Socioeconomic inequalities in childhood mortality: the 1970s to the 1980s*

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Abstract

The last three decades have witnessed substantial reductions in childhood mortality in most developing nations. Despite this encouraging picture, analysis of WFS and DHS survey data shows that socioeconomic disparities in survival chances have not narrowed between the 1970s and 1980s, and in some cases, have widened. Changes in mother's education and father's occupation contributed only modestly to secular declines in mortality. In most countries studied, no more than 20 per cent of the national trend could be accounted for by compositional improvements. The median contributions of improvements in mother's education and father's occupation were ten and eight per cent, respectively.

The last three decades have witnessed substantial reductions in childhood mortality in most developing countries. The record of socioeconomic progress has been less even. Nevertheless today's mothers are more likely than the mothers of the previous generation to be educated, to be living in an urban setting and to be married to a man with a non-manual occupation. We also know, particularly from extensive analysis of WFS data, that the survival chances of children vary widely between socioeconomic strata, with the educational attainment of the mother being a particularly strong predictor. From this perspective, two important questions arise. Are socioeconomic disparities in child survival widening or narrowing? And to what extent can mortality decline be attributed to changes in the socioeconomic composition of populations?

Answers to these and other questions relating to changes in the age pattern of mortality are sought by a joint analysis of WFS and DHS survey data for 15 developing countries that have participated in both survey programs. We make no pretence that these countries are representative of the developing world or of particular regions, but their number and geographical spread are sufficient to permit tentative generalizations. Life-table measures of mortality for five-year calendar periods are produced at the national level and for socioeconomic subgroups. This approach permits an unusually long historical dimension to the study of trends. It also encounters severe problems of data consistency between the WFS and DHS which are assessed in the first substantive section of the paper. In a few countries, the two sets of estimates are incompatible. These cases are dropped from the analysis. In the majority of cases, however, they match well and may be regarded (with caution) as a single continuous historical record.

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Design of the analysis

The data collection procedures of WFS and DHS are well known and require no elaboration here (Singh 1984, IRD 1990). With regard to mortality measurement, both survey programs used methods that are identical in their essential features: an initial count of live births by sex and survival, followed by a birth history in which date of birth, survival status and age at death are recorded for each child.

From these data, period measures of mortality are obtained by standard life-table procedures. For each survey, three periods of interest were defined: the five years preceding the survey plus the year of fieldwork; and the two preceding quinquennia. Thus the entire analysis is restricted to events and exposure within the 15 to 16 years before each survey. In calendar terms the study period covers a little over two decades: from the mid-1960s (the most distant WFS period) to the mid-1980s (the most recent DHS period). To press the analysis beyond this span would have encountered increasing problems of data quality and truncation. Even within this shortened time span, mortality estimates suffer from the progressive loss of children born to older mothers, as attention shifts from most recent to less recent periods. However, exploratory analysis confirmed that the truncation bias was negligible within the 15-year period under study and could be ignored.

One of the potential advantages of birth histories over summary measures of mortality from censuses and household surveys is their potential for examination of the age-specific probabilities of death. While most of the results in this paper take the form of ${}_5q_0$ estimates (termed 'overall childhood mortality'), trends in infant mortality (${}_1q_0$) and child mortality (${}_4q_1$) are also presented. The placing of the main emphasis on values of ${}_5q_0$ is justified in terms of both their relatively low sampling error and their robustness to errors in reporting age at death.

As noted earlier, the substantive focus of the paper is on socioeconomic differentials in childhood mortality. The choice of characteristics for inclusion in the analysis was limited to those measured in a reasonably comparable manner in both survey programs, and by the additional consideration of sample distributions. There were only four serious contenders: maternal education, paternal education and occupation, and urban-rural residence. In view of its strong association with child survival, maternal education was an obvious choice. The existence of level of school reached and number of years completed on both WFS and DHS files enabled us to define three groups (no schooling, some primary schooling, some secondary or higher schooling) in a consistent manner for both WFS and DHS.

The handling of paternal characteristics was less straightforward. Ideally we required a measure of economic status but neither WFS nor DHS has devised a satisfactory way of measuring this multifaceted concept. Paternal education is no doubt a predictor of income and standard of living but it is highly correlated with maternal education and, for this reason, was unlikely to yield results that differed appreciably from the maternal education results. Father's occupation has the advantage of identifying position within the economic structure more adequately than education, but is typically not well measured. A recurrent problem with this variable is the existence of an often large but ambiguous sales and service category. On the reasonable assumption that a combination of paternal education and occupation might represent socioeconomic status better than either single characteristic, the following categories were defined:

(a) white collar: professional, managerial or clerical workers with at least five years of schooling, plus sales or service workers with secondary or higher schooling.

(b agrarian: self-employed farmers or agricultural employees.

(c) blue collar: all skilled and unskilled manual workers, plus professional, managerial or clerical workers with less than five years schooling, plus sales and services workers with less than secondary schooling, plus missing values and never married mothers.

The sensitivity of estimates to the decision to place all missing values and never-married mothers in the blue collar category was assessed by running new tabulations with these two responses placed in a separate category. The only case where these adjustments made a noticeable difference to the blue collar estimate was Kenya, but, as will be shown later, this country was excluded from the main study on other grounds.

The third and last characteristic selected for the analysis was urban-rural residence. Though it can be demonstrated that much of the urban-rural differential in childhood mortality merely reflects differences in educational composition, the inclusion of the variable is warranted because of its relevance to health policies. The demonstration that large differences in mortality exist between the two strata may lead, and occasionally have led, to shifts in health resources. All WFS and DHS files contain a coding of type of place of residence, often in the form of dichotomy but sometimes with a more detailed classification of urban areas. Large and smaller urban centres were always grouped together to form a single urban stratum. We were unable to verify that the distinction between urban and rural localities was always identical in both surveys for the same country. However, the policy of both survey programs is to follow the official or census definitions of each country. It is possible that official definitions were changed in the period between the two surveys, but it is most improbable that this occurred in sufficient instances to invalidate our analysis.

To summarize, period measures of morality were calculated at the national level and for subgroups defined in terms of maternal education, paternal occupation/education, and rural-urban residence. Trends were calculated in a straightforward manner from estimates for different periods; and changes in differential mortality were assessed in form of absolute and relative differences for subgroups at different points in time.

Consistency and reliability of WFS and DHS estimates

The value of this analysis rests largely on the degree of consistency between WFS and DHS estimates. This issue is addressed in Figure 1, which presents an overview of the two sets of estimates. For several countries the conjuncture of the trend lines is perfect. Mexico, Egypt, Tunisia, and Dominican Republic fall into this category. In a further group (Sudan, Senegal, Morocco, and Ecuador), the match is very close, almost certainly within the bounds of sampling error. The remaining seven countries are more problematic. In six instances, the DHS estimate for the period approximately 10 to 14 years before the survey is lower than the WFS estimates for the most recent quinquennium before the survey. These disparities suggest – though do not prove – that deaths occurring in the more distant past suffer greater omission than recent deaths. In the remaining case, Ghana, the reverse occurs: DHS estimates are higher than the corresponding WFS estimates.

The magnitudes of these discrepancies are shown in Table 1 in some form of estimates for the same five-year period, mostly taken from an earlier analysis of DHS data quality (Sullivan, Bicego and Rutstein 1990). Ghana provides by far the most serious instance of obvious error. For the period centred on 1977 the WFS estimate of childhood mortality is 38 per cent lower than the corresponding DHS figure. A WFS analysis by Adansi-Pipim (1985) showed that WFS also yielded lower mortality estimates than the 1971 Supplementary Enquiry; thus the probable cause of the WFS-DHS discrepancy is severe omission of deaths in the Ghana WFS, even for the most recent period.

Table 1
Comparison of WFS and DHS estimate of overall childhood mortality for the same five-year reference period

	Midpoint of	Level of $_5q_0$	Percentage

	reference period	WFS	DHS	difference
Senegal	1976.0	261	259	+1
Ghana	1977.2	120	166	-38
Sudan (North)	1976.5	149	141	+5
Peru	1975.5	144	132	+9
Egypt	1975.5	208	206	+1
Morocco	1977.7	144	155	-8
Indonesia (Java/Bali)	1973.8	158	140	+11
Kenya	1975.5	143	116	+19
Dominican Rep.	1972.9	127	117	+8
Ecuador	1977.3	116	110	+5
Tunisia	1976.1	103	101	+2
Mexico	1974.4	94	93	+1
Thailand	1972.9	88	74	+15
Colombia	1974.0	105	84	+19
Sri Lanka	1973.3	85	59	+31

Source: Sullivan et al. 1990

In Sri Lanka, Kenya and Colombia, DHS estimates are appreciably lower than WFS ones for the overlapping period. In Sri Lanka the root problem may be related to the conditions under which the DHS was conducted. Part of the country had to be excluded from the sample frame and no doubt it was more difficult to execute a high-quality national survey in the 1980s than in the 1970s, for obvious reasons. In Kenya, the defect also lies primarily with the DHS; comparison with other sources suggests omission of dead children particularly by older DHS respondents. Diagnosis of the problem in Colombia is more difficult. Indeed, the longer historical perspective provided in Figure 1 indicates that the discrepancy may be restricted to the overlapping period and is not as serious as the 19 per cent gap for this period might imply.

On the basis of these comparisons we decided to exclude Ghana, Sri Lanka and Kenya from the main analysis of socioeconomic differentials. In all three cases, there were solid grounds for doubting the validity of national estimates for one or other of the two surveys, even for the most recent period. If national estimates are suspect, then even more uncertainty must surround subnational figures. For the remaining twelve countries, the two sets appeared sufficiently consistent to justify more detailed examination.

Figure 1
Trends in overall childhood mortality, circa 1965 to circa 1985

Consistency between WFS and DHS, of course, does not guarantee accuracy. Indeed a comparison with the series compiled by Hill and Pebley (1989), who drew upon a variety of data sources and report only for countries having information judged to be of reasonable quality and consistency, indicates major differences for several countries. The most startling example is Tunisia, where WFS and DHS trends are totally consistent but are much lower than the Hill-Pebley estimates. For the period centred on 1972, Hill and Pebley give a ${}_5q_0$ value of 180, compared to values from WFS of 130 for 1970 and 106 and 104 for 1976 from WFS and DHS. It is inappropriate to attempt here a resolution of these and other differences in estimated childhood mortality levels and trends, because it would involve detailed country-specific evaluations. It must suffice to stress that mortality trends for many developing countries are not known with certainty and that the results presented below should be interpreted with caution. Interpretative emphasis should be given to general patterns rather than country-specific results.

National levels and trends

We start the presentation of results with an examination of national levels and trends in childhood mortality. By comparing the estimate obtained in the WFS for the period 10 to 14 years prior to the

survey (centred approximately on 1965) with the most recent DHS estimate (centred approximately on 1985), a 20-year perspective on change is obtained.

In eleven out of twelve countries, substantial declines in childhood mortality are recorded (Table 2). The maverick in this group is North Sudan, but a special degree of caution is required for this country because of the possibility that both WFS and DHS suffer from omission. Farah and Preston (1982), for instance, obtained much higher estimates of childhood mortality from the 1973 Census than those derived from WFS.

Table 2
National levels of overall childhood mortality: circa 1965 and 1985

	Level		Decline	
	c.1965	c.1985	Abs	Percentage
Senegal	295	191	104	35
Egypt	248	107	140	57
Indonesia (Java/Bali)	206	95	111	54
Peru	195	111	84	43
Morocco	187	102	85	45
Dominican Republic	159	88	70	44
Ecuador	156	82	74	47
Tunisia	151	65	86	57
Sudan (North)	148	127	21	14
Thailand	131	45	86	66
Mexico	128	61	67	52
Colombia	123	43	80	65
Median	158	92	85	50

Note: Countries are ordered by the level of $_5q_0$ in 1965

The median percentage decline over the 20-year period is 50, with eight countries falling in the range of 40 to 60 per cent. There is no obvious relationship between the initial value of $_5q_0$ in the 1960s and the speed of decline. Indeed those countries with initially low levels (Thailand, Mexico, Colombia) appear to have experienced particularly pronounced percentage declines, with the net result that there is greater relative variability in childhood mortality in 1985 than in 1965.

The analysis is extended in Table 3 with a comparison of trends for the decade 1965-1975 (based on the WFS) with those for the decade 1975-1985 (based on the DHS). The striking finding is that most of the twelve countries experienced a greater average annual decline in the latter than the former decade.

Table 3
Average annual percentage declines in overall childhood mortality: circa 1965 to 1975 and 1975 to 1985

	c. 1965–1975	c. 1975–1985
Senegal	1.2	4.0
Egypt	2.7	6.2
Indonesia (Java/Bali)	3.1	3.3
Peru	2.7	2.2
Morocco	2.4	4.7
Dominican Republic	2.9	2.8
Ecuador	3.2	4.9
Tunisia	3.4	4.5
Sudan (North)	0.0	1.0
Thailand	4.0	3.9
Mexico	3.0	3.9
Colombia	1.7	7.0
Median	2.8	4.0

It is unlikely that this general conclusion is an artefact of data errors. Furthermore, it is totally consistent with Hill and Pebley's results for a much larger group of countries. Shown below is the average annual decline in ${}_5q_0$, calculated from the median values for four main developing regions, taken from table A-1 of their paper.

	c. 1962–1972	c. 1972–1982
Americas	1.7	7.5
Asia	3.4	5.0
Middle East	0.8	2.4
Africa	0.6	1.1

The results in Table 3 strongly support the view that the rise in interest rates in the early 1980s, the international debt crisis and the ensuing retrenchment of government subsidies and social expenditures has not resulted in a slowing down of improvements in child survival. On the contrary, the evidence suggests that the decade from the mid-1970s to the mid-1980s saw an acceleration rather than a downturn in the rate of decline of childhood mortality, among the countries studied.

One advantage of the birth history approach to mortality estimation over the application of indirect methods to census-type data is the ability to describe the age pattern of mortality. It is not claimed that reporting of ages at death is highly accurate: for instance, ages are often severely heaped at twelve months, the critical boundary between infancy and childhood. But it is unlikely that the extent of heaping has changed and thus trends in infant and child mortality should not be badly distorted.

Table 4 summarizes trends in infant and child mortality between the mid-1960s and the mid-1980s. Without exception, declines in the probability of dying between the age of one and five years have been sharper than declines in infant death rates. The median value for the twelve countries shows an annual percentage decline in childhood that is twice as great as that for infancy.

Table 4
Average annual percentage declines in overall childhood mortality ($_5q_0$), child mortality ($_4q_1$) and infant mortality ($_1q_0$): circa 1965 to 1985

	Annual percentage decline			Ratio $_1q_0/_4q_1$	
	$_5q_0$	$_4q_1$	$_1q_0$	c.1965	c.1985
Senegal	2.4	3.0	1.8	0.60	0.75
Egypt	4.5	6.0	4.0	1.54	2.24
Indonesia (Java/Bali)	3.6	5.4	2.7	1.27	2.27
Peru	2.9	4.3	2.2	1.33	2.00
Morocco	3.3	5.7	2.1	1.23	2.35
Dominican Republic	2.8	4.3	2.2	1.84	2.91
Ecuador	3.6	4.8	3.1	1.68	2.32
Tunisia	4.1	7.2	2.8	1.28	3.13
Sudan (North)	0.7	1.1	0.4	1.03	1.18
Thailand	4.8	6.5	4.4	2.21	3.50
Mexico	3.5	5.3	3.0	2.05	3.36
Colombia	5.2	7.6	4.3	1.68	3.30
Median	3.6	5.4	2.8	1.44	2.34

Over the 20 years, the age pattern of early mortality has changed profoundly. In the mid-1980s the chance of dying in infancy was typically 2.3 times the chance of dying in childhood, compared to 1.4 times in the mid-1960s. While these findings are by no means unexpected, they do underscore the growing contribution of neonatal and early post-neo-mortality to overall childhood mortality and the corresponding need to address deficiencies in maternal health and in maternity services.

Socioeconomic composition and national trends

In the preceding section, the substantial declines in mortality over the period 1965 to 1985 were described. In this section we assess the extent to which these declines may be attributed to improvement in socioeconomic structure.

Table 5 and Figure 2 summarize changes between 1965 and 1985 in three key indicators: the schooling of the mother; the occupation of the father; and urban-rural residence of the family. The estimates apply not to mothers but to the composition of births which is affected not only by structural change in the general population, but also by the fertility among members of each socioeconomic stratum. These two factors tend to offset each other, to the extent that expanding, more advantaged groups have low birth rates. This tendency may account for the small size of the increase between 1965 and 1985 in the proportion of births classified as urban. The median values indicate a negligible increase from 41 per cent urban in 1965 to 45 per cent in 1985. There are even two countries (Peru and Morocco) where the proportion urban has declined. The only case of a very large increase is Indonesia, a country characterized by exceptionally modest urban-rural fertility differentials.

Table 5
Socioeconomic composition of births: circa 1965 and 1985

	Percentage having mothers with some schooling		Percentage non-agricultural		Percentage urban	
	c. 1965	c. 1985	c. 1965	c. 1985	c. 1965	c. 1985

Senegal	5	17	39	55	32	35
Egypt	34	46	57	NA	38	41
Indonesia (Java/Bali)	28	82	43	62	17	32
Peru	55	82	52	60	60	52
Morocco	7	14	59	53[a]	40	34
Dominican Republic	78	91	50	70	44	57
Ecuador	79	89	56	68	41	49
Tunisia	9	44	42	61	49	50
Sudan (North)	19	41	60	66	26	34
Thailand	72	90	31	41	12	17
Mexico	69	83	56	NA	54	61
Colombia	78	90	58	67	59	62
Median	45	82	50[b]	62[b]	41	45

[a]15% of cases were unclassified in DHS
[b]Excluding Egypt, Morocco and Mexico

The impact of expanding schooling for girls, however, overwhelms the generally negative association between education and fertility. For these twelve countries, the median percentage of children born to mothers with at least one complete year of schooling has increased from 45 per cent in 1965 to 82 per cent in 1985. Particularly outstanding changes may be noted for Indonesia (an increase from 28 to 82 per cent) and for Tunisia (nine to 44 per cent). By comparison, the shift in terms of father's occupation is modest. While the proportion of children born to fathers with non-agricultural occupations has risen in all countries for which reliable data are available, the changes are relatively small.

The contribution of this compositional change to the overall national mortality decline is estimated by standardizing childhood mortality for the period centred on 1985 by the composition of births in the mid-1960s. Because urban-rural changes are small, this factor was omitted, but two separate standardizations were performed: one for education and the other for occupation. The education standard was defined in terms of the proportions of 1965 births to mothers with no schooling, primary schooling and with secondary or higher schooling. The occupation standard was defined similarly in terms of three categories: agricultural, blue collar and white collar. Standardized values of ${}_5q_0$ for the period centred on 1985 were calculated. They represent hypothetical levels of childhood mortality that would have prevailed in the absence of any change in the socioeconomic composition of births since 1965. The difference between the observed ${}_5q_0$ and standardized ${}_5q_0$, divided by the observed change in ${}_5q_0$ between c. 1965 and c.1985, gives the percentage of that change attributable to the shift in the composition of births over the period.

Figure 2
Socioeconomic composition of births, circa 1965 to circa 1985

The results are given in Table 6 in the form of the percentage of the 1965 to 1985 decline in childhood mortality that is attributable to improvements in socioeconomic composition. The absolute decline in childhood mortality level and that part of the change explained by changing educational and occupational composition is shown in Figure 3. In Indonesia, for instance, where there was a decline in ${}_5q_0$ over the 20-year period of 111 per 1000, it is estimated that 20 per cent (or 22 per 1000, in absolute terms) of the decline reflects changes in educational composition. The corresponding figure for occupational change is only six per cent. These two figures, of course, cannot be summed to give an overall compositional effect.

While educational and occupational change has made a positive contribution in all countries to the secular decline in childhood mortality, the contribution is surprisingly modest. The direct effect of rising education is ten per cent or less for half of the twelve countries. In these cases, it may be inferred that declines within educational strata have been of overwhelming importance in explaining the secular decline in mortality. There are a number of important exceptions, however. In Peru and Ecuador, over one-third (36 and 35 per cent, respectively) of the decline is directly attributable to improvements in

educational composition, while, in a further three countries (Dominican Republic, Indonesia and Mexico), the contribution is about one-fifth. The predominance of Latin American countries suggests that improvements in maternal education may have played a particularly important direct role in increased child survival in this region. Colombia is the only Latin American country in this analysis to show small effects of educational change.

Table 6
The contribution of changing maternal educational and paternal occupational structure to the decline in overall childhood mortality: circa 1965–1985

	Abs. change in $_5q_0$	Percentage of change attributable to: education	occupation
Indonesia (Java/Bali)	111	20	6
Tunisia	41	10	8
Peru	36	36	11
Sudan (North)	21	7	17
Thailand	42	9	2
Mexico	67	17	NA
Dominican Republic	70	21	2
Colombia	80	9	2
Egypt	140	6	NA
Senegal	104	10	14
Ecuador	74	35	23
Morocco	85	4	NA
Median	72	10	8

Note: Countries are ordered by absolute change in percentage of births to mothers with some schooling.

It should also be noted that the pace of educational progress does not account for the Latin American pattern, nor indeed does it explain the intercountry variability of results in Table 6. Neither Tunisia and Sudan, for instance, which both rank high in terms of the absolute increase in the percentage of births to mothers with some schooling, record small contributions of educational composition to the decline in childhood mortality.

The results of the second standardization suggest that changes in occupational structure have been less important that changes in female education. This is to be expected in view of the fact that paternal characteristics generally exert a less decisive influence on child survival than those of the mother (Cleland 1990). It should be remembered that paternal occupation is measured at the survey date and thus may not accurately reflect occupation during the period of mortality risk. If such misclassification is significant, it would tend to attenuate estimates of the occupation-mortality relationship.

Figure 3
The contribution of change in education and occupational structure to decline in overall childhood mortality (c.1965–c.1985)

Socioeconomic inequalities in childhood mortality: convergence or polarization

In this section we address the theme that provided the main motivation for this paper. In the 1970s, WFS documented very large socioeconomic differentials in childhood mortality for most of the 41 participating countries (e.g. Hobcraft, McDonald and Rutstein 1984). Since that time, mortality has continued to fall, probably at an accelerated pace. It is of considerable interest and policy relevance to establish whether the last decade had witnessed a convergence in the survival chances of children from different socioeconomic strata or whether the huge inequalities persist.

Analysis of mortality trends among sub-populations using WFS-DHS data encounters severe limitations of small sample sizes. WFS and DHS samples are moderate in size and fragmentation into subgroups cannot proceed far before interpretation is obscured by sampling imprecision. The difficulty is exacerbated by changes in the composition of populations over the last 20 years. In several countries, the numbers of children born to mothers with secondary schooling or into a white-collar family fall steeply for earlier periods, effectively reducing the historical depth of any analysis. Analysis of differential mortality also makes heavy demands on the quality of data, because different types of mother may vary in their ability to recall more distant children who have died. Our response to these problems is to rely only on the most recent estimates from the two surveys. In effect, the examination

of subgroup trends is based solely on a comparison of WFS data for the five years preceding the survey (approximately the mid-1970s) with DHS data for their corresponding period (approximately the mid-1980s). Estimates based on less than 300 births are also suppressed.

The first set of results, comparing the mortality of children with uneducated and primary school mothers, is shown in Table 7. Both absolute and relative differences in ${}_5q_0$ for the two periods are given. For the majority of countries, absolute differences in childhood mortality have declined since the mid-1970s. However there are four cases where the reverse has occurred: Sudan, Indonesia, Egypt and Ecuador. In Ecuador, the substantive importance of this trend should be put into context by pointing out that, by the mid-1980s, only a small minority of births (eleven per cent) fell into the uneducated category. But in the other countries where the absolute difference has widened, mothers with no schooling still account for a considerable proportion of all births.

In terms of relative risks, the overall result is adequately captured by the median values. In the mid-1970s the children of uneducated mothers were 1.46 times more likely to die before the age of five years than the offspring of primary school mothers. In the mid-1980s, this figure was almost identical (1.42). This overall conclusion of no change in relative risks – with its implication that the percentage declines in ${}_5q_0$ were similar for both educational groups – holds for half the countries in this analysis (Peru, Morocco, Tunisia, Thailand, Mexico and Colombia). Reductions are recorded in Senegal and Dominican Republic but these are more than offset by increases in Sudan, Egypt, Indonesia and Ecuador.

Table 7
Differences in overall childhood mortality between children of mothers with no and primary schooling: circa 1975 and 1985

	Absolute		Relative (primary = 1.0)	
	c.1975	c.1985	c. 1975	c. 1985
Senegal	153	73	2.22	1.56
Egypt	18	38	1.10	1.41
Indonesia (Java/Bali)	9	27	1.05	1.27
Peru	62	47	1.43	1.37
Morocco	79	53	2.04	1.96
Dominican Republic	61	34	1.54	1.37
Ecuador	19	52	1.16	1.59
Tunisia	42	23	1.59	1.43
Sudan (North)	17	46	1.12	1.45
Thailand	40	20	1.49	1.41
Mexico	40	39	1.59	1.61
Colombia	34	18	1.33	1.37
Median	41	39	1.46	1.42

The analysis is extended in Table 8 to a comparison of primary and secondary schooling for those six countries where minimum sample size requirements are met. Again there is no evidence of any general tendency towards convergence. Relative risks have widened in four cases and narrowed appreciably only in Peru. This is a remarkable finding in view of the fact that secondary school mothers tended to be a smaller and more heavily selected minority in 1975 than a decade later. The growth in size of the upper stratum has not had the expected effect of diluting disparities in child survival.

Table 8
Differences in overall childhood mortality between children of mothers with primary and secondary or higher schooling: circa 1975 and 1985

	Absolute		Relative (secondary = 1.0)	
	c.1975	c.1985	c. 1975	c. 1985
Egypt	70	49	1.64	2.09
Indonesia (Java/Bali	85	64	2.27	2.71
Peru	97	77	3.17	2.50
Ecuador	63	42	2.12	1.90
Mexico	27	46	1.47	3.57
Colombia	46	27	1.80	2.20

The parallel analysis for paternal occupation is restricted to seven of the twelve countries (Table 9). Two are omitted because the white-collar group comprised less than 300 cases in WFS (Senegal, Dominican Republic) and an additional three because of lack of comparable occupational coding in the two surveys (Egypt, Morocco, Mexico). The reduced sample of countries, together with the wide variability in the magnitude of country-specific differentials, makes it difficult to discern a general pattern.

Table 9
Differences in overall childhood mortality by paternal occupation: circa 1975 and 1985

	Absolute white collar versus:				Relative (white collar = 1.0)			
	Agrarian		Blue collar		Agrarian		Blue collar	
	c.1975	c.1985	c.1975	c.1985	c.1975	c.1985	c.1975	c.1985
Indonesia (Java/Bali)	42	65	63	33	1.37	2.16	1.57	1.59
Peru	124	104	74	39	2.93	2.89	2.28	1.72
Ecuador	85	79	71	41	2.92	3.18	2.60	2.12
Tunisia	84	44	64	34	3.39	2.32	2.81	2.00
Sudan (North)	23	37	36	34	1.19	1.38	1.30	1.35
Thailand	65	35	14	17	2.64	2.93	1.35	1.95
Colombia	87	20	53	20	3.15	1.76	2.31	1.75

Taking the agrarian-white collar comparison first, it appears that two countries (Indonesia and Sudan) have experienced a divergence in both absolute and relative terms. In Thailand and Ecuador, relative risks have increased but absolute differences have diminished. In the remaining three cases, relative risks have narrowed (Tunisia, Colombia) or remained the same (Peru). The white-collar versus blue-collar comparisons hint at a general conclusion of convergence. Six countries record a narrowing in absolute terms. Relative risks have narrowed in four countries, changed little in two cases and have increased only in Thailand.

Examination of rural-urban differentials does not raise problems of sample size, and results for all twelve countries are shown in Table 10. The median value suggests a greater tendency towards increased polarization of mortality risks than towards convergence. In the mid-1970s, rural children

were 1.4 times more likely to die before the age of five years than their urban counterparts. In the mid-1980s the relative rural disadvantage has increased to 1.6. This general finding conceals considerable variation in national results. There are four cases of convergence and two instances of little change. But in the remaining six countries, relative risks have increased, with absolute increases recorded in two cases (Egypt and Mexico). These results are remarkable in the context of the economic policies of the mid-1980s, which are usually assumed to impinge upon the urban more severely than the rural population.

Table 10
Differences in overall childhood mortality between rural and urban children: circa 1975 and 1985

	Absolute		Relative (urban = 1.0)	
	c.1975	c.1985	c. 1975	c. 1985
Senegal	165	75	2.10	1.53
Egypt	44	60	1.28	1.83
Indonesia (Java/Bali)	50	39	1.46	1.57
Peru	87	78	1.79	2.05
Morocco	59	59	1.56	1.93
Dominican Republic	24	-4	1.23	0.89
Ecuador	32	38	1.35	1.61
Tunisia	22	24	1.23	1.44
Sudan (North)	27	24	1.21	1.22
Thailand	54	23	2.34	1.88
Mexico	27	61	1.33	2.66
Colombia	45	8	1.55	1.20
Median	45	39	1.41	1.59

Summary and discussion

The main findings of this analysis may be summarized as follows. During the 20-year period from the mid-1960s to the mid-1980s, all but one of the twelve countries experienced substantial declines in overall childhood mortality ($_5q_0$). Typically the decline amounted to a 50 per cent reduction. The fall in mortality between ages one and five years was much steeper than the drop in infant mortality. The relative improvement in child survival chances over the 20-year period was unrelated to starting mortality level in the mid-1960s. Some of the countries with the lowest levels in 1965 (Thailand, Mexico, Colombia) recorded proportionate increases in survival as large as those found in high-mortality countries such as Egypt and Indonesia.

Despite the economic problems faced by many developing countries in the 1980s, the pace of decline appears to have accelerated since the mid-1970s, with an annual average percentage decline of 4.0 for 1975-1985 compared to 2.8 for the period 1965-1975.

Compositional change – in terms of educational advance, shifts in occupational structure or increased urbanization – has not been a major force underlying mortality decline in most of the twelve countries. Its contribution, though in all cases positive, is overwhelmed by mortality declines *within* all socioeconomic strata. Latin America may provide a partial exception to this generalization. In all but one of the study countries from the region, improvements in maternal education accounted for 20 to 35 per cent of the national decline.

Socioeconomic differentials in mortality for the mid-1970s were compared to those observed in the mid-1980s. In general terms, there was little evidence of convergence in relative mortality levels although absolute differences diminished. The urban-rural disparity shows a slight tendency to increase rather than decrease. The relative advantage enjoyed by the children of primary school mothers over those of uneducated mothers has remained stable, while the advantage associated with secondary over primary schooling may have widened. In terms of paternal socioeconomic status, there is a suggestion of a narrowing of the blue-collar/white-collar divide, but no such tendency was observed for the agrarian/white-collar differential. The conclusion, though based on a small number of countries, may be stated with some confidence: the huge inequalities recorded in the 1970s have persisted into the 1980s, despite the large overall decline in mortality in this decade.

How does this new evidence relate to the existing body of knowledge? Should we be surprised that the steep falls in childhood mortality have not been accompanied by greater equality? And what is the appropriate policy response? Hitherto, systematic study of sub-national trends in infant or childhood mortality has been hampered by lack of reliable data for many developing countries. There are, of course, many exceptions, usually in the form of single- country studies. Thus the narrowing of differentials by maternal education is well documented for China (Yang and Dowdle 1985) and for Costa Rica (Rosero-Bixby 1985), while the reverse has been observed for Malaysia (DaVanzo and Habicht 1986). Data are relatively abundant for Latin America and a number of analyses of differential mortality across time and space are available for this region (e.g. Palloni 1981, 1985; Guzman 1989). Guzman reports results similar to this study: little evidence of a decline in the relative risks associated with low social class or low educational status. On the basis of his analysis, however, Palloni claims that increases in overall adult literacy bring about a reduction in education-related differentials in childhood mortality. High levels of literacy are associated with social equity and a commitment to make health services widely available. In such societies, personal characteristics of families and mothers lose their primacy as determinants of health. This interpretation receives support from the multi-country analysis by Cochrane, O'Hara and Leslie (1980), who estimate that the effect on child survival of maternal education diminishes with rising national literacy levels and health expenditures. Yet Bicego and Boerma (1991), in a comparative analysis of 17 countries, show that education-related differentials in childhood mortality are not narrowed in urban settings (relative to rural areas), where literacy levels and public expenditure on health and social services have been and continue to be greater.

We see from this analysis that rising literacy levels and declining mortality at the national level do not necessarily bring out greater equality. However, this unsatisfactory outcome should not blind us to the fact that all major socioeconomic strata appear to have benefited equally from the improvements in child survival – and perhaps in child health – that were achieved in the late 1970s and early 1980s. Any disproportionate gain by more privileged groups would have resulted in increased relative risks, which is not the main pattern observed in this study.

We should also remind ourselves that appreciable socioeconomic differentials in mortality persist even in highly developed countries. Relative differences by social class have remained essentially unchanged for decades in the USA (Syme and Berkman 1976) and in the UK (Townsend and Davidson 1982). The educational differential in US adult mortality has actually widened (Feldman et al. 1989). Much of the evidence for Europe has been summarized by Valkonen (1987). In those countries of Europe noted for their egalitarian social structures, such as Denmark and Sweden, social class differences in neo-natal mortality have almost disappeared, while in other countries they remain. But even in Denmark and Sweden, as well as most other European countries for which data are available, there are still large differentials in adult male mortality.

The appropriate policy response to large socioeconomic differentials in mortality, both in developing and developed countries, should be guided by the understanding of their origins. The DHS is in a stronger position than WFS to illuminate this area, because of its more adequate measurement of the proximate determinants of health. A review of published DHS results indicates rather modest socioeconomic differentials in childhood morbidity (Boerma, Sommerfelt and Rutstein 1991). If these findings are genuine and not an artefact of differential underreporting, it suggests that response to illness (i.e., recognition and treatment) may be more important than prevention of illness in explaining the large differences in survival chances between socioeconomic subgroups. But much more analysis is needed and it would be naive to expect quick, clear-cut answers. In developed countries, attempts to explain differential mortality in terms of specific risk factors and specific diseases have failed (see, for example, Marmot, Shipley and Rose 1984). There is much discussion of general factors that discriminate by social class or educational status, such as stress and ability to cope with ill-health, but thus far little convincing evidence.

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