

Chapter 3
Mind the gap!
Child mortality differentials by income group *

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Summary. Globalisation has opened up enormous opportunities but has not been able to spread these opportunities equitably among all social strata, as signalled for instance by the increase in income disparities observed between and within countries over the last two decades. Within this context, this paper explores the evolution of social disparities by analysing the trends in U5MR by income level - a widely accepted measure of social welfare - over the last twenty years.

It is common knowledge that child mortality is higher among the poor than the rich. However, the size of this mortality gap or the way it varies in relation to the absolute level of child mortality are not as well known. This paper shows, based on a sample of 24 developing countries with comparable surveys, that the U5MR of the bottom quintile of the distribution of wealth is on average 2.2 times bigger than that of the wealthiest quintile, with a minimum value of 1.3 and a maximum value of 4.7. For one third of the countries the gap is higher than 2.5. This means that, taking into account the greater fertility of poor households, more than 3 children for a family belonging to the bottom two deciles of the wealth distribution die for every child who dies in a family belonging to the top two deciles.

The trends over time show that U5MR differentials remained constant over time in a few countries but worsened in the majority of them. Only two countries with relatively small populations were able to achieve both a reduction in average U5MR and a decline of U5MR disparities. The relation between changes in U5MR differentials and changes in income inequality does not seem to be pronounced, thus suggesting that social policy may play an important role in reducing U5MR than household income. They do not seem to be correlated with changes in tariffs, share of trade in total output, or the importance of FDI in total investment.

JEL: D31, I12, I31, J13

*** This study presents the views of its authors and not the official UNICEF position in this field.**

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1. Introduction

We live in a world full of contradictory signals. Unprecedented expansion in global economic transactions has been concentrated in only a few parts of the world. Incredible technological progress has occurred but millions of people lack access to the most basic services. A huge increase in wealth is confronted with everlasting misery. Life expectancy increased in many countries, but premature deaths spread due to the HIV/AIDS pandemic. Greater acknowledgement of human rights coexists with the persistence of different forms of slavery. The Convention on the Rights of the Child (CRC) has been adopted by practically all countries but these rights are permanently violated – as evidenced by the millions of children that die or struggle to survive in the worst of circumstances.

These rapid world-wide changes take place in the context of what is now referred to as the globalisation process, a term that assumes a variety of meanings. Following chapter 1 in this compilation, we focus on "economic" globalisation, and on the two major globalisation-related variables that affect child well-being directly or indirectly. The first is family income, a variable that – in turn - depends on changes in labour market conditions, which are related to the local political and economic conditions as well as the evolving international situation and rules. The second variable affecting child well-being are social policies and programs towards children, women and families¹. Developing countries are making efforts to take part in this globalisation process by introducing a variety of adjustment processes, changes in government structures, the privatisation of social services and decentralisation and, in many of them, changes in the debt management and trade policies.

The issue of the impact of these changes on poverty has, naturally, emerged. Even though it is widely recognised that poverty is a multi-dimensional phenomenon, it is mainly measured in monetary terms. This is not just a technical issue, but in many cases also implies a conceptual approach that prioritises economic growth and income as the central dimension in dealing with the problems of poverty (Ravallion 1998, WB 2000/01, CAER study). Although economic growth and the reduction of household income-poverty are important for improving child well-being, there is enough evidence that social policies are equally important in this regard and far more than a complement to economic policies (Cornia et al 1987, Mehrotra and Jolly, 1997, HDR 1999). This point is clear in relation with child well-being. For children, public programs in the fields of survival, early development, education and protection are essential for their development and membership in a society based on rights. The fulfilment of these rights is not only a problem of family income but involves other aspects that range from availability and quality of services to issues related with discrimination and neglect (UNICEF, 2000)

¹ It must be highlighted that legal and institutional aspects are also crucial to ensure the realisation of child rights, but these will not be considered explicitly on this occasion.

One important problem in this regard is the distribution of the benefits of social programs among different social classes. The relationships among income distribution, poverty, child well-being, and development have been analysed and widely discussed in the literature (see, for instance, Chenery et al 1974, Cornia 1999, van der Hoeven 2000). In contrast, due to the lack of reliable data, less is known on the relation between the intensity and distribution of social programs and other dimensions of child well-being such as mortality and morbidity.²

In view of all this, this paper aims at documenting changes across countries and through time in the differentials in child mortality (U5MR) for different wealth groups. We also propose some tentative explanations for these changes. The considerable number of the countries included in our analysis³ allows to draw some conclusion on the effect of globalisation in this area. Two sets of comparisons are made. One is a cross-section analysis involving 43 countries for which information on U5MR disaggregated according to the wealth of household has been produced by the World Bank. The second is based on 24 of these 43 countries for which we obtained information from previous rounds of DHS. This allows us to examine trends in IMR and U5MR differentials by household wealth over the 1980s and 1990s. After a very brief methodological discussion (section 2), the paper explores the changes in the above differentials (section 3) as well as their relation with income inequality, trade openness and foreign investments (section 4). The trends in child mortality disparities are also described (section 5) as well as analysed in relation to changes in income distribution, trade and FDI (section 6). Some working hypothesis are presented in the conclusions (section 7).

2. The many dimensions of globalisation and disparities

Globalisation has many dimensions. Political, social, cultural, and economic. The emergence of democracy and consolidation of voting cycles, the widespread adoption of human rights instruments and legislation, the easier and less costly access to TV and the internet represent important dimensions of globalisation which, although not strictly economic, have an impact on economic decisions and policies. Even economic globalisation has many dimensions, such as trade opening, privatisation, capital account

² Life expectancy at birth in developing countries depends closely on infant and under five mortality, and is often used as a key indicator of development. Thus, Sen (1995) points out that: "The influences that increase or reduce mortality often have economic causes, and there is a prima facie reason for not dismissing mortality as a test of economic performance...Also the focus on mortality has strong "associative" features. Mortality and morbidity often go together, and so do, frequently enough, other correlates... In fact, differential mortality rates are significant indicators not only over time, but also across different groups."

³ The results presented in this paper are part of a larger research project on disparities in child welfare indicators and their trends carried out at the Division of Policy and Planning of UNICEF (UNICEF, 2002). It needs to be highlighted that the countries included in this analysis are those with available data, in particular with one or more Demographic and Health Surveys. Although low income countries might be over-represented in this groups, there is a wide variation in terms of their policies both in the social area and with respect to globalisation.

liberalisation, labour market deregulation, structural adjustment, etc. Before describing the trends in IMR and U5MR differentials, it might be useful to consider some of the channels through which economic globalisation can affect social outcomes. As discussed also in chapter 4, liberalising trade may introduce or widen cleavages between skilled workers and owners of assets and the skilled workers in the export sector on the one hand, and the rest of the population on the other, thus distributing the increases in private incomes and the health benefits that they derive from them in a lopsided manner. Alternatively, exports could be low-skilled labour intensive, resulting in more demand for labour, higher wages, and a reduction of income disparities and widespread improvements in terms of morbidity and mortality. Increasing openness, also results in more imports which may lower the cost of consumption and capital goods, but also often destroys local production and jobs.

Structural adjustment programmes too may generate contradictory effects. Reducing taxes has serious implication for income distribution which may compensate or exacerbate the effects of trade liberalisation on the primary distribution of income. The same applies to the retrenchment of government expenditures. Cuts in some expenditures, like those on health or education, may have an impact on social outcomes greater than that due to changes in average private incomes or in their distribution. In short, the policies associated with globalisation generate a variety of direct and indirect effects that determine who are the winners and losers of this process. Consequently, they can be expected to affect the disparities in social outcomes.

When analysing social differentials in social indicators such as U5MR, as we do in this paper, there are at least three sets of questions that need to be answered before proceeding with the actual data description. These methodological questions pertain to: (i) What is inequality? Why is inequality important? How is it measured? What thresholds are relevant to characterise a situation as unequal/unfair? (ii) Whose inequality? Will inequality be measured at the household or individual level? What characteristic or variable will be used to classify individuals/households? How many groups or sub-groups is important to use to describe inequalities? And finally (iii) What methods are used to measure disparity? What sources of data will be used? What procedures will take place to classify individuals/households? How are inferences going to be made?

The rest of this section attempts to briefly answer some of these questions. There are many reasons that make the analysis of social disparities relevant. One is that there seems to be increasingly evidence about growing inequity between and within countries in terms of income and it is natural therefore to be increasingly concerned that a similar pattern may, as a result, be emerging for key social indicators⁴ Another important reason is that averages in IMR and U5MR are often not very helpful in evaluating social trends. Averages are used to simplify complex realities in easily interpretable summary measures. As such, they are an abstraction. However, by simplifying reality excessively, averages entail large informational costs. In fact, average changes through time that can be interpreted as “positive”(as the reduction in U5MR) can be the result of proportional

⁴ For reasons of space, we are not going to discuss fundamental issues about the nature of inequality (see Sen 1997, Atkinson, 1983)

or equal improvements for all members of society or, alternatively, of improvements confined only to a few social strata⁵ (on this see also chapter 2). Third, because of a lack of comparable cross country data, we do not know, *ex ante*, what U5MR differential can be considered “normal” and what is typical of a very unequal society.⁶

The analysis of disparities can be done emphasising different social dimensions such as: income level (rich/poor), location (urban/rural), gender (women/men), ethno-linguistic groups, etc.(see chapter 2 of this compilation). In this paper we concentrate on the U5MR differentials by different levels of household wealth – as lack of space prevents us from looking at other important dimensions of mortality disparities. Household wealth is approximated by an “asset index” based on the presence in the household of certain durable goods (such as a radio or a bicycle), the quality of the dwelling (e.g. roof and floor materials), and access to different types of water and sanitation. The index was constructed following the procedure described in Filmer and Pritchett (1998 a and b) and Gwatkin (1999). This “asset index” was then used to stratify the households included in the DHS into quintiles.

There are advantages and disadvantages in using wealth rather than income to rank households, see for instance Minujin and Joon Hee Bang (2001). The clearest shortcoming is that the traditional analysis of welfare uses current expenditure (or income when data are not available). However, it is well known that measure expenditure and income in fields surveys is problematic because, among other reasons, some people might have incentives to over- or under-report the real figures, and due to insufficient recall. Using a measure of “assets wealth” is much simpler and results in less measurement errors as the objects needed to calculate the asset are directly observed by the interviewer. Moreover, the assets represent the previous expenditure of the household, so it is not very different from the more traditional indicator. In addition, following in this line of reasoning, given that we are looking at a social outcome indicator that changes slowly through time and that represents the effect of various influences⁷, it might be more appropriate to use a measure of accumulated stock through the years, the assets, than a current variable such as last month or last years expenditure (income).

The measure of inequality of the distribution of U5MR used in this paper is the ratio between the U5MR of the bottom and top quintiles of the distribution of the households ranked according to the value of their asset index. We choose this measure, that we label the “relative gap” because it is easy to plot (see section 3) and interpret. It also allows us to avoid cluttering the exposition with different inequality measures (that we have in any case used to test the robustness of our results).

Another issue that needs to be highlighted is that the relationship between changes in averages and in relative gaps is not a simple one. A change in the average U5MR could derive from an infinite number of changes in its distribution and in the relative gap. Thus, *per se*, changes in U5MR averages do not imply *a priori* any particular modification in

⁵ An interesting exercise on this point is Gwatkin, 2000.

⁶ In terms of income, for instance, it is known that Gini coefficients of 0.6 are large, and 0.2 is low.

⁷ By definition, the elements that affect Under-5 Mortality take place during 5 years.

the relative gap. For example, an improvement in U5MR could go together with increases in the relative gap and could be accompanied by a deterioration among the disadvantaged and vulnerable children. Combining the various possibilities between improvements and deterioration in the average and in its distribution, we obtain the four alternative scenarios described in Table 1. Not all of them are equally probable to happen.

Table 1. Possible relationships between changes in averages and relative U5MR gap

Trends		RELATIVE U5MR GAP	
		Narrowing	Widening
AVERAGE U5MR	Improving	BEST OUTCOME	Improvement for better-off, but not for disadvantaged
	Worsening	Worsening with an element of protection of the disadvantaged	WORST OUTCOME

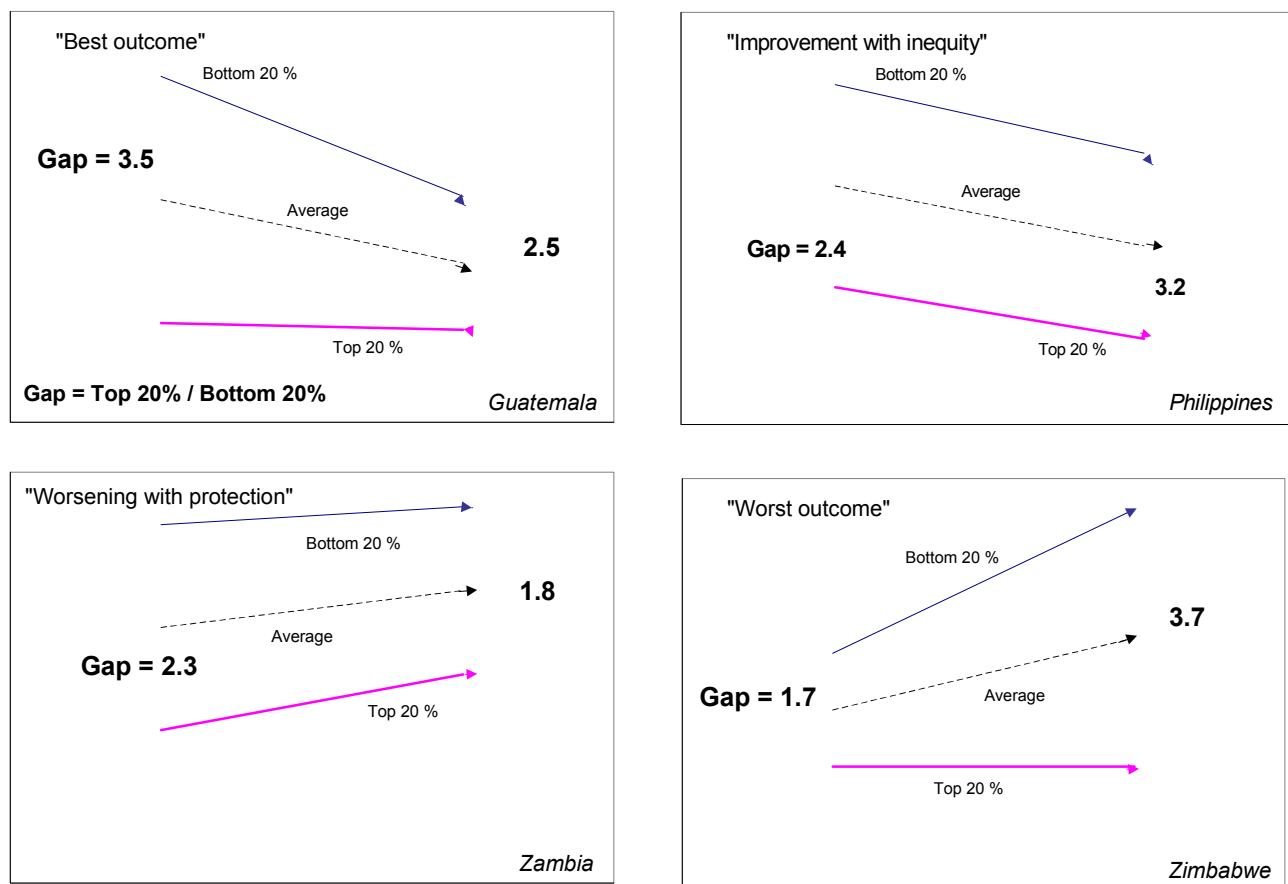
This 2x2 classification based on average results and the relative gap between the top and bottom quintiles, however, may need some further subdivision. This results from the fact that the ratios, or relative performance, expressed in the relative gap, may fail to capture the different possibilities of outcomes among the bottom 20 per cent. For instance, "improvement with inequity" may be the result of a situation where the top 20 per cent gain much more than the bottom 20 per cent. Thus, the average improves while the relative gap widens. But it may also be the result of a deterioration in the bottom 20 per cent accompanied by an improvement in the overall average driven by the gains among the top 20 per cent. Given that we are not only interested in inequity but the actual outcome among the worse off, the "improvement with inequity" case may not capture all the information we needed.

Similarly, in the "worsening with protection", both groups see their situation deteriorate and the relative gap reduced. Alternatively, the relative gap can be reduced because the gains among the bottom 20 per cent are small and dwarfed by the losses among the top 20 per cent. In this case both average welfare and the relative gap are reduced, but the worse-off improve their situation. This is probably not found in actual real-world cases.

Finally, in the "best outcome", there is a further possibility, even if only of theoretical than empirical relevance. The average can improve due to major gains among the bottom 20 per cent, and the relative gap can decline if the situation among the top 20 per cent deteriorates (although not as much as the gains among the bottom quintile, thus allowing the average to increase).

The following Figure shows, in a graphic way, these different results.

Figure 1: Combinations of changes in average level and disparity, some country examples.



Source: Own calculation based on DHS data

3. A bird's eye view of differential U5MR across countries

The “absolute gap”, defined as the difference between the value of U5MR for the bottom and the top quintiles of the wealth distribution takes into account the level of average mortality. This ratio could indicate a reduction in the absolute gap for lower mortality only because the size of the absolute gap is necessarily reduced when the national average is lower. However, this need not imply that in relative terms the bottom quintile is in a more favourable position vis-à-vis the top one. Thus, we analyse the ratio of the bottom to the top quintile, we call this ratio the relative gap. A shortcoming of this measure is that we lose the information on the level of the national average U5MR. A relative gap of 2 (i.e. mortality in the bottom quintile is twice as high as in the top one) in a country with relative low level of mortality could imply that the U5MR would be 30⁸ for the bottom 20% and 15 for the top. In a country of higher mortality a relative gap of 2 could reflect an U5MR of 140 for the bottom and 70 for the top. However, the relative gap measure is a pure number and allows a comparison of disparities across countries in a standardised way.

⁸ In the rest of the paper, as it is customary, U5MR is expressed as a rate out of 1,000 live births.

In developing countries, every year, over 7 million children die before reaching one year of age and another 3 million die before their fifth birthday. Many of these early deaths are related to preventable causes. Lack of access to basic health services, immunisation, safe water and sanitation, low levels of maternal nutrition and education, etc are the direct causes of this sorry state of affairs. Poverty and discrimination are some of the underlying causes. For instance, while basic health should be a universal entitlement, the evidence shows it varies with a nation's overall wealth level and with its wealth gap. But, how large is the U5MR gap by income/wealth levels? Are there similarities across countries?

The results shows that relative U5MR gap, defined as the ratio between the U5MR of the bottom and the top wealth quintile, are significant in most developing countries. When countries are ranked by their average U5MR, the U5MR for the bottom and top quintiles show the pattern depicted in Figure 2. The graph illustrates that an important part of the variability of the absolute gap is due to factors other than the level of U5MR. Plausible explanations of these differences are disparities in income distribution or differential access to services.

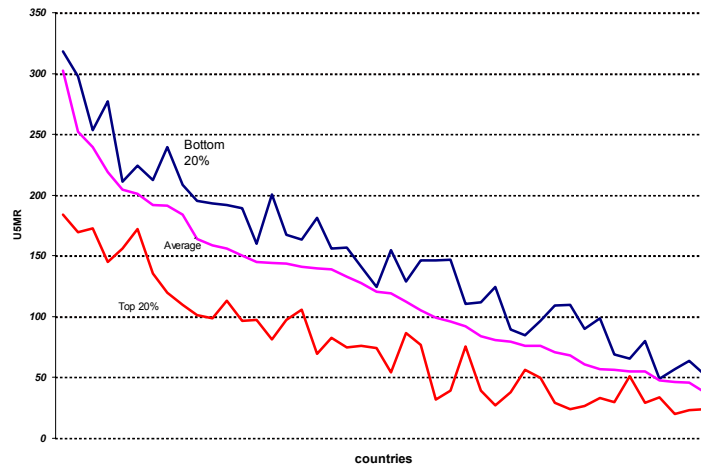
On average children belonging to families in the bottom quintile have more than 2 times the possibilities of dying before reaching 5 years of age than children living in families in the top quintile. Due to higher fertility rates among the families belonging to the bottom quintile, this implies that seven of their children die for every two that die among the better-off households.

Disparities are quite different for different countries. Relative gaps range from 1.3 to 4.7. For these countries the average (both simple and weighted by the number of live births) is close to 2. Also, the geometric average and the median are close to 2. The standard deviation is around 0.9. The relative gap is higher than 3 in 20 per cent of the 43 countries analysed. There are many countries around the average, but the distribution is asymmetrical, with more observations above the average than below.

The lowest level is 1.3, so in all the cases U5MR is higher for the bottom quintile than for the top. In other words, children from families in the top quintile always have a higher probability of survival. Although this may be taken as the "normal" way things are, it is a clear measure of discrimination in the most basic right, the right to survive.

In the few countries where the relative gap was less than 1.5, the concentration index was not significantly different from 0. Only Bangladesh, Benin, Niger, Pakistan and Zimbabwe showed a concentration index which was not significantly different from 0 and relative gaps between 1.5 and 1.9. Twice as many countries in that range showed concentration indices significantly different from 0.

Figure 2. U5MR by country, bottom 20%, average and top 20%

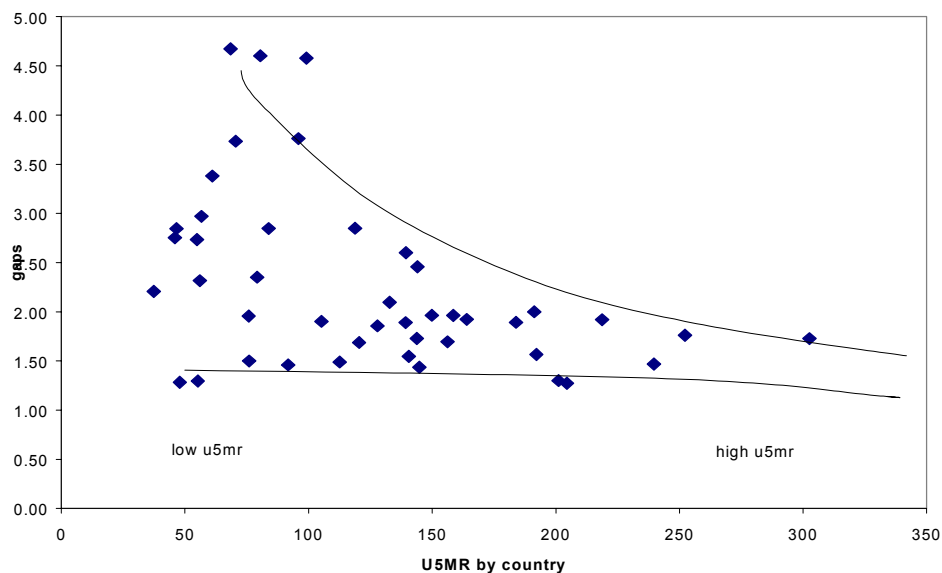


Source: Own Calculation based on Gwatkin et al 1999.

If we compare the number of children that die in the top and bottom quintiles, in 14 of the 43 countries, more than four children belonging to families in the bottom quintile die for every dead child in the top quintile. For some countries that have combined elevated fertility rates with significant disparities, this relation is higher than five, e.g. 5.5 in India, 5.6 in Dominican Republic or 6.5 in Egypt.

In Figure 3 we can observe the relative gaps by countries ordered by increasing level of U5MR. We can notice that there are higher relative gaps for countries where under-five mortality is between 50 and 150 per 1,000 live births than for countries where U5MR is above 150. More importantly, the dispersion of the relative gaps is higher among countries with lower U5MR.

Figure 3. U5MR Relative gap by U5MR level



Source: Source: Own Calculation based on Gwatkin et al 1999.

What could be derived from this is that besides the average level of U5MR and the distribution of wealth, there are other factors that are relevant in relation to disparities. As noted, public policies and income distribution are the two candidates to influence the outcomes of the top and bottom quintiles.⁹ This could lead to the following statement: decreases in average U5MR are important but improving the situation of the poor and narrowing the existing disparity requires public social policies as well as a better distribution of assets (and income).

4. U5MR, globalisation, and income distribution

In the discussion so far, we have focused on the U5MR differentials by wealth quintiles. One possible explanation for these differences is that, in as much as wealth and income are correlated, disparities in income would be translated to disparities in mortality. Thus, countries with more unequal income distribution would be expected to show larger relative gaps in mortality by quintile. This, however, does not seem to be the case. As U5MR cannot be estimated for the year of the survey but for a cohort born at least 5 years prior to the survey date, it would be incorrect to correlate estimated U5MR levels with the income distribution measure of the year of the survey. Moreover, in order to obtain a large enough sample (to increase the reliability of the estimates) several cohorts are usually involved in the estimates. We have analysed infant and child mortality for children born five to ten years prior to the survey. Thus the relevant income disparity is not the latest one, but the one prevalent 10 years ago. The measure of income distribution we have used is the ratio of the shares of income of the top and bottom income earners.

This measure is similar to our measure of disparity in U5MR in that it looks at the top and bottom quintiles. This measure, then, says that if the ratio is 30, the share of the top earners is 30 times as large as that of the bottom earners. Thus, for every dollar the poorest bottom per cent of the income distribution earn, the richest 20 per cent obtain 30. The average and the median of this distribution, for the roughly 30 countries we have data for, was around 10. The proposition we wanted to test is if there is any correlation between relative gaps in U5MR and similar relative gaps in income distribution. The correlation coefficient between this two variables was only 0.15, a very low level, which indicates a lack of association between income distribution and the inequalities in infant and child mortality.¹⁰

⁹ In other words, when households are classified by their wealth, the U5MR differential can be explained because of their different levels of income, if income can be used to buy the basic needs required to avoid infant and child mortality. On the other hand, if access is not primarily determined by ability to pay, but the existence of the service itself, income will not be strongly associated with these quintile differentials.

¹⁰ A similar exercise was carried out with the more traditional Gini Coefficient measure of income inequality and the results were very similar, with correlation coefficient of only 0.20. The ratio of the income share of the top 20 to the bottom 20 per cent of income earners was calculated from data included in the World Income Inequality Database of WIDER (www.wider.unu.edu) which provides also Gini coefficients.

It is interesting to notice that the wide variability in U5MR relative gaps is not related to the distribution of income in these countries. This seems to imply there are other elements, such as access to social services - as measured for instance by educational attainment of the mother or pregnant women who attended regularly antenatal services – that are more closely associated with the level and distribution of U5MR.

As income distribution is weakly related to the U5MR distribution based on wealth rankings, it is not surprising that globalisation (measured through trade and investment openness, which are possible avenues for global market changes to family welfare) is not strongly associated with the U5MR distribution either. Thus for trade openness the correlation coefficient with U5MR distribution is barely 0.10. When the gap in U5MR is correlated with the average level of tariffs, the correlation is only 0.14.¹¹ Similarly, the correlation between investment opening¹² shows an even smaller coefficient of 0.07. In this case, however, the low value could be due by the measurement error implicit in the choice of the indicators of investment openness we chose (see footnote 13).

5. For whom did child survival improve? The achievement of the infant mortality goals and disparities

The goals formulated at the World Summit for Children in 1990 refer to changes in average situations. In the case of infant and child mortality it was “Reduction of 1990 under-5 mortality rates by one third or to a level of 70 per 1,000 live birth, whichever is the greater reduction”.

As discussed before, disparities in U5MR between the wealthy and poor are significant and there are different ways of achieving the reduction of the national average goal. One way is to start improving the situation of the better-off first. An alternative one is to focus on its reduction among the poor. In both cases the country could achieve the same level of U5MR but the results in terms of distribution of mortality gains among the population are fundamentally different (Gwatkin 2000). This point was raised at the time of the WSC (Rohde J, 1989). Effort have been made to “reach the unreached”. Nevertheless, the results of these efforts in terms of relative gaps are basically unknown and the little information available shows an increase in relative gaps for some countries (Stecklov G et al, 1999).

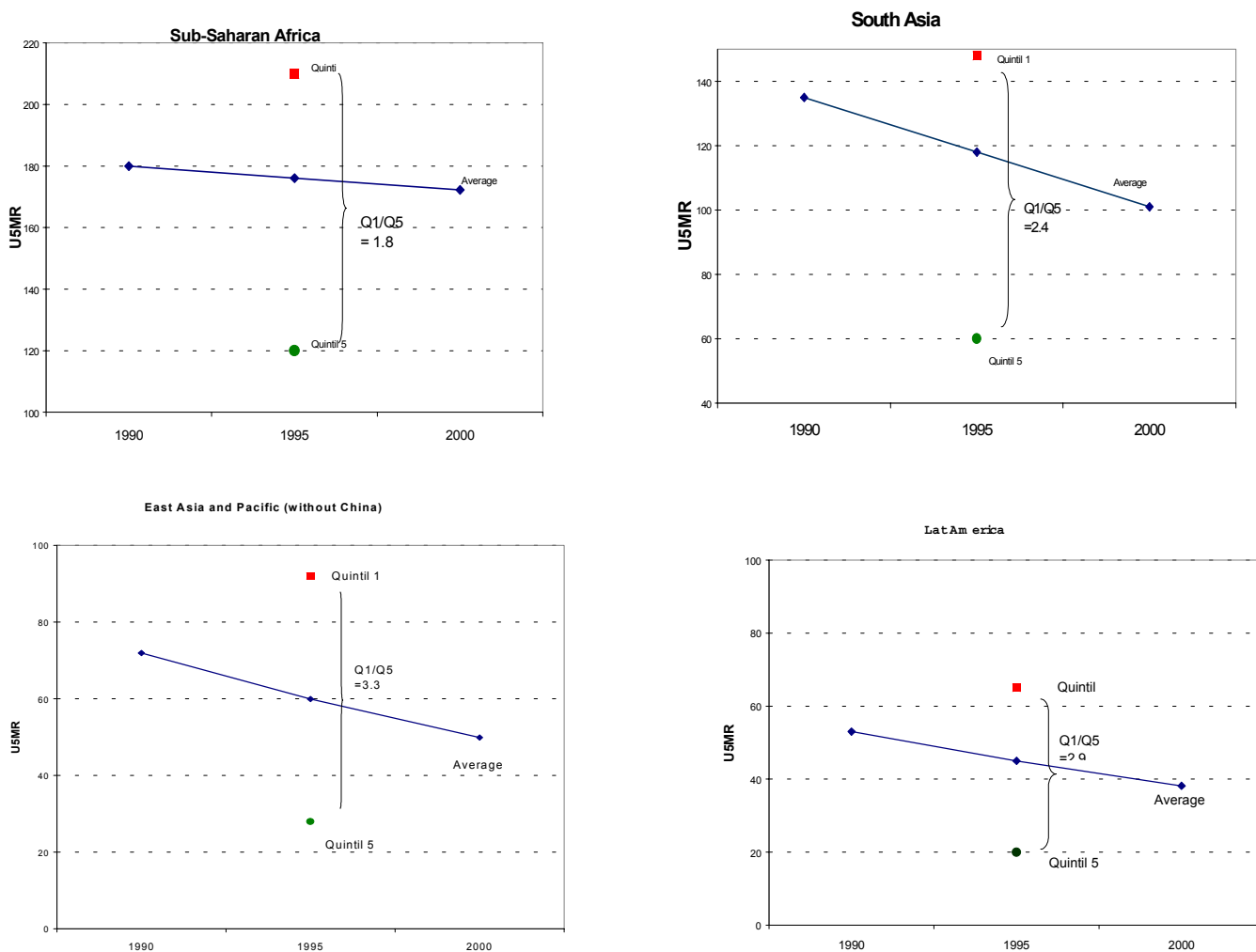
The global changes over the period 1990 to 2000 show that the world U5MR fell from 94 to 81 per 1000 live births, a decrease of 14%. As seen in Figure 4 below, U5MR

¹¹ The correlation with non-tariff barriers was larger (0.37), but based on just 12 countries. Also, unfortunately, we were unable to calculate trends for non-tariff barriers.

¹² Measured as the percentage of FDI in gross capital formation. As in the case of trade openness, this is a ready-made but inaccurate measure of openness to foreign investments as it reflects the impact of many other factors (size of the domestic market, institutional stability, labor cost, etc.) that are independent from the policy stance vis a vis foreign direct investment. The low value of the coefficient of correlation could be well due therefore to measurement error.

decreased in all regions but at a different pace (Here too, the data for Sub Saharan Africa are subject to considerable measurement error. Recent estimates indicate that both IMR and U5MR rose between 1990 and 2000; see the related discussion in chapter 2).

Figure 4 Change in U5MR by regions 1990-2000 and Q1 and Q5 levels by latter 90s



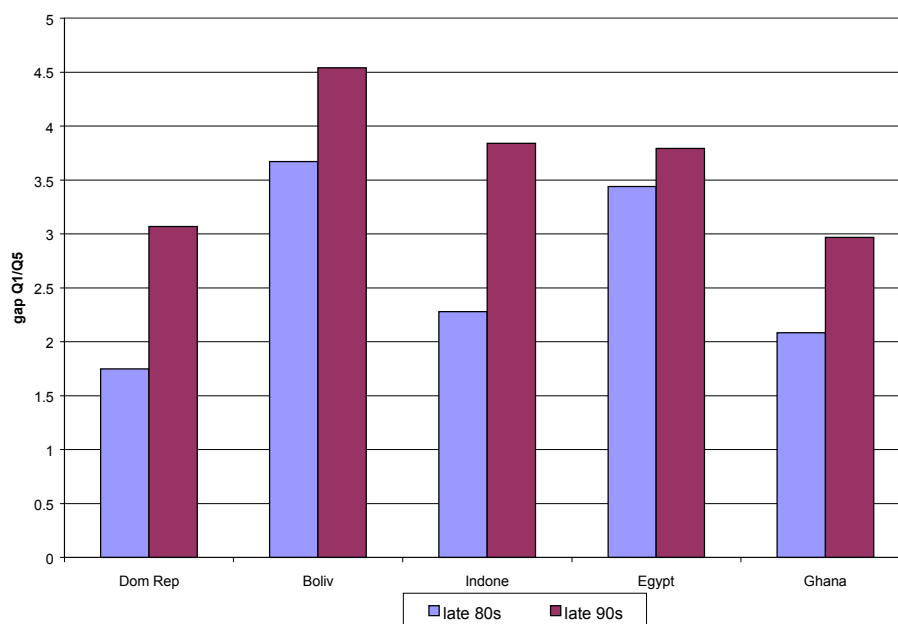
Source: Based on DHS data UNICEF (for regional average trend) data.

However, changes in mortality differentials for the second half of the 90s are not known yet. The estimated regional levels¹³ of child mortality for the top and bottom quintiles around the mid-90s (or earlier depending on the date of the DHS) show that the situation of the bottom 20 per cent was still worse than the average situation at the beginning of the 90s.

¹³ Weighted average for the countries with information by region.

In order to understand the path followed by the child mortality decline over time we need to have information on disparity trends for the 80s-90s.¹⁴ In Figure 5 we can observe the changes over ten years in the relative gap between bottom (Q1) and top quintile (Q5) for Dominican Republic, Bolivia, Indonesia, Egypt and Ghana for U5MR. The relative gap increases in all the cases. From 1.75 to 3.07 in the case of Dominican Republic and 2.08 to 2.97 in Ghana. Egypt is the one country with almost not changes in disparity, however it is very high, around 3.5.

Figure 5 U5MR Relative gaps Q1/Q5 late 1980s and 90s

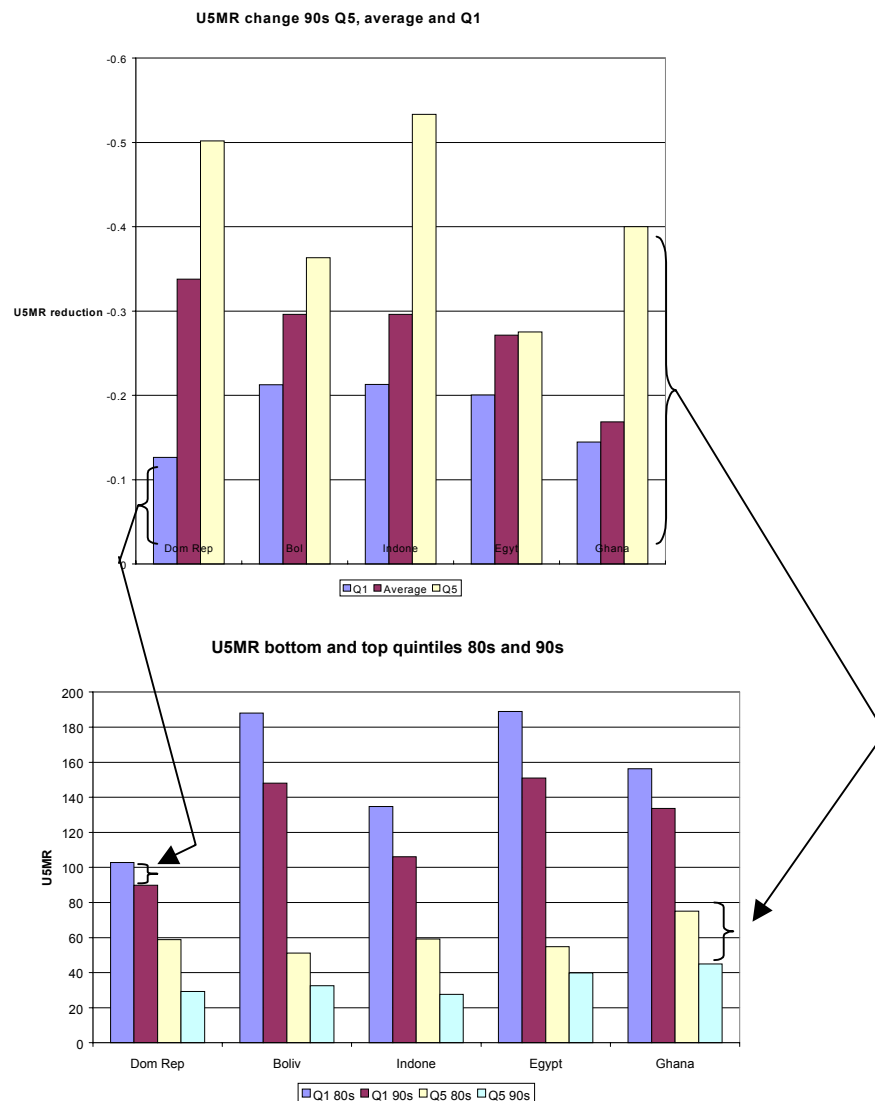


Source: Based on DHS data

Figure 6 below illustrates that the reduction of U5MR for the quintiles Q1, Q5 and the average and the level of U5MR for Q1 and Q5 in the 80s and 90s. The broken arrows for Dominican Republic and Ghana show the correspondence between the changes shown in the top graph, and the different levels shown in the bottom one.

¹⁴ The trends for IMR in eight countries analysed by Sahn et al. (1999) look the same, with the exception of Mali, Zambia and Zimbabwe. It should be noticed that they have evidence for Ghana, which overlaps with ours. It indicates that disparities in IMR are smaller than in U5MR. This is a reasonable conclusion as mortality in the first year of life is influenced less by contextual factors (many of which are related to socio-economic status and captured in our wealth classification) than in later years.

Figure 6 Changes in relative gaps and in the levels of U5MR



Source: Based on DHS data

There is, however, an important issue regarding these temporal changes. It refers to whether the differences observed in the relative gaps represent actual trends, or if they are a statistical artifact. In other words, given the sample sizes, the errors around the quintile estimates are large and it may be that the differences are only due to random sampling. The inputs for doing this statistical analysis are the standard errors of the variables in each period. From there we need to derive the reliability of changes in gaps, which are ratio estimators. After looking at different alternatives, finally we decided for the following approach. We compared the changes between periods for the bottom quintile and found out that in most cases there were no statistically significant differences.¹⁵ Then we followed the same procedure for the top quintile and noticed that

¹⁵ The appendix shows how we estimated the standard errors used in these tests.

in about half of the countries there were statistically significant improvements. Clearly, then, there were increases in disparity due to the lack of progress of the bottom quintile.¹⁶

In terms of the classification proposed in section 2, the table below shows, for 24 countries, both the changes in the average level of U5MR and the changes in relative gap. These countries represent about 40 per cent of the population in developing countries excluding India and China. These trends in child mortality disparities show that within country inequities have remained constant or narrowed in some countries and worsened in most of the others. Only two countries, with relatively small populations which comprise less than 2 per cent of our sample, were able to achieve both improvements in average and reduction of disparities.

Table 2. Changes in average U5MR and relative gap, 1980s and 1990s, selected countries.

Trends		RELATIVE GAP			
		Constant or Narrowing		Widening	
AVERAGE	Improving	Guatemala, Niger*	Morocco*, Togo,	Bangladesh, <i>Bolivia</i> , <i>Brazil</i> , Colombia, Dom. Rep., <i>Ghana</i> , Indonesia, Philippines, Tanzania, Uganda	Cameroon*, Egypt*, Mali*, Peru*, Senegal*
	Worsening	Zambia	Kenya*	Kazakhstan, Burkina Faso* Zimbabwe	

* Not a significant change in relative gap.

Countries in Italics show an unclear trends using the t-test by quintile but could be considered as experiencing a significant increase in the relative gap (see appendix)

Source: Based on DHS data

These statistical results support the analysis, which could be summarised in the following way:

- The U5MR average reduction is mostly driven by the reduction experienced by the middle and top income groups. Meanwhile, the reduction in child mortality among the poor has been considerably lower, most often statistically insignificant.
- The story that these trends tell us is clear. First, relative gap between rich and poor U5MR increased during the 90s. Second, this is because the decrease of child mortality was much higher for the top quintile than for the bottom one. This is very clear for Dominican Republic and Indonesia. In the first case the top quintile experienced a drop in U5MR from 59 to 29 while the reduction was only from 103 to 90 for the bottom decile.

¹⁶ Bolivia, Brazil and Ghana represented slightly more difficult cases, as both quintiles showed improvements. However, the rate of reduction in the top quintile was at least twice as fast as in the bottom one. Thus, we concluded that for these countries there has also been an increase in disparity.

6. Globalisation and U5MR disparity trends

For the 24 countries analysed, the evidence seems to indicate there has been a general increase in U5MR differentials by wealth level. For about half of them, the increases in disparity were strong enough to pass various significance test. However, the question remains about what other changes were taking place at the same time in these countries. In this section we analyse trends in income distribution, as well as in indicators of openness to foreign trade and investments, i.e. indicators which reflect to some extent the actual participation of a country to the globalisation process.¹⁷ As noted in footnote 13, however, such integration may not be the result of the country policies in the fields of trade and investment, but of other characteristics, such as the size of their markets and the efficiency of their institutions and infrastructure. For instance, China has adopted a fairly restrictive policy stance in the field of trade and foreign capitals, and yet has substantially increased both its (import plus export)/GDP ratio and the inflow of foreign direct investment.

Despite these caveats, and following the analysis in section 4, we analyse the trends in U5MR differentials by wealth levels and its relation to changes in income distribution. The latter variable is available only for 18 of these 24 countries included in the above analysis, not a large enough sample for a sophisticated econometric investigation. Rather, a much simpler way of looking at these variables is presented in Table 3, which classifies countries according to whether the income relative gap was becoming wider or narrower and a similar classification for the U5MR relative gap. A few countries could have been assigned to the category no change under one or the other classification. They are highlighted with an asterisk in the table.

Table 3 Changes in income distribution and in U5MR disparities

	U5MR Gap Narrower	U5MR Gap Wider
Income Gap Narrower	Kenya*	Bangladesh Brazil Ghana Tanzania Senegal* Philippines Zimbabwe^)
Income Gap Wider	Guatemala Morocco* Niger* Zambia	Bolivia^) Colombia Indonesia^) Dominican Republic Uganda Peru*

Source: Own estimate based on DHS and WIDER data base.

*countries where U5MR gap changes are not statistically significant

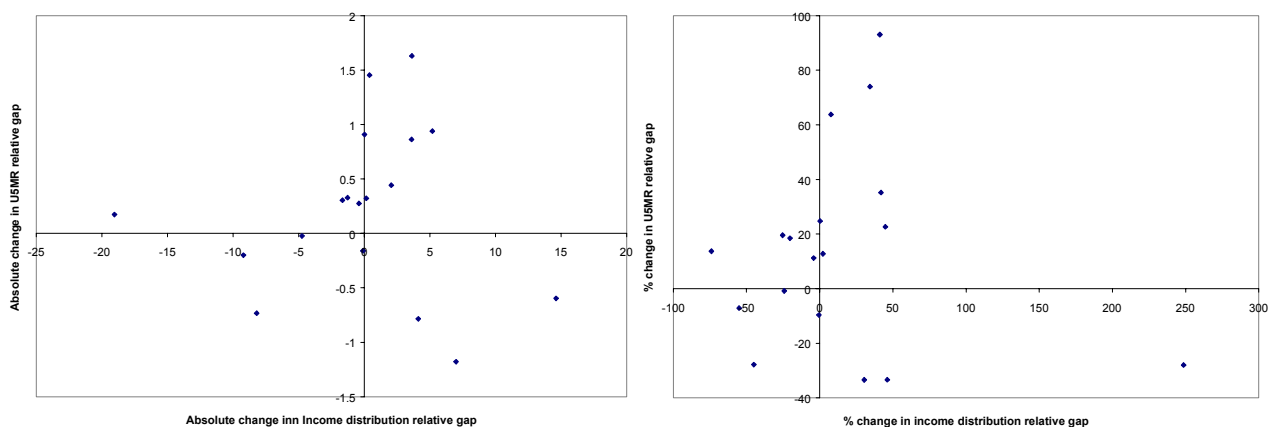
^) countries where income gap changes are not statistically significant

¹⁷ Information on other relevant indicators is not available for all or most of the 24 countries.

Although only Kenya shows a (non-significant) narrowing of both gaps, it is difficult to establish a pattern linking trends in income inequality to those in U5MR differentials. Among the countries where income distribution became more unequal, the same number experienced either an increase or a reduction in U5MR differentials. The countries where the U5MR differential increased, the most common occurrence in this group of 18 countries, are roughly evenly split between countries with more equal or unequal income distributions.

The countries in Table 3 can be arranged according to the magnitude of the changes in either variable. These changes can be expressed in absolute or percentage terms. Figure 7 shows the lack of correlation between changes in U5MR differentials and changes in income inequality.

Figure 7. Absolute and per cent changes in U5MR relative gaps and income gaps.



Source: Own estimate based on DHS and WIDER data base.

Table 4 shows, for the 24 countries the share of exports plus imports of goods and services as a proportion of total output for four years averages starting in 1979 up to 1998. Only 5 countries (in bold) show a marked increase in this measure, that could be considered an index of greater trade integration.

The symbols in the first column show if disparity, i.e. the relative gap, in U5MR was increasing (4), constant (-)¹⁸, or declining (5).

¹⁸ I.e. no statistically significant changes.

Table 4 Trends in trade (exports plus imports) of goods and services (% output), 1979-98

		79-82	83-86	87-90	91-94	95-98
Bangladesh	4	21	21	20	22	30
Bolivia	4	55	48	44	48	50
Brazil	4	18	19	15	19	17
Burkina Faso	-	42	42	38	38	41
Cameroon	-	58	59	36	37	47
Colombia	4	29	27	32	35	34
Dominican Republic	4	44	54	73	66	67
Egypt, Arab Rep.	-	76	53	48	58	45
Ghana	4	14	23	43	49	61
Guatemala	5	42	28	40	43	43
Indonesia	4	52	46	47	51	65
Kazakhstan	4	na	na	Na	100	70
Kenya	-	59	52	52	67	65
Mali	-	42	53	50	54	58
Morocco	-	47	49	45	46	47
Niger	-	61	48	41	36	40
Peru	-	40	36	25	24	29
Philippines	4	49	48	57	68	99
Senegal	-	76	73	55	60	73
Tanzania	4	na	Na	42	55	53
Togo	5	110	101	89	65	74
Uganda	4	37	27	26	30	33
Zambia	5	76	73	67	75	73
Zimbabwe	4	45	42	45	62	82

Source: World Bank, WDI CD ROM

Table 5 shows a similar analysis, but based on the level of trade protection. The average level of tariffs for similar periods as in table 4 were obtained for most of the countries for which we have U5MR gap trends. In all of them (except Burkina Faso and Zimbabwe) average tariffs fell or were constant for 1996-99. However, these changes are too recent to affect past mortality trends. When analysing the evolution of tariffs up to the mid-1990, average tariffs trends were available for only two of the three countries where the gap narrowed. In one of them the tariffs trend shows relatively constant values (Zambia) while in the other one average tariffs show an opening up of trade (Guatemala). Among the countries where the U5MR wealth gap did not change significantly, we found four where average tariffs fell (Burkina Faso, Cameroon, Egypt, and Peru) and two countries where they did not change significantly (Kenya and Senegal). The rest of the countries, where disparities increased significantly, were also evenly distributed among lower and constant average tariffs trends.

Table 5 Trends in trade openness (average tariff rates), 1979-98

		80-83	84-87	88-91	92-95	96-99	
Bangladesh	4	100	82	95	54	25	
Bolivia	4	na	17	16	10	10	
Brazil	4	47	51	33	15	13	
Burkina Faso	-	na	61	na	21	32	
Cameroon	-	28	32	na	19	18	
Colombia	4	na	41	26	12	12	
Dominican Rep	4	na	na	na	18	15	
Egypt	-	47	43	38	28	28	
Ghana	4	37	26	17	17	11	
Guatemala	5	na	23	16	11	10	
Indonesia	4	29	32	22	20	11	
Kazakhstan	4	na	na	na	na	na	
Kenya	-	40	40	39	28	16	
Mali	-	na	Na	na	17	15	
Morocco	-	45	26	24	24	22	
Niger	-	na	Na	na	na	18	
Peru	-	22	45	33	17	13	
Philippines	4	34	28	27	22	12	
Senegal	-	na	14	13	12	12	
Tanzania	4	24	32	29	28	21	
Togo	5	na	Na	na	15	15	
Uganda	4	na	25	na	17	13	
Zambia	5	na	30	na	26	11	
Zimbabwe	4	10	9	10	17	23	

Source: World Bank, WDI tables from <http://www.worldbank.org>

Table 6 provides data on a different measure of globalisation, the share of foreign direct investment in total investment. The period and the results are similar. The same, and a few additional countries, seem to have undergone a substantial increase in economic integration with the rest of the world.

It is noticeable that all the countries that can be classified as “globalisers” by these highly imperfectly readily available measures, are countries where a significant increase in disparity was observed in the previous section. However, there have been roughly as many countries where there have been significant increases in disparity in the absence of an increase in the import plus export/GDP ratio and of the increases in the ratio of foreign direct investment to total investments. Thus, on the basis of the imperfect measures of trade and capital account opening, it is difficult to establish any causal relation between globalisation and the trends in the social differentials in infant and child mortality¹⁹. This points to the need to do more work on the measurement of policies of ‘external openness’ and on the effects of internal policies on child well-being.

¹⁹ This result is similar to the ones reported by Vandemoortele (2001a) with respect to globalization and public social spending and by Kaufman and Segura (2000) for health and education spending (but not for pensions and transfers) in Latin America.

Table 6 Trends in Foreign Direct Investment (% of Gross Physical Capital Formation), 1979-98

	79-82	83-86	87-90	91-94	95-98	
Bangladesh	4	0	0	0	0	1
Bolivia	4	10	2	1	11	43
Brazil	4	4	3	2	2	10
Burkina Faso	-	1	0	0	3	2
Cameroon	-	6	7	-2	0	2
Colombia	4	3	11	5	8	15
Dominican Republic	4	3	3	7	9	14
Egypt, Arab Rep.	-	11	10	9	8	6
Ghana	4	6	1	1	8	6
Guatemala	5	8	6	14	6	8
Indonesia	4	1	1	2	4	5
Kazakhstan	4	na	Na	na	2	31
Kenya	-	3	2	2	1	1
Mali	-	1	2	0	0	11
Morocco	-	2	1	2	7	1
Niger	-	5	-1	6	1	8
Peru	-	1	0	1	11	17
Philippines	4	0	1	7	7	10
Senegal	-	7	-2	2	3	9
Tanzania	4	Na	Na	0	2	13
Togo	5	10	2	3	0	11
Uganda	4	0	0	0	7	16
Zambia	5	4	8	31	13	30
Zimbabwe	4	0	0	-1	1	13

Source: World Bank, WDI CD ROM

7. Final Comments

The following are some of the findings and hypothesis that can be derived from the analyses done in this paper:

1. U5MR differentials by income level and other social dimensions were found to be significant in most of the 43 countries analysed cross-sectionally.
2. In the case of wealth disparities, the relative U5MR gap between the bottom and top quintile is on average 2.2, with a range of variation going from 1.3 to 4.7. For one third of the countries the relative gap is higher than 2.5. This implies that more than 3 children from families at the bottom of the distribution die for each child who dies in families at the top of the distribution.
3. The relative gap and its dispersion were found to increase when the level of U5MR decreases. In countries with more than 130 child deaths per 1,000 live births the U5MR relative gap range from 1.7 to 2.5 and most of them are below 2. For countries with U5MR of less than 100 per 1,000, the relative gap ranges from 1.3 to 4.7 with most of the countries beyond 2.3.
4. The analysis of trends in U5MR differentials for 24 countries with at least two DHS over the 1980s and 1990s shows that the U5MR differentials between poor and rich households increased during the ten years studied. The observed reduction in average

U5MR is mostly driven by the reduction experienced by the middle and top social groups. The U5MR reduction for the poor was modest and in most countries it was not statistically significant.

5. The trends in U5MR differentials were found not to vary significantly among relatively more globalised countries and the relative more closed ones, although this conclusion is subject to a considerable measurement error.
6. All of this suggests to undertake further research on the following topics:
 - There are different alternatives for achieving a lower level of infant mortality; some of them are much more equitable than others. Which paths have followed the globalising countries?
 - Particular efforts should be made to improve the situation of the poor. The universal provision of Basic Social Services has been shown by several studies as one key measure for that purposes. Is there a pattern between globalisation and provision of BSS?
 - What public policies, on top of better distribution of assets and income, are crucial to narrowing the U5MR relative gaps and improve the situation of the poor?
 - Can/should goals be set up and monitored not only in terms of national averages but also in terms of disparity reduction or in relation to the poorest groups?

Annex 1.

In this appendix we briefly explain the methodology used to establish if the observed changes in the relative gap reported in Table 2 are statistically significant. We only had standard errors for 5 countries, 5 quintiles and two periods of time. We regressed the observed 50 standard errors on the U5MR. The result was a linear approximation of the standard error based on the values of the U5MR, with the following coefficients:

(I) Approximated standard error = $4.06 + 0.04 * U5MR$

However, the size of the errors are related to the number of households included in the sample. In order to include this effect we also estimated an alternative equation.

(II) Alternative approximation = $6.4 + 0.03 * U5MR - 0.00013 * \text{Number of HH in sample}$

All coefficients in both equations are significantly different from 0 at the 5 per cent confidence level. Both approximations were used (in order to double-check the robustness of the results) to estimate the standard errors for the countries where they are not available. The standard test for ratio (our relative gap measure is a ratio between the U5MR of the first and top quintiles) requires that we know, or are able to estimate, the covariances among the quintiles which we did not have. As a result we approached the problem by testing the observed difference quintiles by quintile. This raises a problem when both quintiles move in the same direction, we come to this point below.

We took two slightly different routes to establish the statistical significance of the difference in U5MR between periods. First, we built confidence intervals and analysed whether these overlap. Second, we explicitly tested for difference using a t-test.²⁰ Combining the results of both of these approaches, we constructed the table below, which shows the estimated U5MR for both periods of time for the bottom and top quintiles, as well as the estimated standard errors.

In the table, which for space reasons only portrays the estimated standard errors emanating from equation (I), it can clearly be observed that for the majority of countries there has been an increase in disparity. In 9 out of the 24 countries there has been a statistically significant increase in the top quintile with a statistically constant level for the bottom one (or an increase in the bottom quintile and a constant level for the top one). In 8 of the countries the changes in U5MR were not significant for either quintile, resulting in a constant level of disparity. In 3 of them the changes were significant but in terms of reducing disparity; two cases where U5MR for the top quintile was constant but it declined for the bottom one and one where U5MR increased for the top quintile and remained stable for the bottom one. Finally in 4 countries, both quintiles enjoyed statistically significant changes (the problem mentioned above). However, in 3 of them (Bolivia, Brazil and Ghana) the rate of reduction among households of the top quintile is roughly more than double that in the bottom quintile. In addition we constructed confidence intervals for the relative gap, using the lower and upper bounds of the bottom and top quintiles in each period. Not only did the relative gap increase considerably but the upper bounds increase disproportionately. All of this leads us to classify them as increasing inequality countries.

²⁰ The differences emerges from the treatment of the unobserved standard deviation.

Table A.1 U5MR for bottom and top quintiles with their standard errors approximated by linear regression (version I), two observations in time

	First observation				Second observation				Significant decline in mortality	
	Q1	Q5	SEQ1	SEQ5	Q1	Q5	SEQ1	SEQ5	Q1	Q5
Bangladesh	177	114	11	9	159	89	10	8	0	YES
Bolivia	188	51	12	6	145	31	10	5	YES	YES
Brazil	154	52	10	6	119	33	9	5	YES	YES
Burkina Faso	226	161	13	10	256	165	14	11	0	0
Cameroon	222	100	13	8	208	87	12	8	0	0
Colombia	59	47	6	6	51	16	6	5	0	YES
Dom Rep	103	59	8	6	90	29	8	5	0	YES
Egypt	189	55	12	6	150	41	10	6	0	0
Ghana	196	111	12	8	134	45	9	6	YES	YES
Guatemala	101	29	8	5	66	27	7	5	YES	0
Indonesia	135	59	9	6	108	29	8	5	0	YES
Kazakhstan	34	59	5	6	89	24	8	5	Increase	YES
Kenya	134	51	9	6	143	57	10	6	0	0
Mali	322	194	16.9	11.8	307	169	16.3	10.8	0	0
Morocco	169	67	10.8	6.7	109	46	8.4	5.9	YES	YES
Niger	379	178	19	11	329	200	17	12	0	0
Peru	150	39	10	6	122	31	9	5	0	0
Philippines	99	40	8	6	79	25	7	5	0	YES
Senegal	206	74	12	7	200	66	12	7	0	0
Tanzania	183	145	11	10	151	93	10	8	0	YES
Togo	212	101	12.5	8.1	169	100	10.8	8.1	YES	0
Uganda	221	176	12.9	11.1	191	124	11.7	9	0	YES
Zambia	218	93	13	8	229	127	13	9	0	Increase
Zimbabwe	69	42	7	6	111	30	8	5	Increase	0

Source: Based on DHS data

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