

Setting the stage for equity-sensitive monitoring of the maternal and child health MDGs*

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Deborah Balk¹
Meg Wirth²
Enrique Delamonica³
Adam Storeygard¹
Emma Sacks¹
Alberto Minujin³

¹ Center for International Earth Science Information Network (CIESIN), Columbia University, contact: dbalk@ciesin.columbia.edu

² Consultant to Task Force 4 (Child health and maternal health), UN Millennium Project

³ Global Policy Section, Division of Policy and Planning, United Nations Children's Fund (UNICEF)

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Setting the stage for equity-sensitive monitoring of the health MDGs

Deborah Balk, Meg Wirth, Enrique Delamonica, Adam Storeygard, Emma Sacks, Alberto Minujin

Abstract

The Millennium Development Goals (MDGs) must be buttressed by an explicit and systematic commitment to equity in order to ensure that poor, marginalized and vulnerable groups are given opportunities for health and access to health services. This analysis seeks to ‘set the stage’ for equity-sensitive monitoring of the health-related MDGs using data from the broad-scale, international household-level surveys (i.e., the Demographic and Health Survey and Multiple Indicator Cluster Survey) to demonstrate that establishing an equity baseline is necessary and feasible, even in low-income, data-poor countries. We examine six countries using 20 health indicators and 6 social strata to ground our recommendations in current data. Use of singly stratified tables shows effects of single stratifiers on different population groups. We also utilize simultaneously stratified tables to expose unexpected outcomes that occur when two stratifiers are used simultaneously. We found that inequities are complex and interactive: one cannot draw inferences about the nature or extent of inequities in the health outcomes from a single indicator. We further conclude that assessing health equity across dimensions rather than simply one of them is an important element of monitoring the effectiveness of health policies and Poverty Reductions Strategies guided by the MDGs. Recommendations for implementation are made.

I. Rationale

Increasing international attention to equity has led to recognition that, while overall health indicators are improving in many countries, gaps between population groups are increasing or remaining stagnant.

This general statement obscures a very complex reality on the ground. Inequities may be narrowing for some health indicators and widening for others, and likewise, inequities between social groups may vary widely depending upon the health indicator. Further, inequities are interactive—with overlapping forms of disadvantage often conferring higher health risk. We argue that a complete and country-specific analysis of inequities in health is an essential baseline for tracking policy changes and their effect on development indicators.

We believe an explicit and systematic commitment to equity is needed to ensure that poor, marginalized and vulnerable groups are given opportunities for health and access to health services (Freedman et al. 2004, Gwatkin et al. 2002, 2003). Monitoring equity implies an ongoing assessment of how different groups in society are faring in absolute terms, and how they fare relative to one another (Braveman 2003). Population averages are insufficient for monitoring the health MDGs. In order to measure progress in reducing the extent of health inequalities, countries must have a clear *baseline* for their own health MDGs, based upon unique country circumstances and socio-cultural dynamics. This paper is an effort to move beyond the very important stages of ‘setting the values base’ for a focus on equity and ‘sounding the alarm’ about growing gaps in health, to putting in place the requirements for assessing progress toward achieving greater equity. We use widely available data from recent Demographic and Health Surveys (DHS) and Multiple Indicator Cluster Surveys (MICS) to demonstrate that establishing an equity baseline is *necessary and feasible*, even in very low-income, data-poor countries. For many countries lacking vital registration systems, monitoring of the MDGs will rely—at least in the short-term—upon these population-based surveys. We examine six countries—Cambodia, Ethiopia, Dominican Republic, Ghana, Kenya, and Tajikistan—using 20 health indicators and 6 social strata to ground our recommendations in current data.¹ This approach is generalizable to the vast majority of resource-poor countries, which have at least one such population-based household survey containing information on health and on important social characteristics.

Information and data are essential in the effort to reach the MDGs and arguably, nowhere are data as critical as in the realm of counting who lives, who dies, who is healthy and who is sick (Stansfield and Evans 2003). Information systems must be upgraded to keep pace and measure progress. Of particular concern, is the ability of countries to effectively gather their own health information and monitor health status and health system outcomes within their boundaries.

¹ As the largest worldwide survey programs, MICS and DHS help us illustrate our points—but note that other data sources including censuses, vital registration, qualitative studies, health facility information and surveys of refugees also must be used in order to fully describe the extent and nature of inequalities in a given country and to chart and monitor a path forward.

This paper is based around the following four arguments and assumptions: The MDG targets should be framed in equity-sensitive terms; equity is not simply a matter of poor versus rich—the full complexity of social disadvantage must be considered; it is feasible to measure inequalities in health based upon current data; yet we also need to build basic health information systems as an essential part of strengthening health systems and donors must commit to these long-term investments.

The multiple dimensions of disparities

The definition of equity is based on simple notions of fairness and distributive justice. The nuances of this field and the difference between disparities and inequities are briefly discussed here.

Obviously, not all individuals are the same. Thus, unfortunately, some children will die, or be stunted while other ones will not. These differences between individuals are unavoidable. In addition, they are random differences in the sense that they are not associated to any unalterable characteristic which is (or could be) used to separate individuals into groups. When these differences are associated with these characteristics,¹ we are no longer dealing with inequalities but with inequities. Put another way, disparities are simply differences in health status between groups independent of an assessment of fairness. Inequities are a subset of disparities which are judged to be avoidable and unfair and thus require some sort of ameliorating policy intervention (Evans, Whitehead et al 2001).

Distinguishing between disparities or inequalities² and inequities is associated with the question: “Inequality of what?” The answers to this question usually fall in two camps: equal opportunities or equal outcomes. The distinction is important for assessing fairness. While most authors agree that all individuals should have the same opportunities, few of them agree that the outcomes or results should be same for everybody.³ Thus, value judgments enter the discussion.

In the case of both disparities and inequities, there are arbitrary thresholds. On the one hand, whether observed differences are meaningful needs to be established and on the other hand, in the case there is an actual difference, whether it is fair or not needs to be evaluated. We must first assess whether in fact two apparently different indicators do in fact reveal a disparity. For instance, average weight at birth could be 2.4 Kg in one province and 2.6 Kg in another. The former indicator appears to reveal a problem of low birth weight (defined as <2.5kg) which may be absent in the latter. However, as these estimates are based on samples, statistical tests must be employed to establish (for each indicator and context) what numerical differences actually represent inequalities.⁴ In this analysis we make a point of performing statistical tests in order to be definitive about which differences between indicators are

¹ Below, we call these characteristics stratifiers, following the standard terminology.

² As “disparities” and “inequality” mean basically the same, we use them interchangeably. In common usage, “inequality” seems to be associated with quantitative measures and “disparity” often implies a degree of unfairness not easily captured in numbers. Nevertheless, the dictionary definition is the same for both.

³ The reasons for this vary and their validity need not concern us here. Specifically in terms of income, they range from luck, to individual efforts and the need to maintain certain degree of inequality to provide “incentives”.

⁴ See McCloskey and Ziliak (1996) for the need to complement statistical test with common sense when evaluating what magnitudes are real differences or not.

actually disparities. But the level of significance at which one tests and the magnitude of disparity which one highlights, although grounded in statistical theory and methods, retains an arbitrary element which may be seen as subjective.⁶

In assessing the fairness of disparities (to determine if they are inequities), moral or ethical judgments come into play. “Small” differences in some types of outcomes may be considered unacceptable while large ones are usually perceived as normal. For example, access to plastic surgery for cosmetic reasons is highly unequal across social classes yet does not raise public outcry. However, smaller disparities in rates of immunization for children would, in most societies, be deemed ‘unfair.’

In sum, “inequalities” or “disparities” refer to outcomes which are dissimilar without any assumption about whether they should have been equal. Concomitantly, “inequities” refers to outcomes which are not the same when they ought to have been similar. Nevertheless, it would not be accurate to say that “equality” refers only to outcomes while “equity” is restricted to processes.

This is very clear when dealing with the MDGs. Some of the MDGs are outcomes (e.g. child mortality) while others are inputs/processes (e.g. access to health care). But in both cases, there is an expectation that equality across population groups is ‘the ideal.’ In the case of the MDG indicators examined here, all disparities would thus be considered the result of some socio-economic mechanism or constraint which policy-makers ought to change. In other words, they are deemed avoidable disparities between population groups -- inequities.

Finally, it is important to highlight that some of these stratifiers lead to a natural hierarchy while others do not. For instance, when households are classified by wealth, richer households are clearly “above” the poorer ones. The observed disparities are then called “vertical inequities.” When comparing provinces or sub-national regions, there is no natural ranking. Thus, we refer to these as “horizontal inequities.”

What is unique about this analysis

First, the paper specifically addresses *within country inequalities in health* with the intent of demonstrating how the MDGs can and should be monitored. Thus, we look at multiple health outcomes. The majority of equity studies have tended to take a single health outcome—such as child mortality, skilled birth attendants or antenatal care—and examine the distribution of this indicator across and within countries though there are notable exceptions (Stanton and Blanc 2004, Kunst and Houweling 2001, AbouZahr and Wardlaw 2004, Victora et al. 2000, Wagstaff and Watanabe 2000, Wagstaff et al. 2003). Other studies consider many indicators but only one or two stratifies, such as wealth or urban/rural residence (Gwatkin et al. 2003, Minujin and Delamonica 2003). This study evaluates many indicators *and* many stratifiers.

⁶ For instance, in the selection of the level of significance, traditionally a threshold of 5 per cent or 10 per cent is used. Not only one or the other is a subjective choice, it could also be 4, 8 or 12 per cent. Arbitrary, then, should be interpreted as conventional (in the sense of Poincaré) and not despotic or capricious. See Poincaré, (1905).

Second, the paper attempts to deepen analysis of inequities in health by showing the complex reality in different country contexts. The paper addresses multiple dimensions of inequity, moving beyond the overly simplistic poor versus rich dichotomy. Equity in health is not simply a matter of rich versus poor. Other forms of disadvantage, such as ethnicity, educational level of the mother, region of the country, urban versus rural residence and gender are considered important stratifiers of health and access to health, both on their own, and in interaction with one another. We undertake an analysis where we cross-classify indicators by either single or multiple stratifiers to capture the complexity of health disadvantage. Note that we avoid multivariate regression analysis in order to simplify replication in low resource settings.

Third, the paper assesses the statistical significance of the inequities in health status, specifying in which cases the gaps are a result of random variation and in which cases the inequalities are statistically valid, and thus the basis for policy making. While such a statistical assessment should be routine, they are generally not included.⁷

II. Equity Indicators for Monitoring purposes

Equity-sensitive monitoring serves primarily as an ‘early warning’ system, pointing to fault lines in a country’s social fabric or economic system. From a human rights perspective, narrowing avoidable disparities in health outcomes or health access between population groups is imperative. Doing so is often highly charged politically, as there are, in perhaps most contexts, very strong interests in maintaining the status quo or suppressing identification of fault lines. “Achieving greater equity generally requires real changes in resource allocation to favor disadvantaged groups, who by definition, are less influential” (Braveman 1998).

A range of studies over the last five to six years has demonstrated that inequities in health outcomes differ across and within countries and across different health indicators (Minujin and Delamonica 2003, Segone 2001, Evans et al. 2001, AbouZahr and Wardlaw 2004, Victora et al. 2000, Wagstaff and Watanabe 2000, Kunst and Houweling 2001). In addition, studies have shown the extent to which even public expenditure on health (and other social services) tends to disproportionately favor the better-off groups in society (Gwatkin 2002, Castro-Leal et al. 2000). Though the fact that the poor suffer greater ill-health than the rich is perhaps conventional wisdom, these recent analyses enabled a *quantification* of the differentials in access to health care and in health outcomes. What has been striking in the analyses is the oft-seen stepwise gradient in which *each step* up the ‘wealth ladder’ confers greater advantage in health.

As important as ‘wealth’ is in determining who has access to care and who has better health outcomes, other stratifiers may be equally (or more) significant in monitoring inequalities and in

⁷ Similar singly stratified cross-tabulations appear in the country report series of the DHS and MICS reports but no tests of statistical significance are given.

designing appropriate policies. Gender, race/ethnicity (perhaps measured by language) and geographic location are significant stratifiers of health opportunity that should be tracked. Yet, tracking indicators on their own should, where possible, be supplemented by analysis that looks at interactions between stratifiers. Examination of interaction effects allows one to specify, for example, the cumulative disadvantage conferred on a child of a poor family whose mother has no education.

National averages are not enough to assess progress because changes in the national average do not necessarily imply improvement for all members of society. For example, a national average improvement could go together with increases in disparity, or countries may *improve average health outcomes while reducing disparities in health* (Minujin and Delamonica 2003). Further, examining trends over time is another critical component for health equity monitoring. While we do not undertake trend analysis here, we note that the overarching goal of an equity analysis should go beyond simple description of gaps between groups to quantifying the extent of the disparity and with the intent toward monitoring the progress of policies designed to reduce disparity. This exercise establishes a baseline.

Indicators used for monitoring must meet many criteria, including being simple, reliable, sustainable, timely, policy-relevant, and affordable (Braveman 1998). The very process of determining what stratifies health and opportunities to be healthy exposes the ‘fault lines’ in society—pointing directly to the ‘haves’ and ‘have-nots.’ It must be recognized that the selection and implementation of equity analysis, which technical and scientific, takes place in the context of a highly politicized process (Braveman 1998).

III. Methods and Data

A. Health Indicators

The health indicators used in this analysis were selected to match the MDG indicators as closely as possible, with a few exceptions (see Table 1). For example, we include the following: under-five mortality rate, DPT3 immunization (which may indicate which groups tend to ‘fall off’ in terms of coverage over time (Ransom 2004)), skilled attendants at delivery, knowledge of HIV/AIDS, contraceptive prevalence rates, and age at first intercourse and union.

The nature of the health indicators chosen varies. Some of the indicators chosen are health outcomes (underweight, child mortality), some represent access to health care or preventative interventions (visits to a health facility, skilled attendant at birth, measles and DPT vaccination, contraceptive prevalence) and others represent health knowledge (AIDS knowledge) and fertility-related or women’s status indicators (ages at first intercourse and marriage).

B. Social Stratifiers

An equity analysis requires stratifying a population into subgroups that have different levels of underlying social advantage. The social stratifier most often used to look at inequities is income or

wealth. Wealth is usually measured based upon a set of assets the family has, rather than in terms of monetary income or expenditure. However, in countries where the vast majority of the population is extremely poor, and only the capital city has a population which falls in the upper quintile, the stratification by wealth quintile is not necessarily the most appropriate way to measure inequities in health. Even in countries where wealth does stratify health access and health outcomes, other stratifiers should be used to analyze the distribution of health outcomes as well.

Other important stratifiers are: age, urban-rural residence, gender, ethnicity, occupation, geographic region, and education level. All but age⁸ and occupation are studied here (see Table 2). The regions used as stratifiers here correspond to survey regions - the smallest geographic areas for which estimates are produced. The number of regions per survey varies with the size of the sample, along with other factors. Among the countries studied here, Kenya has only seven regions, while the Dominican Republic has 32. Especially when used in combination with another stratifier, sample sizes in individual regions can become too small to yield meaningful results. Between the indicator and stratifiers, over 8,000 datum form the basis of this analysis.

C. Surveys/Data Sources

Data are compiled from DHS surveys of Cambodia (2000), Dominican Republic (2002), Ethiopia (2000), Ghana (1998), and Kenya (1998), and a MICS survey of Tajikistan (2000). These countries and surveys were chosen because they are selected Millennium Project case studies. Tajikistan data is taken directly from aggregate tables distributed by UNICEF, whereas most measures from DHS are calculated from individual woman- or child-level data. The remainder were taken from DHS reports or the DHS website. Indicator definitions were harmonized across the five DHS countries when possible. Some indicators reported here differ from those in official DHS reports (Rutstein and Rojas 2003). For example, values of “Don’t Know” or “Missing” were excluded from our analysis, whereas in DHS reports, these categories are sometimes explicitly reported, or, in some types of AIDS knowledge, considered equivalent to “No.” Similarly, DHS reports contraceptive prevalence rates for women currently in union, whereas we report for all women. We report mean age at marriage, as opposed to median.

D. Methods

The analysis began with single stratification analysis for each of the 20 health indicators studied. Wherever possible, the values for health indicators were calculated for all stratifiers. However, some indicators and stratifiers studied are based on data not available for all six countries. Others were omitted because of indicator-specific computational difficulties. Indicators were not calculated for all

⁸ That is, with the exception the inherent distinction in age-specific indicators of the three child mortality rates: neonatal (NNMR) for children from birth to age 1 month, infant (IMR) for children under 12 months of age, and child (CMR) for children under 5 years of age.

combinations of two stratifiers. For example, the cross-tabulation of ethnicity and region resulted, in most cases, in too many very small or empty categories to allow for meaningful analysis. However, ethnicities were recoded into dominant, not dominant, and in some cases, secondary dominant categories, based on relevant literature⁹ in order to create a set of larger classes to be used as a stratifier in combination with regions.

A “Wealth by poverty line” variable was created using the existing wealth indices (based on DHS/Filmer and Pritchett 2001, Sahn and Stifel 2000). Data from the World Development Indicators on the percentage of each national population living below the poverty line were applied to the wealth index data. This approach was developed as an effort to complement the stratification by wealth quintile with a very simple, immediately policy-relevant distinction between rich and poor.

In nearly all cases, the values presented are percentages of the class that fulfill the requirement of the indicator (e. g. having a DPT2 vaccine, being underweight, or using a modern form of contraception). ‘Age at first intercourse’ and ‘Age at first marriage’ are exceptions, representing means. For each stratification class (e. g. gender, region), a difference test was also calculated. These represent probabilities of the null hypothesis that the values of an indicator for each level within a stratifier (i.e. none, primary, and secondary within education) are not significantly different from each other. Tests of significance were not performed on the mortality rate indicators, because they are rates rather than proportions or percentages. However, Standard errors (SE) are given in individual DHS reports for the national mortality rates. National-level SE can be used as a general indication of likely significance between groups.

Our analysis next undertook simultaneous stratification and analysis for each pair of stratifiers using each health indicator for each country. For example, in Kenya, ethnic group values are sub-stratified by gender, region, residence, wealth, etc., and so on for each combination of stratifiers, to determine the compounded effect of dual forms of vulnerability. Some pairings were not generated in the simultaneously stratified analysis. For example, the raw ethnicity classifications are not combined with regions, because doing so would result in the majority of classes being null for all countries studied. Other indicators such as infant mortality were not included in the simultaneously stratified analysis, because the number of events (deaths) would be too few to construct robust rates. P-values were run on selective pairs or pair-sets. The full dataset generated by this analysis, some 14,000 cells of data is available online.¹⁰

⁹ These include Moyo (2004) for Ethiopia, and Brockerhoff and Hewitt (2000) for Ghana and Kenya. For Cambodia, a rough proxy was created as follows: residents of the two provinces with ethnic minorities in the majority, as shown in Elledge et al. (2001), were designated “Not dominant”. Both provinces are more than two-thirds minority, while all other provinces of Cambodia are less than one-tenth ethnic minority. No ethnic group information was available for the Dominican Republic or Tajikistan.

¹⁰ <http://www.unmillenniumproject.org/who/tf4docs.htm>.

IV. Results

This section attempts to succinctly summarize a vast amount of data generated via the methodology described above. Our emphasis is on within country patterns, rather than comparisons between countries. In order to organize our findings, we present data for each indicator in two categories: first, observations or patterns which were ‘expected results’ on health inequalities and second, observations or patterns which seem to be ‘unexpected results,’ surprising variations on the more expected results or findings which seem to overturn conventional wisdom. One caveat worth mentioning is that as analysis in these areas is quite sparse, determining what is the conventional wisdom is not always straightforward.

Given the international literature on the subject, we would expect most indicators studied to be differentiated by wealth quintile. Certain indicators such as measles immunization, we might expect to be less differentiated by wealth because measles immunization tends to be the subject of nationwide ‘vertical’ health campaigns that should, in theory, reach everyone more or less equitably. Other indicators such as ‘underweight’ we might expect to be more stratified by wealth quintile because, as the literature indicates, underweight is more affected by access to food, which is in turn dependent upon wealth or income (Wagstaff 2002). In general, we expect rural health outcomes to be worse than urban and we expect a certain degree of heterogeneity amongst the regions, with certain regions falling behind in most indicators. With regard to ethnic groups, the literature is far less complete on the subject, but we hypothesize that some non-dominant ethnic groups will fall behind the national averages across all the indicators measured. Based on a much more comprehensive literature on the role of maternal education on family health outcomes, we expect stratification across education of the mother for all of the health indicators.

Underweight children

Expected Results: In Ghana, Kenya, Ethiopia and Cambodia, education, ethnicity, region and residence all significantly stratify underweight. In Kenya and Ethiopia, where there is wealth data, wealth by quintile and poverty line also significantly stratifies underweight. Figure 1 (at end of chapter) shows the variation of the various strata on underweight children in Ghana. The horizontal mark indicates the national average, or 25 percent of children. Ethnicity and region—and not wealth quintile—stand out as having the widest range of values for underweight in Ghana. In Ethiopia, the pattern is slightly different with region and education of the mother showing the widest range of values—ethnicity appears to be less of a dramatic stratifier. And in Kenya, the pattern is different yet again, with education of the mother, ethnicity, region and wealth quintile all showing a roughly equivalent range of values.

In Kenya, children whose mothers have secondary or more schooling, or were in the 5th wealth quintile, or were of the Kikuyu ethnic group were least likely to be underweight (roughly 10 percent of these children were), as compared to children of mothers with no education, in the poorest wealth quintile, or were of

the Mijikenda/Swahili ethnic group, who respectively were 34 percent, 33 percent, and 32 percent underweight. In the simultaneously stratified analysis, for each education level group, the proportion of underweight children is two to four times as great for the children in the poorest households as they are in wealthiest households. Rural children are more likely to be underweight, especially in families where the mother has no or only primary education.

Unexpected Results: In none of the countries studied does gender appear to differentiate underweight status. In Ethiopia, wealth does not appear to protect against having underweight children. Even in the highest wealth quintile, education still matters: children of mothers with no education are twice as likely to be underweight and six times as likely to be severely underweight. In Cambodia, the urban bias seems to be concentrated among the households where the mother has completed primary and secondary schooling. Among those with no formal education in Cambodia, there is no difference between rural and urban levels of underweight children.

Immunization:

Expected results: For most countries studied, DPT1, DPT2, DPT3 and measles immunization is significantly stratified by not just wealth quintile but education of the mother, ethnicity and region. Urban versus rural residence also stratified all immunization indicators for Ghana and Ethiopia. These improve significantly with the level of education of the mothers in Cambodia. The regional differences in Measles and DPT3 immunization in Tajikistan show a range between over 90 percent to just above 60 per cent.

Unexpected results: For all of the countries studied, gender was did not significantly stratify immunization (with the exception of DPT3 only for Dominican Republic). Rural versus urban residence was not a strong factor in immunization inequities for any immunizations in Cambodia, for DPT immunization in Kenya or for DPT 1 and 2 in the Dominican Republic. In Tajikistan, there is no stepwise pattern ‘up the wealth ladder’ for immunization. For gender, girls have very slightly higher levels of immunization, while rural areas appear to have very slightly higher levels of DPT coverage—and increasingly higher as you move from DPT1 to 2 to 3. In Kenya, simultaneously stratified analysis shows that ethnicity stratifies immunization (especially DPT 3 and measles), with less dominant ethnic groups falling well behind—but without boys and girls treated more or less the same (see Table 3).

However, in Ethiopia, while the singly stratified relationship suggests a slight (though statistically insignificant) favoring of male over female children for all vaccine, the more in-depth simultaneously stratified analysis indicates an interaction with education: uneducated women significantly favor their sons for all immunizations measured but DPT1, which is given at rates that are indistinguishable. Primary educated women treat their sons and daughters more or less equally, and women with secondary or more schooling favor their daughters significantly for measles vaccination (see Table 4). Unlike the situation in many countries, it appears that basic immunization is very inequitably distributed, suggesting

that there are significant challenges in the current implementation of even vertical programs. In Kenya, a two-way view suggests that there are no gender differences in childhood immunization rates, but differences emerge when adding other stratifiers. For example, 98 percent of urban boys were vaccinated against measles whereas only 90 percent of urban girls were. However, no gender differences emerged among rural children. The gender bias in vaccination rates decreases as the mother's education increases, but not to the extent that females are favored as in Ethiopia. DPT1 is about the same for urban and rural residents.

Not completely unexpectedly, there is a lack of gender bias in DPT3 and measles. However, in the simultaneously stratified analysis, males are significantly favored for measles among women with secondary education and not those with less education. In Ghana, in urban areas, girls were more privileged in immunizations than boys, while nationally there were no differences. In the Dominican Republic, among women with no education, DPT3 is higher for sons, but measles is higher for girls. Moreover, gender differentials appear at higher levels of education. For secondary-schooled women, there is a weak DPT3 preference for daughters, but for the primary educated, there is no difference.

Child mortality rates:

Expected results: In Ghana, Ethiopia, Kenya and Cambodia, educational level of the mother, region and residence stratify under-five mortality rates. For Kenya—the only country with ethnic group data for this indicator—ethnicity dramatically stratifies child mortality rates with a range from 35 to 253 for under-five mortality rates. And for Kenya, under-five mortality shows the expected stepwise decrease by increasing wealth quintile. Phnom Penh, the capital of Cambodia, consistently shows the lowest mortality. For IMR and U5MR, the next best region (a different one in each of the three mortality indicators) is almost twice as high. In the worst region for all three indicators mortality rates are about 4.5 times higher than in the capital city. In Ghana, inequality in childhood mortality is closely aligned with differences in education and place of residence: more highly educated women and urban dwellers have much lower mortality.

Unexpected results: In Ethiopia, wealth quintile is not particularly strong in terms of stratifying outcomes, nor is the urban/rural distinction. In fact, the third and fourth quintiles have higher U5MR than the lowest quintiles and the highest quintile is not much different from the lowest. And in Kenya, it appears that the difference between no maternal education and primary education does not yield large differences in terms of NNMR, IMR and U5MR. Likewise in Ghana, primary education actually yields a higher NNMR and IMR than no education.

Skilled birth attendants (SBA):

Expected results: Education, ethnicity, region, residence and wealth quintile all significantly stratify skilled birth attendant usage in Ethiopia, Ghana and Kenya. For instance, in Ethiopia, major differences are evident when the indicator is stratified by educational level with 3 percent SBA for those with no

education, 10 percent for those with primary and 45 percent for those with secondary or more. In Kenya, the Mijikenda/Swahili ethnic group was at a low of 27 percent and the Kikuyu at a high of 71 percent. Similarly, in Ghana, ethnicity appears to dramatically affect delivery assistance by a skilled birth attendant, with a near two-fold, statistically significant difference between dominant (63 percent) and the not dominant groups (34 percent). In Ghana, education level shows a very similar pattern with mothers with secondary or more education being attended by a SBA at a rate of 65 percent and those with no education at 25 percent. In Cambodia, almost 90 percent of the births in Phnom Penh are assisted by SBAs. This high level of coverage coexists with a national average of only a third of births assisted by SBAs. Education and urban versus rural residence also stratify SBA in Cambodia. In Tajikistan, wealth does make a difference whereby 55 percent of the lowest quintile and 87 percent of the highest use SBAs and the rural/urban differential is 68 versus 84 percent.

Unexpected results: Simultaneously stratified analysis shows fairly dramatic stratification by education, region and residence even amongst the non-poor (see Table 5). The Dominican Republic shows relative equity in delivery by SBA in terms of maternal education and the urban versus rural residence. Still, it is worth noting that SBA is at a relatively high absolute level in the Dominican Republic. In Tajikistan, likewise, delivery by a skilled birth attendant is quite equitable in terms of level of education (74 percent for those with no education, 77 percent for those with secondary or more) and between rural and urban areas. Note that 'skilled birth attendants' yields quite different results from the 'access to health care facility in the last year' indicator, suggesting that these questions measure two very different aspects of the health system and are not proxies for one another.

AIDS Knowledge:

Expected results: In Ghana, Ethiopia and Kenya, AIDS knowledge is stratified significantly by education, ethnicity, region and residence, suggesting a rather unequal spread and uptake of critical information and education about HIV/AIDS. In Cambodia, knowledge that a healthy-looking person may have AIDS and that using a condom during sex can help prevent HIV infection is also significantly related to the level of education, though it's worth noting that AIDS knowledge is relatively high even among women with no formal education (87 and 72 percent respectively for the two indicators). In Tajikistan, rural populations have much lower levels of AIDS knowledge and wealth by quintile makes a difference only for the richest group (20 percent of individuals in this group knows that condoms can help prevent infection, as opposed to less than 5 percent for the rest of the population). There are also large differences in AIDS knowledge between regions and wealth quintiles in Tajikistan. In the Dominican Republic knowledge of AIDS varies by region, with a range from 78 to 96 percent for the knowledge that a healthy-looking person may have AIDS. As in Cambodia, where knowledge about AIDS is high (average close to 95 percent), it is still quite inequitably distributed.

Access to a health facility:

Expected results: In Ethiopia, Ghana and Kenya, access to a health facility was stratified by education of the mother, ethnicity, region, residence and wealth by quintile (with the exception of Ghana, for which wealth information was not available). In Cambodia—all stratifiers measured were significant (education, ethnicity, region and residence). In Kenya, ethnic disparities were high-- 70 percent of Kamba women sought health services, whereas only about 40 percent of Luhya and Luo women sought health care. In the Dominican Republic—education, and not residence was significant-- women with no education have lower access (53 percent) than those with primary or secondary or more (a round 65 percent). In addition, this indicator is stratified by region with a range from 55 to 73 percent in the Dominican Republic.

Unexpected results: Though wealth quintile was a significant stratifier in Ethiopia and Kenya, ethnicity and region varied far more dramatically than did differences by wealth. And in Ethiopia, for those with no education or a primary education, the rural/urban split in access to a health facility holds true, but for those with a secondary or more education, rural versus urban residence gap closes (also there is no gap between urban and rural for the fourth and fifth wealth quintiles). In the Harari region, *regardless of the level of education*, access to a health facility lingers around 45 percent. Similarly, women from some ethnic groups (e.g. Tigray) enjoy high level of access independent of their wealth level.

CPR modern method:

Expected results: In Ethiopia, Kenya and Ghana, CPR (modern method) is stratified significantly by education, ethnic group, region, residence and wealth. In Tajikistan, there is a clear educational gradient, with those with no education at 16 percent, 26 percent for secondary education and 41 percent for tertiary. By wealth quintile, it is relatively equitably distributed though the richer groups have ten percentage points higher than the rest.

Unexpected results: In Dominican Republic, surprisingly, the percentage of women using a modern method of contraception actually declines as education increases, and the differences are statistically significant. Among women with no education, CPR is significantly higher in urban areas, but among women with primary education, use rates are slightly but significantly higher in rural areas [P-value: 0.03]. CPR *decreases* significantly with education at all levels in urban areas, and from primary to secondary in rural areas. The level of formal education is not significant for utilization of modern contraceptive method in Cambodia, but region and residence do stratify access. In Ethiopia, the lack of education effect applies only in Addis (the capital).

Age at first marriage (AAFM):

Unexpected results: Education makes a great difference in age at first marriage in Tajikistan, the Dominican Republic, Ethiopia and Kenya but confers a statistically significant, but small difference in Ghana and Cambodia. In both Tajikistan and Kenya, AAFM ranges from about 16 years of age for women with no education to 20 years of age for women with secondary or more education. By contrast, wealth quintile makes quite a difference in AAFM in Kenya (2.6 year difference from lowest to highest quintile) and less of a difference in Ethiopia (1.2 year difference). In Ethiopia, ethnicity and region stratify AAFM as much as education does—by as much as three years’ difference between population groups. In Cambodia, urban and more educated women marry later than the ones lacking education or living in rural areas. However, the pattern is dominated by education as there is no more than roughly a month delay among urban women with no education or with secondary schooling compared to rural women with the same level education. For women who completed primary education, the difference is slightly larger. In Ghana, it is ethnicity, rather than education or region which has a strong effect on AAFM—a 1.8 year difference between ethnic groups at the extremes.

V. Discussion

A. Key Findings

The first result from this analysis is that the majority of the social stratifiers chosen yield statistically significant differences within all of the child, maternal and reproductive health indicators. Wealth, ethnicity, educational level of the mother, gender, region and urban versus rural residence are important dimensions of health inequity, with different implications for policy. Our analysis strongly suggests that reliance on single indicators alone—and certainly national level averages—would lead to limited, and even misguided, recommendations for policy.

Second, the importance of these social stratifiers must be understood as more than a statistical exercise in mapping out health gaps. The significance of *social processes* (e.g. marginalization or ethnic discrimination) in determining who is healthy and who is sick, and more profoundly who lives and who dies, is a fundamental challenge to health policy. The current global focus on pro-poor health policies “limits intervention to the *end* of the social production chain” leaving out many other core social processes that generate health inequities (Vega and Irwin 2004). The global trend toward equating the ‘health equity agenda’ into ‘pro-poor’ health policies is a misleading oversimplification. The causes of inequities in health are multifactorial, and the solutions are intersectoral. Oversimplification will address only pockets of the problem. This analysis was undertaken to reduce that oversimplification while not introducing complexities that make the analysis unrepeatable where it is needed.

The third, related, point is that inequities in health are complex and interactive. Health exclusion is often a result of multiple and overlapping forms of social exclusion as well as differences in health

system infrastructure that varies by region. One cannot draw inferences about the nature or extent of inequities in the health system from a single indicator. Nor can we assume that the groups that are disadvantaged in one indicator are necessarily the same groups disadvantaged in another. Whatever the causal factors and the eventual policy choices made, the uncovering of severe disadvantage in certain population groups necessitates *a clear plan* for mitigating or eliminating the health exclusion suffered by certain population groups. Such a plan should be an integral part of Poverty Reduction Strategies (PRSs).

B. Limitations

The purpose of this analysis is to make an argument about the importance of disaggregating data when tracking the MDGs and health policy outcomes. Despite the richness of the data, we note that this brief snapshot of health inequalities is not intended to form the complete baselines for the countries we studied.

The data sources should certainly be augmented. DHS and MICS were chosen as data sources because, in practice, they may be the only reliable data source for some of these indicators in very low resource or post-conflict settings. However, other (and additional) data sources may be more appropriate to track all health indicators, or specific ones. Importantly, countries have their own unique population based surveys such as Indonesia's Family Life Survey (IFLS) that provide a wealth of information on health and other social indicators that is explicitly tailored to national circumstances.

Sub-sampling from the vital registration system, demographic surveillance system (DSS) data and facility-based surveys can also provide valid results and would be an important complement to population-based surveys (Vega 2004, Ngom et al 2003). In addition, more in-depth and multivariate quantitative analysis would assist in the clarification of causal pathways that lead certain groups to be disadvantaged relative to others. Qualitative studies will play an important complementary role too.

Certain population groups such as refugee populations, orphans and ethnic or linguistic minorities may be completely overlooked in analysis that relies about either population-based surveys or even vital registration. Surveys must overcome long-standing shortcomings in the sampling frame such that vulnerable populations are fully assessed.

In addition, even disaggregating data by region or by urban versus rural is often far too coarse a level of analysis to highlight the disadvantages suffered by particular population groups—including urban slum dwellers. For important data on these populations, rapid urban assessments or ongoing surveillance or monitoring that is linked to policy, such as is evidenced in the 'Equity Gauges' will provide city-specific data geared toward policymakers (McCoy et al 2003).

Reducing inequality in health will almost certainly require some geographic targeting of policies. This analysis showed how important regional differences are in most countries. Being able to georeference survey information facilities offers much more flexibility than is otherwise possible. Thus,

geographic identifiers should be added to all surveys, including all the MICS and the DHS that have not yet been geocoded.

For certain indicators, stratification by age may be another important aspect of an assessment of inequalities in health. Particularly in an era when the adolescent cohort in the developing world is the largest ever, the specific vulnerabilities of adolescents and the unique needs of vulnerable adolescents will need special consideration. In addition, occupation would have been a very important stratifier for many of the indicators examined but was not included.

C. Health information asymmetry

Putting aside the technical aspects of measuring and monitoring inequalities in health, we must address a broader question of health information asymmetry. Some information on population health exists in all countries, and in many cases, donors have injected considerable resources for population-based surveys such as the DHS and MICS. The broader question of who owns that data and to what purposes it is put is not the primary subject of this paper, but it is certainly a highly relevant and important aspect of health equity.

Information about disparities in health is a potent tool, and it is critical that an adequate share of donor resources be allocated to ensure country level involvement in the surveys—from their design and implementation, to their use and interpretation. In particular, we note that donors should fund NGOs, academic institutions and Parliamentary groups for the policy-relevant interpretation of this critical data on population health. Citizens (and their representatives) must be empowered with information about their health status—and in particular, their relative health status—how well they fare as compared to what is possible. Furthermore, donor support *must* be given to developing complete vital registration systems as a fundamental part of health systems.

VI. Conclusion

Inequities in health do exist even in the poorest countries and, as this analysis has shown, creating a baseline from which to monitor inequities is feasible using population-based surveys.

The analysis presented in this paper has shown that various social stratifiers yield different patterns of disparity. Regions are often co-terminus with ethnic divisions or poverty profiles, although this codetermination is only revealed by the simultaneously stratified analysis undertaken here. For example, measles vaccination rates seem to vary considerably significantly by wealth, but when regions are added as substrata it becomes clear that some districts represent the bottom quintiles of the population. While wealth is an important focus, the geographic elements of poverty would be overlooked and perhaps misdirected without the disaggregation. In keeping with the global focus on pro-poor interventions, understanding the correlates of poverty will be an important element in reducing it. We also note that in many countries, ethnicity is a profoundly inflammatory subject and it may not be politically feasible to

officially track health outcomes by ethnic group; often, however, geography is a proxy for ethnic group and could be used as such.

In addition, educational attainment of mothers is a critical social determinant of most health indicators (for both children and mothers). Thus, investments in education must be seen as having a dual positive effect—both within the education sector as well as in health. And concomitantly, health messages and programs should be tailored so as to reach less educated mothers and their children.

Moreover, we found that different health indicators yield different patterns of inequity. AIDS knowledge may be high and equitably distributed, but contraceptive prevalence rates and percentage of children underweight within the same country may be grossly inequitable. Thus, an assessment of inequities in health using just a handful of indicators has serious limitations. It is essential to measure and monitor inequities in health, *across multiple indicators and different social stratifiers* (i.e. not just wealth but education, gender, ethnicity and region as well). Monitoring health gaps—and being explicit about which policies are being implemented to reduce them—is the responsibility of both governments and donors alike. And monitoring health gaps (both in terms of gathering and analyzing data), in turn, is crucial for the design of national health policies.

Health information systems are critical. Population based surveys such as DHS and MICS are important sources of key health data, but long-term investments in health information systems must be prioritized as part of the Poverty Reduction Strategies (PRSs). Donors and WHO must invest in *country capacity* to oversee population based surveys and health information systems.

Once a baseline of these differences has been established, the difficult work begins. What are the *policies and programs* that will address these critical issues? A range of standard behavioral and social science methods must be used to *explain and augment* the quantitative data such as that generated herein. And the policy initiatives to redress health gaps must be made explicit.

In order to monitor the progress toward greater coverage, national development goals such as the MDGs ought to be framed so as to put priority on the groups that are lagging far behind. A baseline assessment of inequities across multiple indicators and stratifiers should ultimately lead to participatory dialogue that would prioritize the disadvantaged groups. Yet realistic expectations about the political context are required. Whether the groups or regions are explicitly named in the MDGs is up to the country (Vandemoortele 2004), but detailed tracking and monitoring should be clear about the specific gaps that need to be closed. In many countries, interim-PRSs and PRSs have mentioned inequalities in health. However, these strategies must be more comprehensive: first, in their evaluation of inequalities in health—across multiple indicators and several stratifiers-- to piece together an accurate picture of health disparities; and second, in their articulation of specific policy initiatives to redress health gaps.

Practically, our recommendations mean that countries must prioritize the worse-off groups or ensure that they improve at the same or faster rate as the better-off groups. This does not imply a patchwork of ‘pro-poor’ interventions and ad hoc targeted programs. Rather, the results suggest that a

universal health system that pays attention to inclusion of all population groups will likely be more efficient and equitable. An egalitarian approach is, in many cases, a faster and more efficient way to reach the MDGs than the current top-down model where the poorest and most marginalized are relegated to the end of the queue.

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Table 1. Definition of indicators used				
Variable	Closest Related MDG			Indicator Definition
	Goal	Target	Indicator	
Under-five Mortality Rate (U5MR)	4	5	13	<i>Mortality rate for children under five years old, per 1,000 live births</i>
Infant Mortality Rate (IMR)	4	5	14	Mortality rate for children under one year old, per 1,000 live birth
Neonatal Mortality rate (NNMR)				Mortality rate for children under 30 days old, per 1,000 live births
Underweight	1	2	4	<i>Percentage of children under age five moderately or severely underweight</i>
Severely Underweight				Percentage of children under age five severely underweight
Moderately Underweight				Percentage of children under age five moderately underweight. (Moderately or severely underweight means more than two standard deviations below mean weight for age of reference population; severe is more than three)
KNOWLEDGE OF AIDS	6	18	19b.	<i>Percentage of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS (UNICEF-WHO)</i> HIV knowledge, women aged 15-24 who know that a healthy-looking person can transmit HIV, percent (UNICEF-UNAIDS-WHO) HIV knowledge, women aged 15-24 who know that a person can protect herself from HIV infection by consistent condom use, per cent (UNICEF-UNAIDS-WHO)
CPR	6	18	19c.	<i>Contraceptive prevalence rate (UN Population Division)</i> Contraceptive use among currently married women aged 15-49, any method, per cent (UN Population Division) Contraceptive use among currently married women aged 15-49, condom, per cent (UN Population Division) Contraceptive use among currently married women aged 15-49, modern methods, per cent (UN Population Division)
MEASLES	4	5	15	<i>Proportion of 1 year-old children immunized against measles (UNICEF-WHO)</i>
DPT				Proportion of 1 year-old children immunized against Diphtheria, Pertussis and Tetanus. (three doses)
Skilled Birth Attendant	5	6	17	<i>Proportion of births attended by skilled health personnel (UNICEF-WHO)</i> Refers exclusively to people with midwifery skills (for example, doctors, midwives, nurses) who have been trained to proficiency in the skills necessary to manage normal deliveries and diagnose or refer obstetric complications.
Birth attendance by doctor				<i>Proportion of births attended by doctor</i>
AGE AT FIRST INTERCOURSE				Average age at first intercourse.
AGE AT FIRST MARRIAGE				Average age at first union.
HEALTH SYSTEM USE				Visited a health facility in the past 12 months.

Table 2. Definition of Stratifiers Used		
Stratifier	Definition	Adjustments
GENDER	<i>Gender of child</i>	
EDUCATION	<i>Mother's highest level of education</i>	Grouped into None, Primary and Secondary. Non-formal curricula and strictly religious education excluded
RESIDENCE	<i>Urban or Rural</i>	
ETHNICITY	<i>Country-specific</i>	Uses standard DHS recodes (not available in MICS)
Ethnicity (recoded by group dominance)	<i>Country-specific</i>	Divided into dominant, non-dominant, and secondary dominant (where available; see p. 15)
WEALTH	<i>Quintiles of wealth (country-specific)</i>	Ranges from 1 = "poorest" to 5 = "richest"
POVERTY LINE	<i>Above or below national poverty line</i>	Data from World Development Indicators 2003 applied to wealth index
REGION	<i>Country-specific</i>	

Table 3. Immunization in Kenya by gender and ethnic group

Stratification Class 1		Stratification Class 2	Stratifier 2	DPT1	DPT2	DPT3	Measles
Gender	Stratifier 1						
Gender	Female	Ethnicity groups	Dominant - Primary	100	100	96	99
			Dominant - Secondary	99	96	91	83
			Not Dominant	94	86	72	75
	Male	Ethnicity groups	Dominant - Primary	100	100	91	97
			Dominant - Secondary	96	90	78	83
			Not Dominant	95	89	80	76

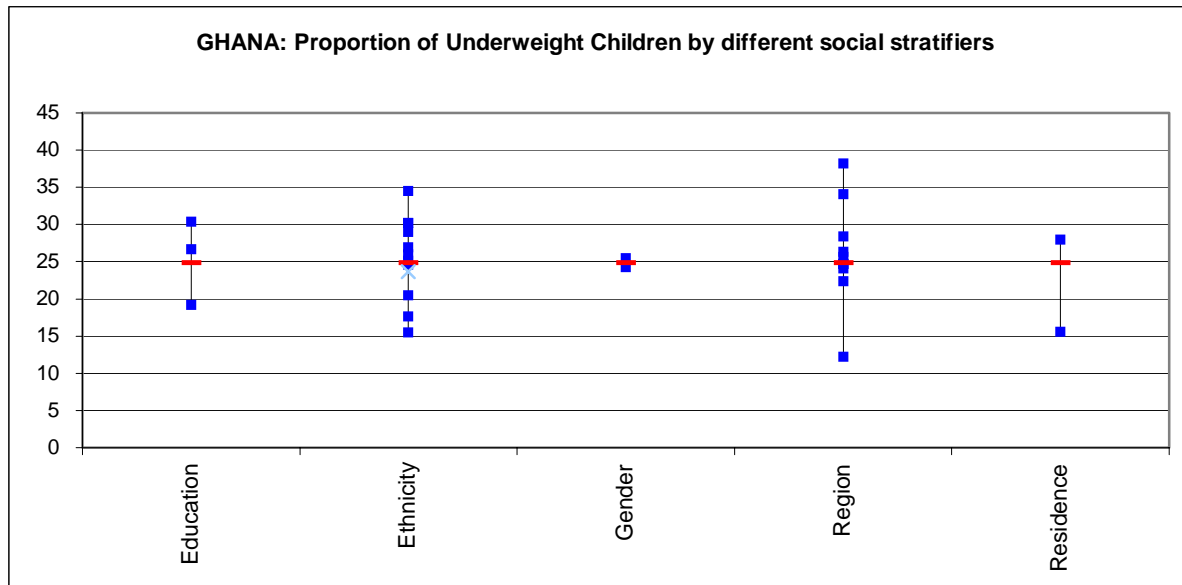
Table 4: Immunization in Ethiopia Stratified by Gender and Education of the Mother

Stratifier 1 (Gender)	Stratifier 2 (Education)	Immunization Indicators	
		DPT 3	Measles
Males	All levels	20	26
Females	All levels	23	28
Males	None	19	25
Females	None	13	20
Males	Primary	37	39
Females	Primary	34	39
Males	Secondary or more	53	48
Females	Secondary or more	59	76

Table 5: Delivery assistance in Kenya by poverty status, education, region and residence

Stratification Class #1	Stratifier 1	Stratification Class #2	Stratifier 2	Deliv Assist by Doctor	Deliv Assist by SBA
Wealth by poverty line	Not Poor	Education	None	12	40
			Primary	12	45
			Secondary or more	25	77
		Region	Central	16	70
			Coast	21	49
			Eastern	16	56
	Nairobi		32	78	
	Residence	Nyanza	11	52	
		Rift Valley	13	50	
	Poor	Education	Western	10	39
			Rural	13	49
			Urban	24	72
		Region	None	6	19
			Primary	5	24
Secondary or more			9	43	
Central					
Coast			2	14	
Residence	Eastern	8	31		
	Nyanza	4	24		
	Rift Valley	9	24		
Urban	Western	4	26		
	Rural	6	25		
	Urban	(9)	(40)		

Figure 1:



Source: Ghana DHS 1998