

## II. MAIN FINDINGS

The presentation in comparable format of the basic data related to child mortality for a large majority of the developing countries provides an opportunity to compare the results of different methods of measurement. The mortality estimates presented in chapter IV come from census data, survey data and civil registration data, using both direct and indirect methods. By comparing the estimates obtained using different methods and by making some evaluation of the data, conclusions can be drawn about the relative performance of the methods themselves.

The comparable estimates also make it possible to examine a variety of aspects of child mortality. The aspects reviewed here are mortality levels (as indicated by probabilities of dying by age 5,  ${}_5q_0$ ) around 1960 and around 1985, and mortality trends (as indicated by the average annual absolute change and the annual rate of change in  ${}_5q_0$  during the period 1960-1985 or any shorter period, if the full range is not observed) by less developed region. The values of  ${}_5q_0$  for 1960 and 1985 used in this discussion were taken from the country-specific graphs. The broad conclusions drawn depend very little upon the precise values chosen. Other analysts might select values that differ somewhat from those used here, but broad comparisons of levels and trends by world region would be very little affected.

### A. EVALUATION OF DATA AND METHODS

The database that follows presents the results of a range of data collection and estimation methods. In many cases, results of different data sets are available for the same country for overlapping time periods. It is therefore possible to compare estimates obtained by each method, with a view to drawing conclusions about appropriate data collection and analysis strategies.

The first point to note is that this volume contains examples of failure for every method available. In some countries, vital registration clearly underestimates infant mortality. There are countries in which maternity histories have resulted in underestimates, those in

which Brass questions included in censuses or household surveys have resulted in underestimates and those in which longitudinal surveys have produced poor results. The conclusion is that there is not one best method for measuring child mortality. All methods require careful survey instrument design, careful sample design, careful training and adequate supervision in order to be successful; attention also needs to be given to data-editing and imputation procedures.

The initial evaluation is to take those countries with vital registration reported to be complete and compare the estimates from other sources against the yardstick of the vital registration estimates. The mortality indicator used is the infant mortality rate,  ${}_1q_0$ . The number of countries with supposedly complete vital registration data and information from other sources is quite small. Of the countries or areas with vital registration reported as complete, Hong Kong, Israel, Mauritius, Puerto Rico and Singapore have no other relevant basis for estimation. For a number of other countries (Egypt, El Salvador, Guatemala, Jamaica, and Trinidad and Tobago), other sources show that vital registration is not sufficiently complete to provide a good basis for measuring child mortality. Of the countries that remain, Brass questions included in censuses give estimates that agree very closely with recent vital registration data in Costa Rica, Cuba, Kuwait and Malaysia (data for Peninsular Malaysia only). In Chile and Uruguay, indirect estimates based on census data for younger women agree reasonably well with vital registration data, but reports of older women give clear underestimates of child mortality. In Argentina (and also in Egypt by comparison with other sources), Brass questions in censuses underestimate child mortality. Brass questions included in surveys, including maternity history surveys, appear to fare rather better, giving apparently satisfactory results in Costa Rica, Cuba, Egypt, El Salvador, Guatemala, Jamaica, Sri Lanka, and Trinidad and Tobago. Direct estimates from maternity histories also appear to do quite well; agreement is particularly good in Malaysia, but in many cases the direct estimates from maternity histories fall below other estimates.

The second approach to evaluation used is to compare estimates derived from Brass questions with those obtained from maternity histories. Here, the mortality indicator used is the probability of dying by age 5,  $q_5$ . A total of 42 countries have both direct and indirect estimates from independent sources. Comparisons of direct and indirect estimates from the same responses, as can be made for the WFS and DHS maternity history data, are not included in this comparison unless the indirect estimates are based on a largely independent household survey, as in the case of the WFS programme that employed an extended household survey. Estimates derived from each source are classified by type: indirect estimates from censuses; indirect estimates from household surveys; and direct estimates from maternity histories. They are then rated as good, if they fit well with what appears to be the true trend in child mortality for the country; as indifferent, if the fit is reasonable or if the true trend is very uncertain; or as poor, if they differ substantially in overall level or trend from the supposedly true trend. The numbers of countries with each rating are shown by region in table 2. It should be noted that an individual country can appear more than once in the same part of the table, for example, if it had one census giving estimates rated as good and another census giving estimates rated as poor.

Both for the developing countries as a whole and for the major less developed regions, roughly comparable numbers of countries have good estimates of child mortality derived from each of the three types of survey. Good estimates have been derived using indirect methods applied to census data for 23 countries, using indirect methods applied to survey data for 21 countries and direct calculations applied to maternity history data for 20 countries. Roughly comparable numbers of countries have obtained poor estimates indirectly from censuses and surveys (seven and eight, respectively), whereas a much higher number of countries (17) have had poor results using maternity histories. Indifferent results, like good results, appear to be evenly distributed by region and by survey type. These figures underline the conclusion stated earlier: there is no failure-proof method for measuring child mortality in the developing countries. The higher proportion of poor results obtained from maternity history surveys probably reflects the greater sensitivity of this approach to high-quality training and supervision.

It is worth carrying this consideration of data quality a bit further by looking at the types of error frequently encountered in the child mortality estimates obtained from different sources. Census data sometimes just give series of estimates that are

TABLE 2. NUMBER OF COUNTRIES BY RATING OF TYPES OF CHILD MORTALITY ESTIMATES, BY REGION

Data source	Rating	Number of countries			
		Africa	Asia	Latin America	Total
Indirect estimates from census	Good .....	8	5	10	23
	Indifferent .....	0	5	8	13
	Poor .....	3	2	2	7
	Total	11	12	20	43
Indirect estimates from surveys	Good .....	9	5	7	21
	Indifferent .....	3	3	8	14
	Poor .....	3	3	2	8
	Total	15	11	17	43
Direct estimates from maternity histories	Good .....	8	5	7	20
	Indifferent .....	2	6	6	14
	Poor .....	6	5	6	17
	Total	16	16	19	51

obviously too low; clear examples are the 1976 census of Lesotho, the 1976 census of Egypt and the 1971 and 1981 censuses of Nepal. General omission of children who have died is the probable explanation. A more common problem with census results, however, is to estimate child mortality trends that are too flat, that is, they fail to show enough decline over time. Examples of this type are the 1986 census of Egypt, the 1971 and 1980 censuses of Indonesia, the 1970 and 1980 censuses of Argentina and the 1970 and 1982 censuses of Chile. This problem probably arises from omission of dead children that increases with age of mother, and for Argentina and Chile, it may be associated with high levels of non-response and inappropriate imputation procedures. Indirect estimates based on survey data are in some cases just too low (for example, the 1983 Contraceptive Prevalence Survey (CPS) in Kenya, the 1978 CPS in Costa Rica or the 1979 CPS in Bangladesh) but appear to suffer less than censuses from trend-flattening. Direct estimates based on maternity histories are in a few cases just too low (an example is the Ghana Fertility Survey in 1980), but a more frequent problem is a flattening of trends, such that estimates for the prior five years are consistent with other sources, but estimates for periods further in the past fall below the apparent true trend line. Examples of this latter error can be found in the 1989 Kenya DHS, the 1987 Guatemala DHS and the 1977 Venezuela WFS, among others. The most likely explanation for this effect is progressive omission of child deaths the longer ago in the past that they occurred.

The main conclusion to be drawn from these errors is that the available methods for estimating child mortality in the developing countries measure the recent level of mortality better than they measure trends. For this reason, it is important to carry out regular surveys of child mortality in order that trends over time can be traced from estimates for time periods up to five years prior to the survey, rather than by relying upon the internal detail of any one data set. A second conclusion is that no one method of data collection or analysis has a monopoly on meeting all data needs. Brass questions included in censuses often produce excellent estimates of child mortality and provide a level of geographical detail unobtainable in any other way. Maternity histories included in small-scale household surveys provide

information about age patterns of child mortality and about social and demographic differentials in child mortality. Brass questions included in general-purpose household surveys provide an inexpensive and opportunistic approach to updating estimates of child mortality levels and trends. The final conclusion is the importance of quality control in data collection and analysis.

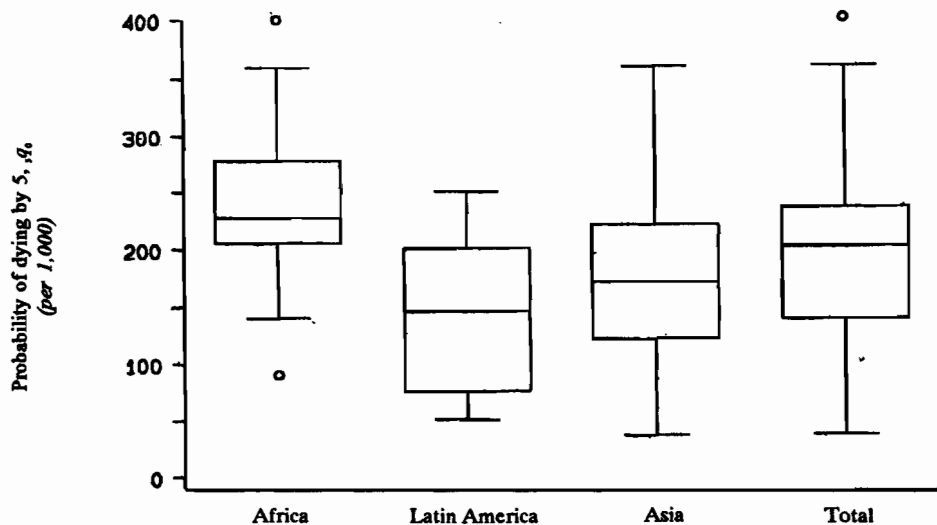
#### B. BROAD LEVELS AND TRENDS OF CHILD MORTALITY, 1960-1985

Measures of levels and trends by region are shown below in the form of box-and-whisker plots. These plots consist of a central box, the upper limit of which marks the seventy-fifth percentile of the observations and the lower limit the twenty-fifth percentile; a line across the box indicates the median or central value. Two lines extend upward and downward from the box; these lines mark the range of substantial numbers of observations.<sup>1</sup> Observations beyond this range are individually plotted. Such plots thus indicate the central tendency of the data and the spread around the centre.

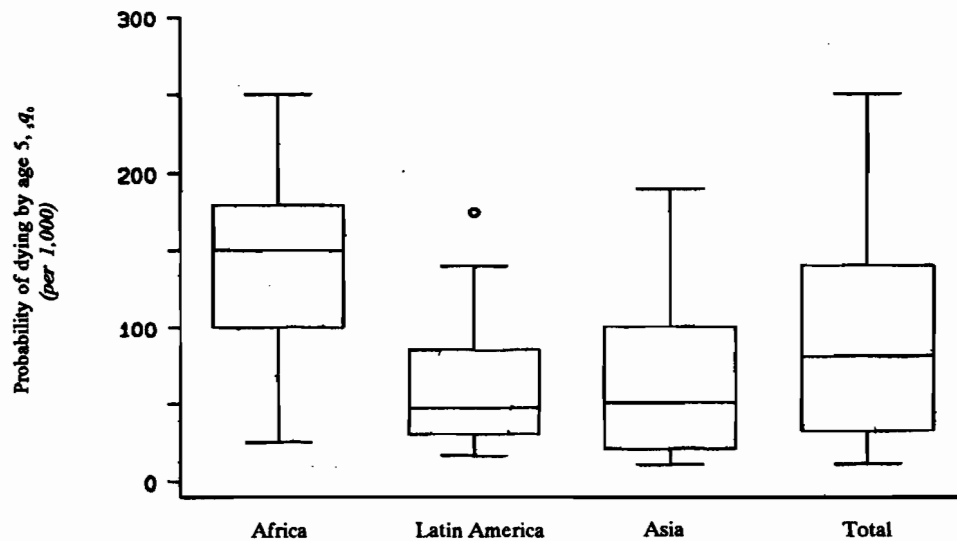
Figure VI shows box-and-whisker plots for all developing countries for which a good estimate could be made of the probability of dying by age 5,  $q_0$ , in 1960, a total of 64 countries, by region. Among all the developing countries with information, the median  $q_0$  was 200 per 1,000 live births. Child mortality was lowest, at a median value of 145 per 1,000, in Latin America; somewhat higher, with a median of 170 per 1,000, in Asia and Oceania; and clearly highest, with a median of 228 per 1,000, in Africa. These estimates are evidently restricted to the countries included here and may be higher if information on the rest of the countries in each region was available.

Figure VII shows comparable box-and-whisker plots for 1985, with a total of 55 observations. Child mortality had fallen sharply in all three regions, the median  $q_0$ s being 80 overall, 47 for Latin America, 50 for Asia and Oceania, and 155 for Africa. The sharp declines have to be interpreted with caution, however, since the countries with observations may not be representative of all countries, and also because the degree of accuracy of the data can change over time.

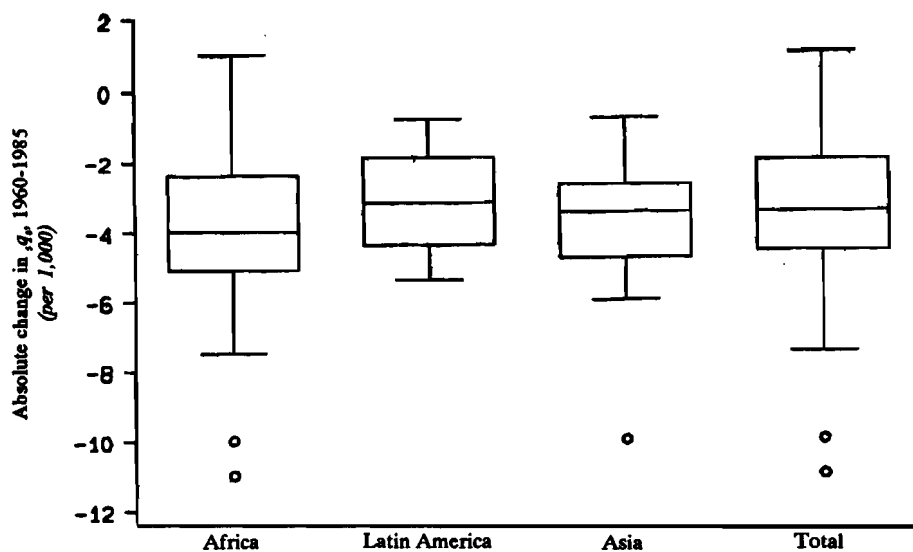
**Figure VI. Level of child mortality in 1960, by region, based on 64 observations**



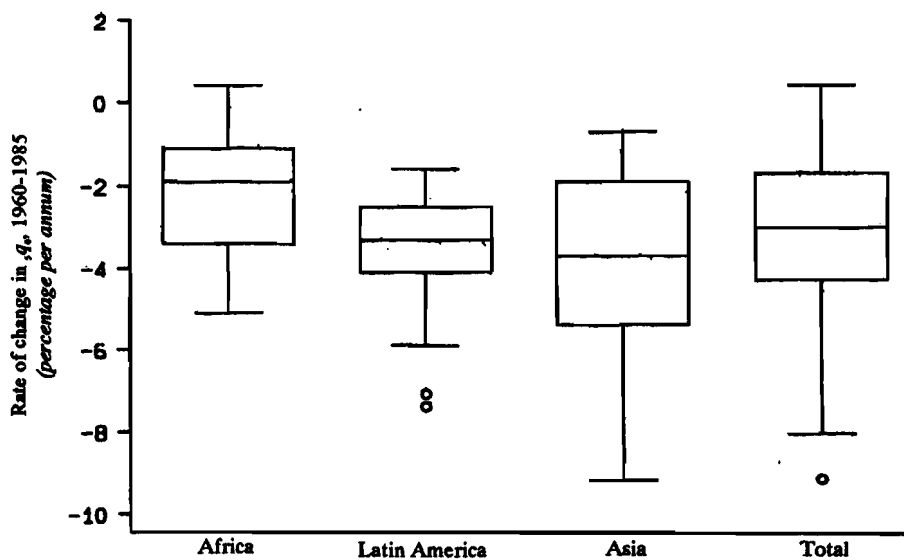
**Figure VII. Level of child mortality in 1985, by region, based on 55 observations**



**Figure VIII. Absolute change in child mortality, 1960-1985, by region, based on 79 observations**



**Figure IX. Rate of change in child mortality, 1960-1985, by region, based on 79 observations**



Figures VIII and IX look specifically at the question of rate of change of child mortality during the period 1960-1985.<sup>2</sup> Figure VIII shows the absolute annual change in  ${}_5q_0$  for all developing countries and lessdeveloped regions. For the developing countries as a whole, the probability of dying by age 5 fell, on average, by almost four points per 1,000 per annum between 1960 and 1985 among the countries included in this comparison.

An alternative way of looking at the pace of child mortality decline is to compare annual rates of change. Figure IX shows box-and-whisker plots of annual exponential rates of change for all developing countries with adequate estimates by region. Overall, among the countries included here, child mortality declined by about 3 per cent per annum during the period 1960-1985; Asia and Latin America both experienced rates slightly above this average, whereas the rate of decline in Africa was only about 2 per cent per annum. Again, these figures may be somewhat different if data for all developing countries were available.

In summary, child mortality has probably fallen by more than half in the developing countries in the two and a half decades from 1960 to 1985. However, child mortality tended to decline by a constant absolute

amount over the period, leaving absolute differentials in 1985 much as they were in 1960. In a majority of countries, child mortality declines were basically linear over the 25-year period. In sub-Saharan Africa, there are a few countries where available data show that child mortality declines may have stalled or even reversed, although the observed trend could be due to poor data quality; and there are a handful of countries in which child mortality has fallen to such low levels that continued linear decline would be impossible. Otherwise, child mortality decline appears to have remained constant or even accelerated in the 1970s and early 1980s.

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#### NOTES

<sup>1</sup> Strictly speaking, the lines or "whiskers" extend to the upper and lower adjacent values, which are defined as 1.5 times the interquartile range, rolled back to the nearest observation point.

<sup>2</sup> Figures VI and VII show values of  ${}_5q_0$  for 1960 and 1985 only if reasonably secure estimates can be made for those specific years. In tables 1 and 2, however, measures of change in the period 1960-1985 are given if reasonably secure estimates can be made for any two time-points in the time interval.