equation combines information on deaths by age with information on the population's age structure. The approach exploits the relationship between numbers of deaths above any age and the numbers surviving to that age that exists in a stable population. For it to be used successfully the data must conform to certain assumptions. First, the degree of under-reporting by age must be constant. This is unlikely to extend to young children and the elderly. Secondly, the age distribution of respondents must be more or less stable and in particular be undistorted by major biases in age reporting or by migration. Data on the young and elderly are also unlikely to meet this assumption.

[14] Software that performs such calculations can be found in most survey analysis packages. It usually employs biostatistical, rather than demographic terminology and notation. For this study the SPSS SURVIVAL procedure was used.

A3 INDIRECT ESTIMATION OF MORTALITY

Indirect methods were developed so that mortality could be estimated by means of straightforward retrospective questions on the lifetime or recent experience of respondents. The data required are far simpler than those obtained in birth histories. However the analytic techniques involved are fairly complicated. They entail the use of models to estimate ages at death. These must be assumed to apply to the population concerned.

An important group of indirect methods are those that translate the proportions dead – or surviving – of various categories of close relatives of the respondents into conventional mortality indices. Use of these methods is now long established. The best known estimate mortality rates in childhood from the proportion of women's children that have died (Brass *et al* 1968). Other applications of the approach estimate indices of adult mortality from the proportions of respondents that have been orphaned or widowed (Brass and Hill 1974; Hill 1977). These estimation techniques use the fact that the proportion of relatives surviving for a particular age group of respondents depends mainly on two factors: the level of mortality and the mean length of the period over which those relatives have been exposed to the risk of dying. For the orphanhood and childhood mortality methods the period of exposure to risk depends on the timing of fertility and the current age of the respondent. For the widowhood technique it depends on the timing of marriage and age. Thus given estimates of the timing of fertility and nuptiality it is possible to estimate the level of mortality from data on relatives' survival.

Recent methodological advances allow one to estimate the dates to which indices of mortality obtained in this way refer. They clearly represent an 'average' of some sort of mortality levels over the period of exposure to risk. There is some point in time at which the actual mortality level prevailing equalled that obtained by the indirect estimation procedure. The older the age group of respondents and the longer the period of exposure, the more distant this point in time. A rough estimate of it would be halfway through the period of exposure to risk. In fact better estimates of the time location of indirect mortality estimates can be made. It has been demonstrated that for any linear decline in the level of mortality, the time location to which indirect mortality estimates apply is independent of the rate of decline (Feeney 1980). What it depends largely upon is the age pattern of mortality. Thus, on the assumption of some model age pattern of mortality, fairly good time location figures can be obtained for a series of indirect estimates of mortality levels. This approach is used here to estimate mortality trends from the data supplied by different age groups of respondents.

A number of different implementations of the indirect approach to mortality estimation have been developed. For example, there are sets of multipliers and weights that can be applied to the proportions surviving by age to produce conventional mortality rates (eg Brass 1975) and sets of regression equations that fulfil the same function (eg Hill and Trussell 1977). The various implementations incorporate somewhat different assumptions about age patterns of mortality and fertility. While there is no consensus about which estimation procedures or fertility and mortality models are preferable (and much evidence exists that the various techniques give similar results), there are clear advantages to be gained from consistency.[15] In particular this will ease comparison of estimates from different sources. This analysis uses the multiplier and weighting methods developed by Brass and Hill to calculate conventional mortality indices. These all incorporate the same fertility model and assume an age pattern of mortality derived from that of the General Standard (Brass 1971). Similarly, the times to which these mortality estimates refer were calculated using the approaches developed by Brass and Bamgboye (1981) and by Brass (1982). These also assume a pattern of mortality based on that of the General Standard and in addition a linear trend in alpha over time.

To compare estimates from respondents of different ages, from different questions and from different surveys, they must all be expressed in terms of a single index of the level of mortality. To achieve this requires assumptions about the age pattern of mortality. These should not conflict with those used to obtain the estimates. Here the alpha parameter of the relational model life table family derived from the General Standard is used. It measures the level of mortality relative to that in the standard. Conventional indices of mortality derived from alpha are presented alongside it to ease interpretation of the results. These are the probability of death by age five (${}_5q_0$) for the child mortality estimates and the expectation of life at age 15 ($\mathring{e}_{15}$) for the adult mortality estimates. These indices were chosen instead of other possible ones (eg the infant mortality rate and survivorship from ages 25–60) because on the one hand they are relatively little affected by deviations of the actual pattern of mortality from that assumed, while on the other their significance is fairly easy to interpret.

[15] Ideally one would use appropriate mortality models. In practice attempts to do so are difficult to justify as indirect techniques are most useful when other information on mortality is unavailable. In particular one is concerned with the age pattern of mortality within childhood and within adulthood. Models fitting these may differ from the model fitting the relationship between child and adult mortality. Thus in general it is best to use an 'average' mortality model.

Appendix B – Detailed Tables

Table B1 Proportions of children that have died by region of residence of mother, LFS household survey

Age	Lowlands	Foothills	Orange River Valley	Mountains
A Both sexes				
15–19	0.1473	0.0970	0.1228	0.1208
20–24	0.1208	0.1439	0.1524	0.1706
25–29	0.1506	0.1552	0.2067	0.2000
30–34	0.1767	0.1804	0.2193	0.2187
35–39	0.1793	0.1945	0.2230	0.1971
40–44	0.2106	0.2268	0.2606	0.2363
45–49	0.2281	0.2337	0.2628	0.2808
B Male				
15–19	0.1589	0.0972	0.0952	0.1358
20–24	0.1304	0.1581	0.1703	0.1529
25–29	0.1570	0.1623	0.2262	0.1970
30–34	0.1851	0.1927	0.2302	0.2280
35–39	0.1882	0.2068	0.2307	0.2061
40–44	0.2207	0.2380	0.2745	0.2520
45–49	0.2255	0.2492	0.2735	0.3100
C Female				
15–19	0.1348	0.0968	0.1731	0.1029
20–24	0.1111	0.1282	0.1302	0.1898
25–29	0.1435	0.1491	0.1878	0.2031
30–34	0.1680	0.1672	0.2077	0.2083
35–39	0.1656	0.1811	0.2134	0.1879
40–44	0.2004	0.2140	0.2465	0.2215
45–49	0.2307	0.2183	0.2524	0.2486

Table B2 Proportions of children that have died by education of mother, LFS household survey

Age	No schooling	Lower primary	Upper primary	Secondary +
A Both sexes				
15–19	0.2432	0.1280	0.0898	0.1224
20–24	0.2197	0.1506	0.1321	0.0633
25–29	0.2360	0.1757	0.1642	0.1044
30–34	0.2563	0.2043	0.1747	0.1317
35–39	0.2451	0.2110	0.1645	0.1192
40–44	0.2825	0.2324	0.1973	0.1395
45–49	0.3005	0.2448	0.2131	0.1850
B Male				
15–19	0.2195	0.1436	0.0678	0.1905
20–24	0.2532	0.1565	0.1354	0.0828
25–29	0.2558	0.1660	0.1841	0.1203
30–34	0.2506	0.2122	0.1904	0.1308
35–39	0.2672	0.2130	0.1828	0.0977
40–44	0.2955	0.2381	0.2186	0.1652
45–49	0.3035	0.2555	0.2242	0.1953
C Female				
15–19	0.2727	0.1088	0.1087	0.0714
20–24	0.1875	0.1445	0.1296	0.0420
25–29	0.2160	0.1853	0.1442	0.0876
30–34	0.2616	0.1963	0.1577	0.1358
35–39	0.2218	0.2090	0.1461	0.1362
40–44	0.2690	0.2265	0.1752	0.1186
45–49	0.2981	0.2342	0.2015	0.1746

Table B3 Deaths in the last 12 months, population and partial birth and death rates, LFS household survey

Age	Female				Male			
	Deaths	Population	Partial birth rate	Partial death rate	Deaths	Population	Partial birth rate	Partial death rate
0–4	201	6162	–	–	225	6276	–	–
5–9	6	5539	0.0308	0.0066	10	5393	0.0339	0.0108
10–14	5	5431	0.0338	0.0076	9	5190	0.0365	0.0125
15–19	15	4672	0.0374	0.0089	9	4209	0.0395	0.0148
20–24	15	3833	0.0381	0.0101	14	3336	0.0385	0.0175
25–29	3	3158	0.0378	0.0114	24	2890	0.0383	0.0203
30–34	18	2399	0.0363	0.0136	14	2248	0.0384	0.0229
35–39	6	2202	0.0356	0.0147	26	2268	0.0406	0.0262
40–44	19	2245	0.0415	0.0172	29	2157	0.0499	0.0300
45–49	7	1658	0.0460	0.0195	21	1634	0.0566	0.0354
50–54	14	1475	0.0459	0.0232	27	1245	0.0568	0.0426
55–59	13	1659	0.0586	0.0269	30	1396	0.0691	0.0494
60–64	17	1085	0.0745	0.0355	31	880	0.0937	0.0655
65–69	14	836	0.0739	0.0438	34	644	0.0984	0.0827
70–74	20	583	0.0804	0.0567	26	356	0.1106	0.1040
75+	80	1181	0.1494	0.0677	68	548	0.1650	0.1241

Table B4 Deaths during 12 months, population and partial birth and death rates, 1971–2 survey

Age	Female				Male			
	Deaths	Population	Partial birth rate	Partial death rate	Deaths	Population	Partial birth rate	Partial death rate
0–4	208	8134	–	–	209	7898	–	–
5–9	22	7555	0.0322	0.0066	26	7658	0.0350	0.0088
10–14	22	7574	0.0368	0.0073	20	7305	0.0406	0.0100
15–19	17	6029	0.0406	0.0083	15	5592	0.0437	0.0118
20–24	20	4814	0.0394	0.0094	12	4481	0.0421	0.0139
25–29	16	3321	0.0358	0.0106	20	3034	0.0386	0.0165
30–34	21	3086	0.0331	0.0116	20	2867	0.0360	0.0183
35–39	17	3210	0.0386	0.0125	20	2880	0.0424	0.0207
40–44	10	2434	0.0431	0.0142	30	2286	0.0484	0.0244
45–49	10	1860	0.0403	0.0165	25	1743	0.0481	0.0275
50–54	20	2627	0.0510	0.0189	33	2400	0.0624	0.0309
55–59	18	1688	0.0700	0.0237	31	1403	0.0898	0.0406
60–64	21	1166	0.0637	0.0286	38	913	0.0818	0.0498
65–69	18	883	0.0618	0.0323	36	657	0.0818	0.0537
70–74	27	1062	0.0800	0.0366	25	606	0.1000	0.0531
75+	62	1369	0.1776	0.0453	42	657	0.1922	0.0639

Table B5 Deaths in the last 12 months, population and partial birth and death rates, 1968–9 survey

Age	Female				Male			
	Deaths	Population	Partial birth rate	Partial death rate	Deaths	Population	Partial birth rate	Partial death rate
0–4	327	8032	–	–	376	8320	–	–
5–9	24	8595	0.0301	0.0078	45	9253	0.0333	0.0101
10–14	23	7926	0.0355	0.0088	18	8642	0.0412	0.0112
15–19	13	6350	0.0369	0.0100	21	6500	0.0435	0.0135
20–24	14	4684	0.0341	0.0115	15	4641	0.0393	0.0158
25–29	19	3988	0.0314	0.0130	18	3907	0.0361	0.0183
30–34	21	3453	0.0315	0.0144	16	3113	0.0355	0.0210
35–39	25	3627	0.0351	0.0158	26	3293	0.0384	0.0239
40–44	11	2739	0.0384	0.0177	34	2478	0.0432	0.0279
45–49	18	2944	0.0411	0.0205	41	2794	0.0484	0.0311
50–54	26	2885	0.0536	0.0243	45	2590	0.0665	0.0368
55–59	24	2099	0.0623	0.0299	53	1849	0.0806	0.0459
60–64	20	1366	0.0587	0.0364	46	1067	0.0797	0.0547
65–69	62	1806	0.0700	0.0430	52	1209	0.0878	0.0594
70–74	46	1193	0.1099	0.0488	32	641	0.1337	0.0737
75+	87	1535	0.1778	0.0567	70	743	0.1863	0.0942

Table B6 Deaths in the survey population, person years at risk and partial birth and death rates, 1962–6 survey

Age	Female				Male			
	Deaths	Person years	Partial birth rate	Partial death rate	Deaths	Person years	Partial birth rate	Partial death rate
0–4	62	5295	–	–	62	5271	–	–
5–9	5	4895	0.0308	0.0102	6	4855	0.0460	0.0140
10–14	9	4900	0.0349	0.0118	6	4847	0.0565	0.0176
15–19	7	3300	0.0354	0.0140	3	2388	0.0587	0.0240
20–24	5	2799	0.0307	0.0159	2	821	0.0323	0.0295
25–29	6	2354	0.0302	0.0182	8	775	0.0175	0.0319
30–34	8	2208	0.0311	0.0208	7	1003	0.0213	0.0339
35–39	9	1673	0.0311	0.0238	13	934	0.0264	0.0376
40–44	16	1840	0.0325	0.0266	11	1094	0.0316	0.0410
45–49	16	1688	0.0393	0.0303	24	1192	0.0430	0.0474
50–54	15	1722	0.0468	0.0352	23	1208	0.0582	0.0553
55–59	21	1155	0.0518	0.0434	21	762	0.0675	0.0703
60–64	31	1485	0.0599	0.0500	39	811	0.0730	0.0854
65–69	24	850	0.0800	0.0647	33	474	0.0956	0.1079
70–74	40	802	0.0798	0.0797	31	359	0.0957	0.1287
75+	125	1267	0.1015	0.0987	81	511	0.1098	0.1585

Table B7 Proportion of respondents with mother alive by region of residence, LFS household survey

Age	Lowlands			Foothills		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.9412	0.9396	0.9403	0.9281	0.9314	0.9298
20–24	0.9277	0.8928	0.9089	0.9012	0.8957	0.8984
25–29	0.8719	0.8548	0.8631	0.8586	0.8409	0.8493
30–34	0.7981	0.7647	0.7810	0.8230	0.7809	0.8012
35–39	0.6896	0.6765	0.6831	0.7119	0.6842	0.6981
40–44	0.5992	0.5233	0.5618	0.6783	0.6071	0.6410
45–49	0.4624	0.4533	0.4578	0.5402	0.4917	0.5171
50–54	0.3699	0.3245	0.3456	0.3951	0.3639	0.3772
55–59	0.2157	0.1924	0.2028	0.3283	0.1859	0.2503
60–64	0.1628	0.1154	0.1376	0.2028	0.1233	0.1567

Age	Orange River Valley			Mountains		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.9323	0.9522	0.9427	0.9419	0.9208	0.9308
20–24	0.8756	0.8939	0.8855	0.9238	0.8640	0.8900
25–29	0.8466	0.7862	0.8143	0.9074	0.8200	0.8615
30–34	0.7565	0.7425	0.7492	0.8122	0.7172	0.7629
35–39	0.7244	0.6268	0.6779	0.7309	0.6776	0.7047
40–44	0.6127	0.5460	0.5776	0.5742	0.5463	0.5595
45–49	0.4871	0.4203	0.4525	0.5240	0.4659	0.4929
50–54	0.3252	0.3150	0.3196	0.3457	0.3643	0.3553
55–59	0.3486	0.2027	0.2670	0.2778	0.2191	0.2485
60–64	0.1383	0.1353	0.1365	0.1615	0.1069	0.1315

Table B8 Proportion of respondents with father alive by region of residence, LFS household survey

Age	Lowlands			Foothills		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.7600	0.7373	0.7479	0.7674	0.7539	0.7603
20–24	0.6851	0.6224	0.6512	0.6882	0.6760	0.6820
25–29	0.5739	0.5592	0.5663	0.5750	0.5674	0.5710
30–34	0.4355	0.4519	0.4439	0.4913	0.4631	0.4766
35–39	0.3155	0.3373	0.3263	0.3780	0.3151	0.3468
40–44	0.2285	0.2101	0.2195	0.2538	0.2326	0.2427
45–49	0.1584	0.1720	0.1652	0.1919	0.1468	0.1704
50–54	0.1049	0.0722	0.0874	0.1198	0.0854	0.1000
55–59	0.0380	0.0395	0.0387	0.0468	0.0504	0.0496

Age	Orange River Valley			Mountains		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.7368	0.7054	0.7203	0.7707	0.7843	0.7779
20–24	0.6360	0.6369	0.6365	0.7195	0.6667	0.6896
25–29	0.5680	0.5356	0.5506	0.5927	0.5574	0.5742
30–34	0.3902	0.4307	0.4113	0.4781	0.4729	0.4754
35–39	0.3237	0.3169	0.3205	0.4301	0.3886	0.4096
40–44	0.1986	0.2325	0.2164	0.2585	0.2308	0.2439
45–49	0.2135	0.1304	0.1704	0.1952	0.1513	0.1717
50–54	0.0617	0.0900	0.0774	0.1570	0.1085	0.1320
55–59	0.1086	0.0136	0.0556	0.0797	0.0675	0.0736

Table B9 Estimates of adult survivorship and mortality level (α) from orphanhood data by region of residence, LFS household survey

Age (N)	Male				Female			
	$l_N/l_{32.5}$	α	$\mathring{e}_{15}$	Date	l_N/l_{25}	α	$\mathring{e}_{15}$	Date
A Lowlands								
45					0.937	–0.759	55.5	1969.6
50					0.907	–0.735	55.2	1968.0
55	0.731	–0.046	44.0	1968.9	0.864	–0.703	54.7	1966.1
60	0.637	–0.051	44.1	1967.0	0.786	–0.613	53.3	1965.4
65	0.533	–0.091	44.7	1965.2	0.685	–0.571	52.6	1964.4
70	0.392	–0.060	44.2	1963.1	0.558	–0.547	52.2	1963.6
75	0.246	–0.035	43.8	–	0.433	–0.621	53.4	–
B Foothills								
45					0.926	–0.665	54.1	1969.5
50					0.896	–0.663	54.0	1967.9
55	0.745	–0.102	44.9	1969.0	0.849	–0.635	53.6	1966.5
60	0.662	–0.130	45.3	1967.1	0.804	–0.677	54.3	1965.5
65	0.544	–0.121	45.2	1965.3	0.698	–0.604	53.1	1964.5
70	0.416	–0.134	45.4	1963.4	0.633	–0.725	55.0	1964.5
75	0.266	–0.114	45.1	–	0.483	–0.733	55.1	–
C Orange River Valley								
45					0.935	–0.746	55.3	1969.5
50					0.882	–0.583	52.8	1967.8
55	0.704	0.057	42.4	1968.8	0.814	–0.491	51.3	1966.3
60	0.621	0.004	43.2	1966.9	0.751	–0.502	51.5	1965.1
65	0.510	–0.022	43.6	1964.9	0.678	–0.550	52.2	1964.3
70	0.369	0.015	43.0	1962.8	0.570	–0.576	52.7	1963.7
75	0.240	–0.010	43.4	–	0.420	–0.590	52.9	–
D Mountains								
45					0.927	–0.673	54.2	1969.4
50					0.890	–0.628	53.5	1968.0
55	0.765	–0.177	46.1	1969.1	0.866	–0.711	54.8	1966.7
60	0.674	–0.170	46.0	1967.3	0.768	–0.554	52.3	1965.3
65	0.551	–0.143	45.6	1965.5	0.713	–0.646	53.8	1964.7
70	0.449	–0.228	46.9	1964.1	0.560	–0.552	52.3	–
75	0.292	–0.205	46.6	–	0.469	–0.702	54.7	–

Table B10 Proportion of respondents with first spouse alive by region of residence, LFS household survey

Age	Lowlands		Foothills		Orange River Valley		Mountains	
	Male	Female	Male	Female	Male	Female	Male	Female
15–19	1.0000	0.9942	0.9688	0.9914	0.9655	0.9952	0.9655	0.9930
20–24	0.9954	0.9799	1.0000	0.9861	0.9888	0.9766	0.9917	0.9791
25–29	0.9915	0.9665	0.9899	0.9646	0.9921	0.9599	0.9897	0.9737
30–34	0.9827	0.9273	0.9613	0.9284	0.9713	0.9289	0.9758	0.9378
35–39	0.9735	0.9030	0.9717	0.8845	0.9664	0.8498	0.9568	0.9282
40–44	0.9443	0.8042	0.9223	0.8026	0.9234	0.7956	0.9377	0.8447
45–49	0.9273	0.7259	0.9155	0.7393	0.8814	0.7380	0.8897	0.7203
50–54	0.8891	0.6142	0.8870	0.6080	0.8954	0.7021	0.8844	0.6789
55–59	0.8594	0.4944	0.8241	0.5094	0.8944	0.4714	0.8672	0.5738
60–64	0.8610	0.4125	0.8154	0.3692	0.8140	0.3361	0.7846	0.3533

Table B11 Estimates of adult survivorship and mortality level (α) from widowhood data by region of residence, LFS household survey

Age (N)	Male				Female			
	$l_{N+5}/l_{27.5}$	α	$\mathring{e}_{15}$	Date	$l_{N-5}/l_{22.5}$	α	$\mathring{e}_{15}$	Date
A Lowlands								
25	0.979	–0.050	44.1	1976.7	1.004	–1.039	59.6	–
30	0.958	–0.348	48.9	1974.0	0.991	–0.570	52.6	1976.7
35	0.922	–0.300	48.1	1971.7	0.981	–0.772	55.7	1974.1
40	0.876	–0.268	47.6	1969.4	0.969	–0.799	56.1	1971.8
45	0.780	–0.062	44.3	1967.1	0.942	–0.665	54.1	1969.6
50	0.684	0.011	43.1	1965.0	0.921	–0.681	54.3	1967.6
55	0.562	0.103	41.7	1962.9	0.883	–0.632	53.6	1965.9
60	0.450	0.095	41.8	1961.0	0.860	–0.711	54.8	1964.7
65	0.361	–0.014	43.5	1959.7	0.839	–0.828	56.6	1964.0
B Foothills								
	$l_{N+5}/l_{22.5}$				$l_{N-5}/l_{17.5}$			
25	0.968	–0.478	51.1	1974.1	0.994	–0.686	54.4	1976.9
30	0.937	–0.381	49.5	1972.0	0.968	–0.408	49.9	1974.9
35	0.898	–0.310	48.3	1969.8	0.969	–0.753	55.4	1972.0
40	0.832	–0.173	46.0	1967.8	0.939	–0.573	52.6	1969.9
45	0.765	–0.120	45.2	1965.9	0.918	–0.583	52.8	1968.0
50	0.663	–0.019	43.6	1963.9	0.901	–0.633	53.6	1966.4
55	0.552	0.049	42.5	1962.1	0.860	–0.581	52.7	1964.9
60	0.424	0.110	41.6	1960.0	0.821	–0.598	53.0	1963.8
65	0.307	0.118	41.4	1958.0	0.817	–0.777	55.8	1963.5
C Orange River Valley								
25	0.961	–0.343	48.9	1974.1	0.991	–0.454	50.7	1976.9
30	0.933	–0.336	48.7	1972.0	0.974	–0.547	52.2	1974.2
35	0.864	–0.104	44.9	1969.7	0.967	–0.723	55.0	1972.1
40	0.809	–0.069	44.4	1967.7	0.935	–0.539	52.1	1970.0
45	0.755	–0.085	44.6	1965.9	0.897	–0.435	50.4	1968.0
50	0.714	–0.178	46.1	1964.4	0.889	–0.561	52.4	1966.4
55	0.549	0.057	42.4	1962.0	0.895	–0.761	55.6	1965.3
60	0.376	0.271	39.2	1959.2	0.861	–0.765	55.6	1964.2
65	0.361	–0.061	44.2	1959.5	0.769	–0.616	53.3	1963.2
D Mountains								
25	0.975	–0.607	53.2	1974.1	0.991	–0.436	50.4	1976.9
30	0.946	–0.479	51.1	1972.0	0.980	–0.684	54.4	1974.2
35	0.931	–0.564	52.5	1969.9	0.963	–0.653	53.9	1972.0
40	0.873	–0.379	49.4	1967.9	0.945	–0.642	53.7	1969.9
45	0.768	–0.131	45.4	1965.8	0.913	–0.544	52.1	1968.0
50	0.695	–0.120	45.2	1964.2	0.887	–0.552	52.3	1966.3
55	0.616	–0.136	45.4	1962.7	0.878	–0.670	54.2	1965.0
60	0.432	0.086	41.9	1959.9	0.841	–0.678	54.3	1963.9
65	0.351	–0.031	43.7	1959.1	0.782	–0.660	54.0	1963.2

Table B12 Proportion of respondents with mother alive by education, LFS household survey

Age	No schooling			Lower primary		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.9254	0.8846	0.9196	0.9270	0.9276	0.9273
20–24	0.8835	0.8370	0.8751	0.9207	0.8759	0.8973
25–29	0.8400	0.7650	0.8276	0.8907	0.8223	0.8523
30–34	0.7769	0.6540	0.7497	0.8060	0.7441	0.7720
35–39	0.6719	0.5576	0.6468	0.6999	0.6508	0.6731
40–44	0.5741	0.4876	0.5479	0.6345	0.5471	0.5817
45–49	0.4653	0.4141	0.4494	0.4865	0.4572	0.4689
50–54	0.3352	0.2939	0.3200	0.3802	0.3640	0.3697
55–59	0.2543	0.1450	0.2066	0.3019	0.2173	0.2462
60–64	0.1689	0.1044	0.1379	0.1755	0.1333	0.1476
Age	**Upper primary**			**Secondary +**		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.9522	0.9374	0.9417	0.9822	0.9690	0.9737
20–24	0.9319	0.8890	0.9010	0.9414	0.9309	0.9354
25–29	0.8750	0.8429	0.8527	0.8943	0.9006	0.8974
30–34	0.8186	0.7741	0.7880	0.8429	0.8376	0.8403
35–39	0.7391	0.7035	0.7154	0.7949	0.7982	0.7961
40–44	0.6611	0.5794	0.6084	0.6560	0.5495	0.6111
45–49	0.5630	0.4841	0.5130	0.5000	0.5536	0.5183
50–54	0.4103	0.3304	0.3596	0.3971	0.3235	0.3726
55–59	0.2809	0.2390	0.2564	0.2154	0.2000	0.2111
60–64	0.2016	0.1258	0.1600	0.0789	0.0910	0.0816

Table B13 Proportion of respondents with father alive by education, LFS household survey

Age	No schooling			Lower primary		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.7119	0.6648	0.7050	0.7680	0.7300	0.7491
20–24	0.6624	0.6133	0.6536	0.6732	0.6165	0.6435
25–29	0.5663	0.4809	0.5520	0.5416	0.5355	0.5382
30–34	0.4046	0.4408	0.4126	0.4688	0.4312	0.4481
35–39	0.3113	0.2857	0.3057	0.3571	0.3268	0.3405
40–44	0.2237	0.1820	0.2110	0.2198	0.2158	0.2174
45–49	0.1742	0.1212	0.1578	0.1688	0.1473	0.1558
50–54	0.1008	0.0860	0.0953	0.1265	0.0790	0.0956
55–59	0.0504	0.0297	0.0414	0.0495	0.0513	0.0507
Age	**Upper primary**			**Secondary +**		
	Male	Female	Both sexes	Male	Female	Both sexes
15–19	0.7769	0.7588	0.7641	0.8252	0.7714	0.7906
20–24	0.6913	0.6448	0.6577	0.7599	0.6979	0.7241
25–29	0.5755	0.5649	0.5681	0.6938	0.6344	0.6644
30–34	0.4761	0.4702	0.4721	0.4905	0.5051	0.4976
35–39	0.3890	0.3586	0.3688	0.4021	0.4037	0.4026
40–44	0.2493	0.2388	0.2425	0.3680	0.3297	0.3519
45–49	0.1732	0.1818	0.1787	0.2870	0.2500	0.2744
50–54	0.1134	0.0858	0.0959	0.1324	0.1471	0.1373
55–59	0.0730	0.0359	0.0513	0.1231	0.0400	0.1000

Table B14 Estimates of adult survivorship and mortality level (α) from orphanhood data by education, LFS household survey

Age (N)	Male				Female			
	$l_N/l_{32.5}$	α	$\mathring{e}_{15}$	Date	l_N/l_{25}	α	$\mathring{e}_{15}$	Date
A No schooling								
45					0.914	–0.577	52.7	1969.5
50					0.873	–0.538	52.0	1967.8
55	0.696	0.090	41.9	1968.8	0.829	–0.548	52.2	1966.4
60	0.637	–0.050	44.0	1967.0	0.755	–0.513	51.6	1965.2
65	0.515	–0.035	43.8	1965.0	0.649	–0.475	51.0	1964.1
70	0.365	0.028	42.8	1962.7	0.544	–0.515	51.7	1963.4
75	0.235	0.013	43.1	–	0.421	–0.593	52.9	–
B Lower primary								
45					0.924	–0.649	53.8	1969.5
50					0.895	–0.662	54.0	1967.9
55	0.731	–0.045	44.0	1968.9	0.853	–0.654	53.9	1966.6
60	0.626	–0.014	43.5	1967.0	0.777	–0.584	52.8	1965.4
65	0.514	–0.033	43.8	1965.0	0.675	–0.543	52.1	1964.3
70	0.400	–0.087	44.6	1963.3	0.577	–0.593	52.9	1963.9
75	0.248	–0.044	44.0	–	0.447	–0.653	53.9	–
C Upper primary								
45					0.937	–0.761	55.6	1969.6
50					0.899	–0.684	54.4	1967.9
55	0.746	–0.103	44.9	1969.0	0.853	–0.655	53.9	1966.6
60	0.643	–0.069	44.4	1967.1	0.792	–0.633	53.6	1965.4
65	0.542	–0.118	45.1	1965.3	0.718	–0.658	54.0	1964.7
70	0.426	–0.164	45.9	1963.7	0.605	–0.657	54.0	1964.2
75	0.274	–0.143	45.6	–	0.480	–0.725	55.0	–
D Secondary +								
45					0.969	–1.161	61.2	1969.7
50					0.934	–0.936	58.1	1968.1
55	0.779	–0.233	47.0	1969.1	0.898	–0.883	57.4	1966.8
60	0.714	–0.298	48.1	1967.5	0.800	–0.823	56.5	1965.8
65	0.620	–0.334	48.7	1965.9	0.608	–0.907	57.7	1965.4
70	0.455	–0.246	47.2	1964.1	0.487	–0.664	54.1	1964.2
75	0.365	–0.420	50.1	–	0.298	–0.741	55.3	–

Table B15 Proportion of respondents with first spouse alive by education, LFS household survey

Age	No schooling		Lower primary		Upper primary		Secondary +	
	Male	Female	Male	Female	Male	Female	Male	Female
15–19	0.9683	0.9890	0.9722	0.9904	1.0000	0.9952	1.0000	1.0000
20–24	0.9931	0.9702	0.9956	0.9750	0.9951	0.9845	1.0000	0.9862
25–29	0.9886	0.9671	0.9916	0.9637	0.9880	0.9683	0.9949	0.9766
30–34	0.9703	0.8798	0.9738	0.9202	0.9813	0.9472	0.9875	0.9375
35–39	0.9625	0.9096	0.9674	0.8843	0.9745	0.9055	0.9882	0.9091
40–44	0.9194	0.7813	0.9455	0.7903	0.9480	0.8470	0.9664	0.8961
45–49	0.9069	0.6840	0.8944	0.7260	0.9447	0.7557	0.9802	0.8864
50–54	0.8760	0.5458	0.9089	0.6518	0.8771	0.6893	0.9167	0.7000
55–59	0.8507	0.4592	0.8504	0.5499	0.8615	0.4483	0.9333	0.6818
60–64	0.8284	0.3163	0.8193	0.4026	0.8740	0.4825	0.9460	0.7273

Table B16 Estimates of adult survivorship and mortality level (α) from widowhood data by education, LFS household survey

Age (N)	Male				Female			
	$l_{N+5}/l_{22.5}$	α	$\mathring{e}_{15}$	Date	$l_{N-5}/l_{17.5}$	α	$\mathring{e}_{15}$	Date
A No schooling								
25	0.968	–0.469	50.9	1974.2	0.991	–0.432	50.3	1976.9
30	0.910	–0.141	45.5	1971.9	0.975	–0.568	52.5	1974.3
35	0.897	–0.306	48.2	1969.9	0.965	–0.685	54.4	1972.2
40	0.844	–0.229	47.0	1967.9	0.938	–0.566	52.5	1970.1
45	0.737	–0.017	43.5	1965.8	0.914	–0.549	52.2	1968.3
50	0.624	0.107	41.6	1963.7	0.896	–0.603	53.1	1966.7
55	0.510	0.180	40.5	1961.8	0.870	–0.628	53.5	1965.4
60	0.394	0.207	40.1	1959.6	0.847	–0.702	54.6	1964.4
65	0.302	0.133	41.2	1958.2	0.824	–0.802	56.2	1963.9
B Lower primary								
25	0.965	–0.416	50.1	1974.1	0.993	–0.598	53.0	1976.9
30	0.928	–0.295	48.1	1971.9	0.977	–0.600	53.0	1974.2
35	0.893	–0.280	47.8	1969.8	0.969	–0.745	55.3	1972.0
40	0.819	–0.112	45.0	1967.7	0.951	–0.710	54.8	1970.0
45	0.748	–0.059	44.2	1965.8	0.913	–0.541	52.1	1968.0
50	0.679	–0.067	44.3	1964.1	0.902	–0.641	53.7	1966.4
55	0.588	–0.056	44.1	1962.5	0.881	–0.682	54.3	1965.1
60	0.451	0.027	42.8	1960.4	0.837	–0.661	54.0	1964.0
65	0.365	–0.073	44.4	1959.5	0.800	–0.717	54.9	1963.4
C Upper primary								
					$l_{N-5}/l_{22.5}$			
25	0.971	–0.522	51.8	1974.2	1.012	–0.409	49.9	–
30	0.952	–0.549	52.2	1972.1	0.988	–0.401	49.8	1976.6
35	0.918	–0.460	50.8	1970.0	0.981	–0.758	55.5	1974.0
40	0.870	–0.362	49.2	1968.1	0.972	–0.852	56.9	1971.7
45	0.798	–0.246	47.2	1966.3	0.948	–0.728	55.1	1969.5
50	0.722	–0.206	46.6	1964.7	0.934	–0.787	55.9	1967.4
55	0.575	–0.020	43.6	1962.5	0.874	–0.582	52.7	1965.6
60	0.465	–0.015	43.5	1961.1	0.865	–0.735	55.2	1964.4
65	0.410	–0.198	46.5	1960.6	0.837	–0.818	56.4	1963.7
D Secondary +								
	$l_{N+5}/l_{27.5}$							
25	0.981	–0.111	45.0	–	1.009	–0.597	53.0	–
30	0.950	–0.222	46.9	1974.1	0.992	–0.616	53.3	1976.7
35	0.919	–0.272	47.7	1971.8	0.988	–1.016	59.2	1974.1
40	0.901	–0.415	50.0	1969.7	0.977	–0.967	58.6	1971.9
45	0.890	–0.583	52.8	1968.0	0.973	–1.102	60.4	1969.8
50	0.757	–0.245	47.2	1965.9	0.950	–0.947	58.3	1967.9
55	0.687	–0.279	47.8	1964.5	0.925	–0.895	57.5	1966.4
60	0.718	–0.643	53.7	1964.5	0.939	–1.206	61.8	1965.4
65	0.220	–0.664	34.6	1955.0	0.917	–1.228	62.0	1964.9