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Does health care utilization match needs in Africa?

Challenging conventional needs measurement

Igna Bonfrer

Ellen Van de Poel

Michael Grimm

Eddy van Doorslaer

ERASMUS UNIVERSITEIT ROTTERDAM
INSTITUTE OF
HEALTH POLICY & MANAGEMENT

Institute of Health Policy & Management

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Authors
Igna Bonfrer
Ellen Van de Poel
Michael Grimm
Eddy van Doorslaer

Contact
Erasmus University Rotterdam
Institute of Health Policy & Management
Tel. +31 10 408 8555
research@bmg.eur.nl
www.bmg.eur.nl

ERASMUS UNIVERSITEIT ROTTERDAM
INSTITUTE OF
HEALTH POLICY & MANAGEMENT

Research highlights

- Health care use is mainly determined by wealth instead of need in Sub Saharan Africa.
- Countries with better need responsiveness are those with higher income & education but not with higher urbanization rates.
- Conventional tools for measuring inequity in health care delivery tend to underestimate inequities in Sub Saharan Africa.
- The poor not only understate their needs, they or the health care system -on average- also respond inadequately to needs.

Keywords

health care, need, use, income, inequality, Africa, decomposition

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Abstract

An equitable distribution of health care use, distributed according to people's needs instead of ability to pay, is an important goal featuring on many health policy agendas worldwide. However, relatively little is known about the extent to which this principle is violated across socio-economic groups in Sub Saharan Africa (SSA). We examine cross-country comparative micro-data from eighteen SSA countries and find that (a) considerable inequalities in health care use exist and vary across countries, but that (b) identifying the extent to which these inequalities are unfair, i.e. do not correspond to inequalities in need, is not straightforward to ascertain with the conventional tools. These tools include rank-based measures such as the concentration index and the index of inequity. The two main concerns when using conventional tools to measure equity are (i) the reporting heterogeneity in self-reported health variables across socio-economic groups and (ii) the weak relationship between need and use. We show that the use of subjective self-reports of health leads to much lower measured degrees of socio-economic inequalities than those obtained using more objective indicators. This leads to an underestimation of the degree of inequity when using self-reported health measures. The observed weak relationship between indicators of ill-health and use of health care does not appear to provide an estimate of the adequate response to needs, which further puts a downward bias on equity measures. In all countries, apart from the more developed Mauritius, health care use is distributed according to wealth rather than to need. A better match of needs and use is realized in those countries with better governance and more physicians but, perhaps surprisingly, not those with greater urbanization. Given the importance of equity in many health policies worldwide, it is vital to develop more robust equity measures relevant to low income settings.

Introduction

The extent to which health care use is distributed equitably, i.e. according to people's needs rather than their ability to pay, is an important concern of health policy makers worldwide. Income-related inequities in health care delivery have been documented for OECD countries and some high income Asian countries (Lu, et al. 2007; Van Doorslaer et al. 2000; Van Doorslaer & Masseria 2004; Van Doorslaer et al. 2004) but comparative studies for lower income settings, in particular Sub Saharan Africa (SSA) are more scarce. The existence of these inequities is not only a societal concern in itself, their persistence may also cement a possible health-poverty trap that can retard economic growth (Sala-i-Martin 2005; Strauss & Thomas 1998). A fair(er) distribution of health care delivery is therefore vital, especially in SSA where health indicators are lagging far behind other developing regions. Socio-economic inequalities in under-five mortality, underweight and diarrhoea are considerable in SSA and to the disadvantage of the poor (Gwatkin, et al. 2007).

The literature on equity in health care delivery in SSA is surprisingly thin. Earlier work has focused mainly on access to maternity and child care (Cissé et al. 2007; De Brouwere & Van Lerberghe 2001; Gwatkin et al. 2007; Magadi et al. 2003; Schellenberg et al. 2003; Zere & McIntyre 2003; Zere et al. 2011) or on interventions for specific conditions such as HIV/AIDS (Loewenson 2007; Scott et al. 2005). While maternal and child care are indeed crucial components of emerging health care systems, they only represent one segment of the system and consist of largely anticipated and relatively affordable services. Moreover, health inequities may widen in the near future when the sharply rising prevalence of chronic diseases (de-Graft et al. 2010) will add to the currently dominant burden of infectious diseases, creating further challenges for health care systems.

This paper aims to fill a gap in our current knowledge by measuring and comparing inequities in health care delivery beyond those observed in child and

maternity care. First, we document and explain inequalities and inequities in health care delivery across SSA using rank-based measurement methods as outlined in O'Donnell et al. (2008). Second, we draw attention to some important methodological problems encountered with the conventional measurement methods when applied to low income settings and examine how these may influence our findings. We use data from Demographic and Health Surveys (DHS) and World Health Surveys (WHS) from a set of eighteen countries in SSA. Focusing on a sample of SSA countries has the virtue of providing on the one hand sufficient diversity while on the other hand still safeguarding a minimal level of comparability given that many of these countries share some common initial circumstances such as having been under colonial rule.

The outline of this paper is as follows. We start by describing the data and explaining our methods. Thereafter results are presented and our methodological concerns are explained before concluding and suggesting potential methodological extensions relevant to resource poor settings such as SSA.

Data sources

We use data from eighteen SSA countries for which there was a WHS - and in most cases - also a DHS available. Table 1 shows the countries included, the years in which the surveys took place and sample sizes for both WHS (individuals) and DHS (children) across all countries. The WHS sample sizes range from 1827 (Comoros) to 5524 (Malawi) individuals. Sample sizes for the DHS depend on the outcome of interest. For child mortality, only those children born within 10 and 1 years before the survey are considered. The sample is smallest in Comoros (1989) and largest in Mali (14238). Malnutrition is only defined for children born in the 5 years preceding the survey and present in the household at the time of interview.

Table 1 shows that all countries in our sample belong to the group of lower and middle-income countries, but vary widely in their GDP, their population size and their population health and education levels. Mauritius (9078$ GDP/capita) and South Africa (7522$) are the two richest countries. Mauritius' GDP per capita is of similar magnitude as OECD country Turkey. Malawi (557$) and Ethiopia (494$) are the poorest countries. Both utilization of any health care in the last year and inpatient care in the last 5 years are highest in Mauritius, 52% and 32% respectively, while Ethiopia and Swaziland have the lowest use of inpatient care, 4% and 6% respectively.

In addition to the micro level data we use two sources of country level data: the World Development Indicators (World Bank 2010) and the World Bank Governance Indicators (Kaufmann et al. 2010). These contain information on economic performance and population health and on a set of governance quality indicators.

World Health Surveys

The WHS have been collected by the World Health Organization (WHO) in 2003 across a large set of countries and provide information on both household and individual level, with one adult per household randomly selected for an in-depth interview. The WHS contains detailed data on adults' health status, allowing for more extensive measurement of needs than most other commonly available data sets. However, the information on health care use is more limited. One section of the questionnaire focuses on details of the respondent's *last* health care visit, which of course need not be representative of his/her health care use in a given period and is therefore not useful for this study. A later section asks about the same respondent's inpatient care use in the last five years and – *only* if the respondent has used no inpatient care – about his/her outpatient care use. This routing impedes separate

analysis of outpatient care use. Therefore, we investigate inequities in the use of any care in the last year (variable name: *any care*) and inpatient care in the last five years (*inpatient*).

Need for medical care is proxied by a rich set of mostly self-reported health problems. Self-assessed health is measured on a five point scale running from very good to very bad (*SAH*). For six chronic diseases - arthritis, angina, asthma, depression, psychosis and diabetes - respondents are asked about diagnosis and symptoms experienced in the last twelve months. We applied the algorithms derived by Moussavi et al. (2007) for the detection of conditions from these questions to define indicators of these six chronic diseases. In our models these conditions are represented by separate indicators for each disease but for the sake of parsimony in summary table A1 in the appendix, these are combined in *chronically ill* indicating whether a respondent has at least one of the chronic illnesses. Furthermore we indicate whether respondents report to suffer from any limitations in the eight WHO health domains: mobility, self-care, pain and discomfort, cognition, interpersonal, vision, sleeping and depression. As for the chronic diseases, these limitations are used in the models as separate indicators but reported as *limitations in any health domain* in table A1 indicating whether a respondent has at least one moderate limitation. We also have indicators for an observed hearing problem, vision problem, use of cane or walker, walking difficulties, partial paralyses, continual cough, shortness of breath, mental problem, other health problem or limb amputation. Table A1 contains a single dummy variable *observed health problem* which is one if at least one problem was observed. Furthermore, we have indicator variables for reported symptoms of tuberculosis in the last year or the use of TB medication in the last two weeks (*tuberculosis*); for reported oral problems or the use of medication for the mouth or teeth in the last year (*oral problem*); for being involved in an accident in the last year (*involved in accident*) and for women having given birth in the last year or the last five years (*delivery 1 year* or *delivery 5 years*). Demographics are captured

by a set of age/gender indicators (men and women in five age groups: 18-34, 35-44, 45-64, 65-74 and 75 years and older). The summary table only contains the dummy *gender* (1 = female) and the continuous variable *age in years.*

The non-need related determinants of health care utilization consist of marital status (*married*), occupational status (*no work (reference category), manual work and non-manual work*) and highest educational achievement (*no education (reference category), primary and secondary or higher*). While these are used as separate indicators in the analysis, the summary table simply contains the dichotomous variable *primary or higher education*. To measure socio-economic status, we combined information on household dwelling characteristics and asset ownership into a wealth index using principal component analysis[i] (Filmer & Pritchett 2001). The first score was retained and used to divide the sample into five wealth quintiles, subsequently represented in the five dummy variables *wealth very low (reference category)* up to *wealth very high.* Geographical factors are captured by an indicator for urban versus rural areas (*urban*).

Demographic & Health Surveys

The DHS data have the advantage of being updated regularly and being available for many countries, but they generally only contain information on health care use and health status of women at childbearing age and their children. To measure health care use, we construct an indicator of whether the child's mother has received *sufficient antenatal care* (defined as at least four antenatal care visits to a medically trained, skilled health worker) and whether there was *skilled birth attendance* (doctor, nurse or midwife). Both outcome measures are used worldwide, including in the MDGs, to monitor progress in equitable access to mother and child care (UN Department of Economic and Social Affairs 2010).

To investigate our concern of reporting heterogeneity in self-reported health, we exploit information on children's health status, based on both reports from the mother and on objective anthropometric measurements (height and weight) performed by skilled interviewers. These anthropometric measures are indicators for stunting and underweight, derived from continuous z-scores (World Health Organization 2011). *Stunting* is a situation in which children fail to gain sufficient height given their age, a measure of long term malnutrition. *Underweight* describes a situation where a child weighs less than expected given his or her age and is a measure of both acute and chronic malnutrition (Wagstaff & Watanabe 2000). The measures reported by the mother include indicators for episodes of *diarrhoea*, *acute respiratory infection* (ARI) and *fever* in the four weeks preceding the survey. These three self-reported measures are important proximate determinants of stunting and underweight (Caulfield, et al. 2004; Rice et al. 2000; Sahib El-Radhi et al. 2008) and, eventually, also child mortality (Pelletier et al. 1993; Verwimp 2011). Indicator variables for under-one (*U1M*) and under-five mortality (*U5M*) were constructed using information about children born between 1 and 10 years before the survey.[ii] Self-reported mortality rates may also be affected by reporting bias. Gross under-reporting of deaths is common in certain SSA countries, but over-reporting of deaths may occur as well (Feeney 2001; World Health Organization 2006). Inaccurate reporting can derive from simple failure of respondents to report known deaths within the stipulated reference period, taboo against talking about deaths and from confusion over household membership (Arudo et al. 2003; Curtis 1995; Ndong et al. 1994; Stanton et al. 2001). We therefore consider mortality rates as another (quasi) self-reported health outcome and not as an objective measure. As for the WHS, we use principal component analysis to estimate a wealth index and divide the sample into five wealth quintiles. Descriptive statistics of all variables are shown in table A2 in the appendix.

Measuring inequality and inequity in health care delivery

We measure socio-economic inequalities in health care use by means of a concentration index (cf. e.g. (Wagstaff & Van Doorslaer 2000)). Since this paper focuses on socio-economic inequalities in health care use, which is typically a bounded variable, we use the corrected version of the concentration index as suggested by Erreygers (2009).[iii] The Erreygers-corrected concentration index is calculated as:

(1) $$CCI(y) = 8\,\mathrm{cov}(y_{i,} R_i)$$

where y_i refers to the health care use of individual *i* and R_i to his/her fractional rank in the socio-economic distribution. Positive values of CCI indicate a disproportionate concentration of *y* among the rich and vice versa. Wagstaff et al. (2003) have suggested a decomposition technique to identify the underlying drivers of socio-economic inequality in health care utilization. If the health care variable of interest, y_i, can be explained by a linear regression[iv] on K need-related variables, x_k, and J non-need related variables, z_j, i.e.:

(2) $$y_i = \beta_0 + \sum_{k=1}^{K} \beta_k x_{ik} + \sum_{j=1}^{J} \beta_j z_{ij} + \varepsilon_i$$

then the CCI of *y* can be written as (Erreygers 2009; Wagstaff et al. 2003):

(3) $$CCI(y) = 4\left[\sum_{k=1}^{K} \beta_k \overline{x}_k CI(x_k) + \sum_{j=1}^{J} \beta_j \overline{z}_j CI(z_j) + GC_\varepsilon\right]$$

with $\overline{x}_k$ and $\overline{z}_j$ representing the means of x_k and z_j respectively, and $CI(x_k)$ and $CI(z_j)$ their concentration indices, GC_ε is a residual term. Equation (3) illustrates that socio-economic inequality in health care utilization is a weighted sum of the inequalities in its determinants, with the weights defined by the 'semi-elasticities' (regression coefficients evaluated at the means) and a residual term. The advantage

of this decomposition is that it allows ascertaining to what extent the various factors 'contribute' to inequality in health care use. The higher the inequality (CI) or the semi-elasticity, the higher the contribution.

An index of horizontal inequity I can be obtained by subtracting the need contributions in (3) from the corrected concentration index:

$$(4) \qquad I = CCI(y) - 4\sum_{k=1}^{K} \beta_k \bar{x}_k CI(x_k)$$

which for the adoption of the corrected, rather than the standard concentration index is equal to the Wagstaff and Van Doorslaer index (2000), defined as the concentration index for indirectly need standardized health care (Van Doorslaer et al. 2004). From here on we will refer to the CCI as simply concentration index (CI).

Results

Socio-economic inequality in maternity care use (DHS data)

Table 2 shows estimated concentration indices for the use of sufficient antenatal care and skilled birth attendance. Since ideally (the mothers of) all children should receive these interventions, the need for these types of health care use is homogeneous across the sample, irrespective of income and education. This means that any measured socioeconomic inequality directly implies inequity. Both forms of maternal care are clearly distributed (very) pro-rich in all countries, with estimated concentration indices for antenatal care ranging from 0.07 in Zambia to 0.39 in Comoros, and those for skilled birth attendance from 0.17 in Ethiopia to 0.66 in Senegal. The rank correlation between socio-economic inequality in the use of antenatal care and skilled birth attendance is insignificant (Spearman's rho = 0.356 and p = 0.192) but is large and significant when excluding outlier Zambia (Spearman's rho = 0.622 and p = 0.018).

Socio-economic inequality, in this case also inequity, is significantly greater for skilled birth attendance than for the use of antenatal care, in all countries except Congo and Ethiopia. This may be related to the fact that birth assistance is typically needed more urgently and therefore geographical barriers may be more difficult to overcome.

Socio-economic inequality in general health care use (WHS data)

Table 2 also presents concentration indices for *any care* and *inpatient care* and illustrates that again considerable socio-economic inequalities in favor of the rich exist. Countries with lower socio-economic inequality in the utilization of any care also have lower inequality in the use of inpatient care (Spearman's rho = 0.631 and p = 0.005). In only one country - Mauritius - health care use is distributed pro-poor. The most pro-rich use of any care is found in Côte d'Ivoire (0.16) while no significant inequalities were obtained for Zimbabwe. For inpatient care we find that inequalities are relatively large again in Côte d'Ivoire (0.08) and in South Africa (0.11). In more than half of the countries the concentration indices are significantly smaller for the use of inpatient care than for any care. This derives from the fact that, unlike the standard concentration index, the corrected concentration index measures absolute inequalities and differences in average use are smaller for inpatient care than for any care. Socio-economic inequality is virtually absent in Mali which is largely driven by the very low level of utilization (3%, table A1) Comparing socio-economic inequality in maternal care (DHS) with those in general care (WHS) reveals that countries that do well on maternity care also do well on any care (Spearman's rho = 0.572, 0.580 with p = 0.032, 0.030 for sufficient antenatal care and skilled birth attendance respectively), while this is not the case for inpatient care.

Unlike for maternity care, cross-country comparisons of socio-economic inequality in general health care use as measured by the CI might partly reflect

differences in the distribution of the need for care. In the next section we therefore decompose socio-economic inequality in health care use and analyze to which extent the measured degree of inequality can be considered 'inequitable'.

Explaining and standardizing socio-economic inequalities in health care use

Determinants of health care use

Tables 3 and 4 show the estimated regression coefficients for need and non-need related factors on the probability of *any care* use and *inpatient care* use respectively. These are obtained from estimating a linear probability model as specified in Equation (2). We have aggregated all need-related variables into a single ill-health index using factor analysis for the sake of parsimony. In the decompositions (next section) we use the full set of need-related variables. The results illustrate that in almost all countries, need - as measured by the ill-health index - is significant and positively associated with any health care use (15 out of 18 countries) and with inpatient care (12 out of 18 countries) but the effects are relatively weak. Regarding the non-need related variables, we find that being employed is in most countries positively correlated with any health care use but, surprisingly, not with inpatient care utilization. This might be explained by the fact that for employed people being hospitalized implies an indirect cost in terms of foregone earnings. Urbanicity is not significantly associated with any health care use, except for Zambia and Zimbabwe where any health care utilization is actually higher in rural areas. In Burkina Faso, Chad, Ethiopia and Mauritania people living in urban locations are more likely to use inpatient care. There is no strong correlation between primary education and the use of any care in most countries, while the relationship between having completed secondary or higher education and the use of any care is significant and negative in 12 out of 18 countries. Primary education is increasing the probability of using inpatient care in Chad, Kenya, Namibia and Zimbabwe, and only in the latter country

this is also true for secondary and higher education. When the full set of need indicators is used instead of the index measure, the education-health care use relationship is positive in most countries, suggesting that the combined ill-health factor is not capturing as much of the need related variation as the full set of indicators and that this might bias the education-health care use relationship.[v]

Decomposition of inequalities in health care use

The decompositions of the CI (Equation (3)) for the use of any care and inpatient care are shown in Figures 1 and 2 respectively, with the total height of the bars representing the degree of socio-economic inequality (refer to the CIs in Table 2). For any variable to contribute to socio-economic inequality in health care use, two conditions have to hold: (i) it needs to be correlated with use (Tables 3 and 4) and (ii) it needs to be unequally distributed across socio-economic status as measured by the concentration index[vi]. For ease of interpretation, figures 1 and 2 show grouped contributions of need related variables, wealth, education and other non-need related variables (marital status, employment and urban/rural setting).

Figure 1 shows that socio-economic inequality in the use of any care is largely driven by wealth itself; poor people use less care basically because they do not have the ability to pay. In 12 of the countries (Burkina Faso, Chad, Comoros, Congo, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mali, Mauritania and Senegal) the direct wealth contribution is responsible for considerably more than half of total socio-economic inequality in the use of any care, and in eight countries (Burkina Faso, Chad, Comoros, Côte d'Ivoire, Malawi, Mali, Mauritania and Senegal) wealth explains more of the socio-economic inequality in utilization than all other factors together. For some of the richer countries, notably Mauritius, Namibia, South Africa and Swaziland, the contribution of wealth is typically less important and smallest in Mauritius (9%). In Francophone countries (Burkina Faso, Chad, Comoros, Congo,

Côte d'Ivoire, Mali, Mauritania and Senegal) the contribution of education is positive, while for most other, Anglophone countries, it tends to be negative. The historical literature suggests that colonial policies explain a large part of the schooling differences observed between the former British and French colonies and that the former British colonies do even continue to hold the advantage. The two groups of colonies tend in fact to diverge in terms of total human capital, mainly on the secondary education side. Using matching techniques and controlling for initial ethnical and religious fragmentation, Cogneau (2003) shows that colonial power identity and the quality of the institutions they had set up left its mark on the way education developed in the post-colonial period. The generally lower level of education and greater disparity in conjunction with lower public health expenditure per capita in at least the Anglophone countries in Southern Africa compared to the Francophone countries in Western and Central Africa (Anyanwu & Erhijakpor 2007; United Nations 2010) may explain why education tends to reinforce inequalities in health care utilization: the better educated appear capable of getting more out of a health care system of lower quality.

Socioeconomic disparities in need contribute negatively to socio-economic inequality in any health care utilization in two thirds of the countries, but only substantially (i.e. more than 75%) in Kenya, Mauritius and Zambia (see figure 1). This implies that in these countries the "pro-poor use" of health care is mostly distributed according to need. This stems from the combination of need being more concentrated among the poor (negative CI) and showing a clear positive relation with health care use (positive coefficient). In Comoros, Congo, Côte d'Ivoire, Senegal, South Africa and Swaziland need-related variables contribute positively, which is mainly a result of the negative relationship (negative coefficient) between ill-health and health care use that exists for need variables in these countries. In sum, the decomposition results reveal that in most of these countries, need related variables only explain a rather small fraction of socio-economic inequality in any health care

use, indicating that the bulk of socio-economic inequality is indeed driven by non-need variables and is therefore considered inequitable. This is also illustrated in the fourth row of Table 2, showing the inequity indices (I) for the use of any care (Equation (4)). Standardizing CIs for the distributions of need typically does not change the estimates very much. In six countries (Comoros, Congo, Côte d'Ivoire, Senegal, South Africa and Swaziland) it even *reduces* inequity. This is in sharp contrast to what is typically found in studies on OECD countries (Van Doorslaer & Masseria 2004) and we will return to the possible reasons for this finding in the last section before the conclusion.

Figure 2 shows that the decomposition results for inpatient care differ somewhat from those for any care, but the general pattern is similar. Socio-economic inequality in the use of inpatient care is largely driven by non-need related factors, in particular wealth and to a much lesser extent by need. Only in Mauritius wealth contributes negatively to socioeconomic inequality in inpatient care, implying higher health care utilization among the lower income groups. In only five countries (Ghana, Kenya, Malawi, Mauritius and Zambia) the need variables jointly contribute negatively to socio-economic inequality (see figure 2). This implies that standardizing socioeconomic inequality in the use of inpatient care for differences in the distribution of need has little effect, even less so than for any care, as is shown by the inequity index *I* in row six of table 2. Again, this will be further discussed in the last section. The relatively large contributions of the other non-need related variables in Burkina Faso and Mauritania are mostly driven by the urban variable. As the use of inpatient care is much more dependent on the availability of hospitals, which are typically concentrated in urban areas, location is an important driver of socio-economic inequalities in the provision of inpatient care in these countries. Education in most Francophone countries (apart from Congo) again shows a positive contribution to inequality, reinforcing the finding that education tends to raise socio-economic differences in health care utilization in these countries.

Cross-country differences in health care system responsiveness to needs

While there is considerable heterogeneity in the cross-country results, some clear trends in the responsiveness of health care use to needs nonetheless do emerge from an exploratory correlation analysis at the macro level (see table 5). We use the regression coefficient of the ill-health index in tables 3 and 4 as a crude proxy for the responsiveness of a country's health care system to the needs of its population. In table 5 we report correlations between this coefficient (as displayed in the first row in bold in tables 3 and 4) and some macro-level indicators of economic and social development, including GDP per capita, the primary education completion rate, the share of the population living in urban areas, the number of physicians per population (see Table 1) and four indicators for the quality of governance as obtained from the World Bank governance indicators (Kaufmann et al. 2010). We find a large, positive and significant correlation between GDP per capita and the need responsiveness for any care in the last year as well as inpatient care in the last five years. The same holds for the primary education completion rate and the number of physicians per 1,000 inhabitants, with countries with more physicians displaying greater need responsiveness. However, and somewhat surprisingly, the percentage of the population living in urban areas does not correlate with need responsiveness, not even for inpatient care where we would expect responsiveness to be better for those living closer to hospitals. The literature generally seems to consider good institutions as a precondition for adequate health care provision (see e.g. Deaton 2006). We find that three measures of good governance (voice & accountability, government effectiveness and the rule of law) are significantly and positively correlated with need responsiveness for any care. Government effectiveness also correlates positively within patient care responsiveness. While these correlations can obviously not be interpreted as causal, they are nonetheless suggestive and raise interesting research

hypotheses that need testing in order to enhance our understanding of the causes of insufficient responsiveness to health care needs.

Concerns with conventional equity measurement in low-income settings

While the decomposition results reveal interesting patterns, they also highlight the difficulty of trying to standardize the concentration index in general health care use for differences in the distribution of need. There are two important concerns with the conventional tools for measuring income-related inequity in health care use, as applied in this paper, especially in the context of low and middle income countries (LMICs). The first relates to measuring 'need for care' using indicators of self-reported health. These can suffer from reporting heterogeneity: given the same objective health, respondents with different socio-economic backgrounds tend to report differently on their health because they have less information, lower health expectations and possibly different frames of reference (Bago d'Uva et al. 2008; Lindeboom & Van Doorslaer 2004; Salomon et al. 2003). While this problem is not unique to LMIC, it is likely to be of greater importance in settings where awareness of health care needs is less widespread and more likely to be correlated with socio-economic status than in developed countries. The pro-rich concentration of several of the ill-health indicators as discussed in the previous section does indeed point at potential problems of reporting bias. Unfortunately, the WHS data does not have any objective health indicators that could be used to directly test this hypothesis. We therefore explore this issue using DHS data by comparing socio-economic inequalities in objective child health measures (stunting and underweight) with their self-reported proximate determinants (ARI, diarrhoea, fever). We would expect the CIs to be of similar size and in the similar direction for both measures. If this is not the case, we have an indication of reporting heterogeneity. Figure 3*a-d* shows plots of CIs for underweight (x-axis) against CIs for the self-reported measure (y-axis)

respectively ARI, diarrhoea, fever and under-five mortality (U5M). For all countries (except Swaziland) all data points are above the diagonal, indicating that the measured degree of socio-economic inequality in the self-reported measures is less pro-poor than in the objective measures. For example, the pro-poor concentration of underweight is greatest in Senegal (CI -0.18), while the poor do not seem to report disproportionally more ARI and fever episodes than the rich (CI resp. 0.07 and 0.01). Self-reported under-five mortality is also less disproportionately concentrated among the poor compared to the objective measure of underweight (figure 3*d*).

Figure 4 plots the same CIs of the self-reported measures against the CI of stunting – for parsimony all four figures are combined into one. It confirms the finding of a weak health-income gradient in the self-reported measures. While the latter are considered proximate determinants of childhood malnutrition, they are no substitutes and hence one should be careful when interpreting these comparisons. The generally smaller socio-economic inequality in self-reported measures does however suggest that poorer/richer population groups are under/over reporting their ill-health conditions.

The second concern with the application of conventional methods for measuring equity in the delivery of health care in LMIC, derives from the underlying assumption that, when measuring horizontal inequity in health care delivery, the average population relationship between the need for and the use of care is an appropriate vertical equity norm (Van Doorslaer & O'Donnell 2010). While this seems a reasonable assumption in most OECD countries, it is very unlikely to hold, *on average*, in LMIC, where only a small proportion of the population can be expected to obtain access to appropriate health care when needed and a large part of the population foregoes care. This is illustrated by the rather small and often negative coefficients on the need indicators as shown in tables 3 and 4. While important for deriving equity conclusions, a detailed study of vertical (in)equity is beyond the scope of this paper.

Conclusion

We examined the extent to which health care use in Africa is distributed according to people's needs rather than to their ability to pay. We did this separately for care delivered to mothers and children using DHS data and for more general adult use of out- and inpatient care using WHS data. The results for a set of 18 countries in Sub-Saharan Africa (SSA) confirm earlier findings (e.g. De Brouwere & Van Lerberghe 2001; Gwatkin, et al. 2007)) that the use of antenatal care and skilled birth attendance is disproportionately concentrated in women of higher socio-economic status. As the need for these services can be considered relatively homogeneous across pregnant women, this is clearly an inequitable situation.

Significant pro-rich socio-economic inequalities in the more general use of health care services were also observed in all countries. The decomposition analysis demonstrated that the larger part of these inequalities was related to factors that are not indicators of need and can therefore be labeled as inequities. The results suggest that socio-economic inequities in both in- and outpatient care are mostly related to wealth itself, implying that the use of care is mostly determined by people's ability to pay for care, and not so much by their ill-health status. The only exception to these findings is Mauritius, where inequities in both types of care are virtually absent, and wealth contributions are much smaller. Its distribution of medical care is much more related to variations in people's needs than to their socio-economic status. Clearly, given Mauritius' relatively high GDP, it is an outlier that outperforms all other SSA countries in terms of average health outcomes and supply of medical care. Exploratory cross-country comparisons suggest that countries which display a better need responsiveness are those with higher incomes, higher levels of education and with better governance and more effective institutions but, perhaps surprisingly, not those with a higher urbanization rate.

The results highlight three lessons for policy makers aiming to close the gap between needs and use of care. First, in the absence of health insurance coverage for the poor, any intervention that raises the income generating capacity of poor households is likely to have considerable positive effects on health care use as well. Second, the unequal distribution of education also plays an important role in explaining health care inequity in Africa. This suggests that interventions that raise education levels among the worse off as well as increasing the awareness of health problems and providing information on how to respond to them may prove to be particularly effective in reducing inequity. Third, the exploratory cross-country comparisons suggest that good governance is an important driver of the cross-country differences in need coverage.

Our analysis also draws attention to two important methodological problems encountered when measuring inequities in health care delivery - beyond those in maternity and child care - in resource poor settings. The first has to do with the reliance on self-reported measures of ill-health to reflect people's need for care, which tend to suffer from reporting bias. The seemingly higher need for health care among the rich that is often observed in these countries is likely to derive – at least in part – from the underreporting of ill-health by the poor. This is consistent with our finding that far greater socio-economic inequalities are observed in objectively measured childhood malnutrition than in self-reported measures on the proximate causes of this malnutrition. To confront these problems future research should aim at obtaining better measures of need. This is a prerequisite to substantiate the claim that in SSA the needs are not being treated appropriately and the poor suffer more from this lack than the rich. The use of anchoring vignettes in the adjustment of reporting scales holds some promises in this respect (Bago d'Uva et al. 2011; Bago d'Uva et al. 2008), but their effectiveness in low income settings remains to be tested further.

The second shortcoming relates to the unlikely assumption of vertical equity being satisfied on average in each of these countries. The weak, and in some cases reversed, relationship between the need for and use of medical care does not appear to provide an estimate of adequate response to needs and is associated with an underestimation of inequities in health care delivery. The reference for vertical equity must ideally be a group where on average the relation between need and use is an acceptable norm, e.g. using the average need-use relation in Mauritius for other SSA countries, using the ten per cent richest group or those with higher education.

The answer to the question posed in the title of this paper is therefore negative: health care utilization does not match needs in SSA. Rather it is determined by people's ability to pay and education. Conventional tools for measuring inequity in health care delivery underestimate inequities. The poor not only understate their needs, they or the health care system - on average - also respond inadequately to these needs. Given the importance of equity in many health policies worldwide, it is vital to develop more robust equity measures relevant to LMICs.

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Endnotes

[i] The WHS also contains expenditure data, but due to the rather concise set of survey questions these tend to be biased downward (Xu et al. 2009). For this reason, and for consistency with the DHS which has no expenditure or income data, we use the wealth index to proxy socio-economic status.

[ii] We also calculated under-five mortality rates for those children born between 15 and 5 years before the survey and confirmed results were very similar. Going back further in time has the advantage that there is full information on children's survival up to age 5, but the disadvantage that household living conditions at the time of survey are less likely to relate to those to children born 15 years ago. Restricting the sample to children born in 5-10 years before the survey did not give sufficient sample size for many of the countries under study.

[iii] Erreygers (2009) has shown that the CI, when applied to bounded variables, has considerable shortcomings, most importantly that it fails to satisfy the mirror condition (inequality in health does not "mirror" inequality in ill-health). This is especially important in cross country comparisons, as there tends to be great variation in the mean of outcomes between countries.

[iv] The decomposition can also be used in the context of non-linear models, but at the expense of introducing approximation errors (Van Doorslaer et al. 2004).

[v] Results of the regression analysis using the full model can be obtained upon request from the authors.

[vi] Estimated concentration indices of all covariates can be obtained upon request from the authors.

Table 1: Data and country characteristics

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Sample size																		
WHS	4942	4767	1827	3048	3227	5085	4073	4627	5524	4616	3464	3966	4361	3223	2587	3058	4141	4228
DHS, for child mortality calculations	10645	5635	1989	4835	1992	9861	2992	6079	10915	14238	n/a	n/a	5168	10933	n/a	2812	6401	5247
DHS, for other calculations	8142	4414	921	3858	1477	3873	2385	5082	8045	10793	n/a	n/a	3685	2847	n/a	2034	5096	3915
Data collection year																		
WHS	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003	2003
DHS	2003	2004	1996	2005	1998	2005	2008	2008	2004	2006	n/a	n/a	2006	2005	n/a	2006	2007	2005
Country characteristics																		
Population (x 100,000)	129	94	6	33	185	709	210	340	129	113	28	12	19	107	461	11	112	125
Gini index	40	40	64	47	48	30	n/a	48	39	40	n/a	n/a	n/a	41	n/a	51	42	n/a
GDP per capita, PPP (current int. $)	941	862	1064	3090	1485	494	1050	1193	557	897	1496	9078	4575	1431	7522	3951	1001	n/a
Primary education completed (%)	28	33	63	55	45	35	68	88	59	39	44	98	93	45	95	58	61	83
Life expectancy at birth, 2009	53	49	66	54	58	56	57	55	54	49	57	73	62	56	52	46	46	45
Physicians (per 1000 people)	0.05	0.04	0.15	0.20	0.12	0.03	0.15	0.14	0.02	0.08	0.11	1.06	0.30	0.06	0.77	0.16	0.12	0.16
Expenditure																		
Total health expenditure (% of GDP)	6	6	3	3	4	5	7	4	6	6	3	4	7	5	9	5	7	n/a
OOP health expenditure (% of health expenditure)	49	50	43	50	72	34	49	47	12	55	28	36	5	55	14	17	29	n/a

[a] Source: authors' calculations based on World Health Surveys (2003), Demographic & Health Surveys (1996 - 2008) and World Development Indicators (2007 - 2009)

[b] Notes: The abbreviations of the countries represent respecitvely Burkina Faso, Chad, Comoros, Congo, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Malawi, Mali, Mauritania, Mauritius, Namibia, Senegal, South Africa, Swaziland, Zambia and Zimbabwe.

Table 2: Concentration indices (CI) for maternal and general health care and inequity indices (I) for general health care

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Maternal care																		
Sufficient antenatal care (CI)	0.15	0.27	0.39	0.23	0.37	0.21	0.25	0.25	0.15	0.30	n/a	n/a	0.11	0.28	n/a	0.10	0.07	0.13
Skilled birth attendance (CI)	0.35*	0.33*	0.47*	0.26	0.49*	0.17	0.44*	0.46*	0.29*	0.36*	n/a	n/a	0.34*	0.66*	n/a	0.34*	0.54*	0.30*
General health care																		
Any care (CI)	0.11	0.09	0.11	0.08	0.16	0.05	0.11	0.07	0.07	0.05	0.12	-0.06	0.03	0.10	0.08	0.07	-0.04	*-0.05*
Any care (I)	0.12	0.10	0.10	0.06	0.15	0.07	0.13	0.12	0.09	0.05	0.13	0.00	0.05	0.08	0.06	0.03	0.01	0.01
Inpatient care (CI)	0.08**	0.06**	0.05**	0.03**	0.08**	0.04	0.07**	0.04	0.06	*0.01***	0.09	-0.10	0.06	0.04**	0.11	0.07	0.03**	0.05**
Inpatient care (I)	0.08	0.06	0.04	0.02	0.08	0.04	0.08	0.06	0.06	0.00	0.10	-0.04	0.06	0.03	0.10	0.04	0.06	0.05

[c] Notes: country codes as indicated under Table 1

* CI skilled birth attendance differs significantly from CI sufficient antenatal care

** CI inpatient care differes significantly from CI any care

All CIs are significantly different from 0 at α=0,05 apart from the two in italics

Table 3: Coefficients from linear regression on the use of any care in the last year

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Ill-health index	**0.05****	**0.02****	**0.04****	**0.00**	**0.02***	**0.04****	**0.05****	**0.09****	**0.02***	**-0.02****	**0.03****	**0.14****	**0.07****	**0.03****	**0.05****	**-0.01**	**0.02****	**0.03****
Demographics																		
Married	-0.04**	-0.01	-0.02	0.03	-0.06**	0.00	-0.03	-0.02	-0.02	0.03**	0.05**	-0.04*	0.00	0.05**	0.02	0.01	-0.04*	-0.01
Manual work	0.00	0.02**	0.00	0.08**	-0.02	0.00	0.00	0.08**	0.049**	0.01	-0.01	0.02	0.09**	0.01	0.01	0.04*	0.02	-0.01
Non manual work	0.00	0.05**	0.11*	0.05*	0.06*	0.05	0.09**	0.10**	0.13**	0.07*	0.02	0.10**	0.11**	0.02	0.01	0.02	0.179**	0.073*
Urban	0.01	0.01	-0.02	0.00	-0.01	0.04	0.03	0.03	-0.02	-0.01	-0.01	0.03*	0.02	-0.02	0.00	-0.01	-0.06**	-0.11**
Primary education	0.09**	0.01	0.01	0.00	-0.02	-0.01	-0.02	-0.01	0.03	0.01	0.05	-0.01	0.02	0.01	0.00	-0.01	-0.09**	0.00
Secondary or higher	-0.02	-0.02	-0.01	-0.07**	0.01	-0.02	-0.17**	-0.06**	-0.20**	-0.05**	-0.03	-0.11**	-0.07**	-0.06**	-0.04*	-0.04**	-0.23**	-0.04*
Wealth																		
low	-0.01	0.06**	0.03	0.04*	0.04	0.01	0.04*	0.02	0.03	0.01	0.04	0.00	0.00	0.00	0.08**	0.02	-0.01	-0.04
moderate	0.02	0.05**	0.03	0.09**	0.04	0.02	0.03	0.02	0.06**	0.03*	0.03	0.00	0.00	0.02	0.06*	0.07**	0.05	-0.01
high	0.03	0.08**	0.11**	0.08**	0.11**	0.05**	0.09**	0.11**	0.07**	0.03	0.13**	0.04	0.03	0.14**	0.07**	0.07**	0.02	0.05*
very high	0.13**	0.13**	0.13**	0.11**	0.18**	0.06*	0.15**	0.13**	0.14**	0.08**	0.16**	0.01	0.07**	0.12**	0.17**	0.08**	0.10**	0.10**

[d] Notes: country codes as indicated under Table 1
* significant at 5%; ** significant at 1%

Table 4: Coefficients from linear regression on the use of inpatient care in the last five years

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Ill-health index	**0.01**	**0.03****	**0.04****	**0.02****	**0.04****	**0.02****	**0.04****	**0.03****	**0.01**	**0.00**	**0.05****	**0.08****	**0.04****	**0.02***	**0.04****	**-0.01**	**0.00**	**0.02****
Demographics																		
Married	0.09**	0.03*	0.07**	0.05**	0.01	0.01	0.05**	0.10**	0.07**	0.01*	0.07**	0.16**	0.04**	0.06**	0.07**	0.01	0.05**	0.08**
Manual work	-0.03**	0.02*	-0.02	0.07**	0.00	0.00	0.00	0.00	-0.05**	0.00	0.00	-0.14**	0.00	-0.03*	0.00	0.03*	-0.02	-0.06**
Non manual work	-0.09**	0.00	-0.01	0.06**	-0.01	-0.01	0.02	-0.05*	0.02	0.00	-0.02	-0.10**	0.01	0.00	0.051*	0.00	0.09**	-0.034
Urban	0.08**	0.04**	-0.02	-0.03	-0.02	0.04**	0.02	0.02	-0.01	-0.01	0.10**	-0.01	0.02	-0.01	-0.06**	-0.01	-0.01	-0.04*
Primary education	0.01	0.04*	0.02	0.02	-0.01	0.01	0.02	0.04*	0.00	0.01	0.04	0.04	0.05**	-0.02	0.05	0.00	0.02	0.08**
Secondary or higher	0.02	-0.03	-0.05	-0.10**	0.00	-0.01	-0.04*	0.02	-0.11**	-0.02**	-0.01	-0.02	-0.02	-0.03	0.01	-0.01	-0.05**	0.04**
Wealth																		
low	0.00	0.01	0.03	0.03	0.05**	0.01	-0.02	0.02	0.01	0.00	0.01	0.03	0.07**	-0.01	0.01	0.02	-0.03	-0.005
moderate	0.01	0.02	0.05	0.06**	0.06**	0.02**	0.02	-0.02	0.01	0.00	0.03	-0.03	0.08**	0.02	0.08**	0.05**	-0.01	0.028
high	0.02	0.03*	0.08*	0.06**	0.09**	0.04**	0.05**	0.02	0.05**	0.00	0.01	-0.04	0.08**	0.07**	0.07*	0.03*	0.00	0.06**
very high	0.05*	0.08**	0.11**	0.08**	0.13**	0.03**	0.09**	0.05*	0.10**	0.01	0.07**	-0.08**	0.11**	0.06**	0.16**	0.09**	0.06*	0.11**

[e] Notes: country codes as indicated under Table 1
* significant at 5%; ** significant at 1%

Table 5: Country-level correlations between need responsiveness and macro level indicators

	Need-use correlate	
	any care	inpatient care
Need-use correlate		
any care	1.00	-
inpatient care	0.73*	1.00
Country characteristics		
GDP per capita, PPP (int. $)	0.54*	0.55*
Primary completion rate	0.63*	0.51*
Urban population (% of total)	0.02*	0.44
Physicians (per 1000 people)	0.67*	0.67*
Governance		
Voice & accountability	0.52*	0.43
Government effectiveness	0.55*	0.56*
Rule of law	0.51*	0.41
Control of corruption	0.46	0.41

[f] Notes: Need responsiveness for any and inpatient care is measured by the coefficient of the ill-health index in Table 3 and Table 4 respectively. Macro-level indicators are taken from the World Development Indicators
* significant at 5%

Table A1: Means of variables from WHS data (expressed as percentage unless indicated differently)

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Demographics																		
Gender (% female)	53	53	55	53	43	52	55	58	58	42	61	52	59	48	52	54	55	64
Age in years	36	37	42	36	36	37	41	38	36	39	38	42	38	38	38	38	36	37
Married	75	69	51	25	38	66	56	60	65	57	62	67	30	60	34	47	55	59
Manual work	52	50	32	22	48	53	69	54	42	26	24	39	22	31	21	11	53	22
Non manual work	5	7	6	10	9	3	8	7	5	2	5	17	12	7	16	6	4	5
Urban resident	41	25	30	79	61	16	39	32	16	25	43	45	48	49	60	25	41	36
Primary or higher education	17	16	32	78	47	36	58	59	30	23	27	79	58	34	81	57	59	72
Wealth																		
Low	21	22	20	21	20	20	19	19	21	21	20	20	18	19	22	22	21	19
Moderate	20	20	19	19	19	19	20	19	20	19	21	19	20	21	20	18	19	19
High	20	19	19	18	19	19	21	21	19	18	20	18	21	21	18	20	19	22
Very high	20	16	18	18	17	20	19	22	16	18	18	19	21	19	21	22	17	22
Self assessed health																		
Good	43	37	34	18	37	30	35	39	24	30	43	42	29	31	33	15	31	29
Moderate	23	28	29	23	29	19	20	25	15	18	26	21	20	29	18	16	20	35
Bad	6	11	14	8	8	4	6	7	4	5	4	11	5	6	5	22	6	9
Very bad	1	1	2	1	1	1	1	1	1	0	0	3	1	1	2	8	1	2
Health status																		
Observed health problem	14	38	12	10	15	16	11	20	6	6	12	20	11	13	16	8	12	15
Limitations in health domain	73	84	97	88	85	80	82	77	68	77	83	83	85	89	87	93	81	80
Chronically ill	39	52	36	29	34	45	30	36	46	25	41	33	31	36	35	32	23	28
Tuberculosis	2	3	3	1	1	3	1	1	2	1	3	1	3	1	2	2	2	3
Has oral problem	23	28	25	18	21	19	18	28	34	19	13	23	20	22	13	12	25	32
Involved in accident	6	5	5	4	10	2	8	12	9	3	3	7	5	3	6	3	6	4
Delivery 1 year	2	2	1	2	2	1	2	1	2	2	1	0	1	1	1	1	2	2
Delivery 5 years	6	6	3	4	4	5	4	3	5	7	3	2	4	5	2	2	6	4
Health care utilization																		
Any care	22	10	27	14	28	18	29	34	35	11	22	52	23	23	19	8	35	34
Inpatient care	13	10	21	12	12	4	15	16	18	3	16	32	24	11	20	6	16	16

[g] Note: country codes as indicated under Table 1

Table A2: Means of variables from DHS data (expressed as percentage unless indicated differently)

	BFA	TCD	COM	COG	CIV	ETH	GHA	KEN	MWI	MLI	MRT	MUS	NAM	SEN	SAF	SWZ	ZMB	ZWE
Child mortality																		
Under-one	9	10	7	7	11	8	6	6	9	10	n/a	n/a	6	7	n/a	9	7	7
Under-five	14	14	9	9	15	10	7	7	11	14	n/a	n/a	7	9	n/a	10	9	8
Health care utilization																		
Sufficient antenatal care	19	25	50	76	41	17	78	47	56	35	n/a	n/a	77	38	n/a	81	59	70
Skilled birth attendance	59	32	52	88	62	18	71	45	56	48	n/a	n/a	80	49	n/a	74	48	79
Self-reported health																		
Diarrhoea	20	25	23	15	21	17	20	17	23	12	n/a	n/a	13	22	n/a	14	16	13
Acute Respiratory Infection	24	24	41	30	32	16	22	27	39	13	n/a	n/a	18	26	n/a	29	25	22
Fever	9	9	23	8	17	11	11	13	19	6	n/a	n/a	9	13	n/a	15	9	12
Objective health																		
Stunting	37	32	49	24	37	18	20	25	38	17	n/a	n/a	17	30	n/a	30	18	8
Underweight	38	39	34	23	23	43	23	29	48	34	n/a	n/a	24	17	n/a	22	38	28

[h] Note: country codes as indicated under Table 1

Figure 1: Decomposition concentration index of any care use

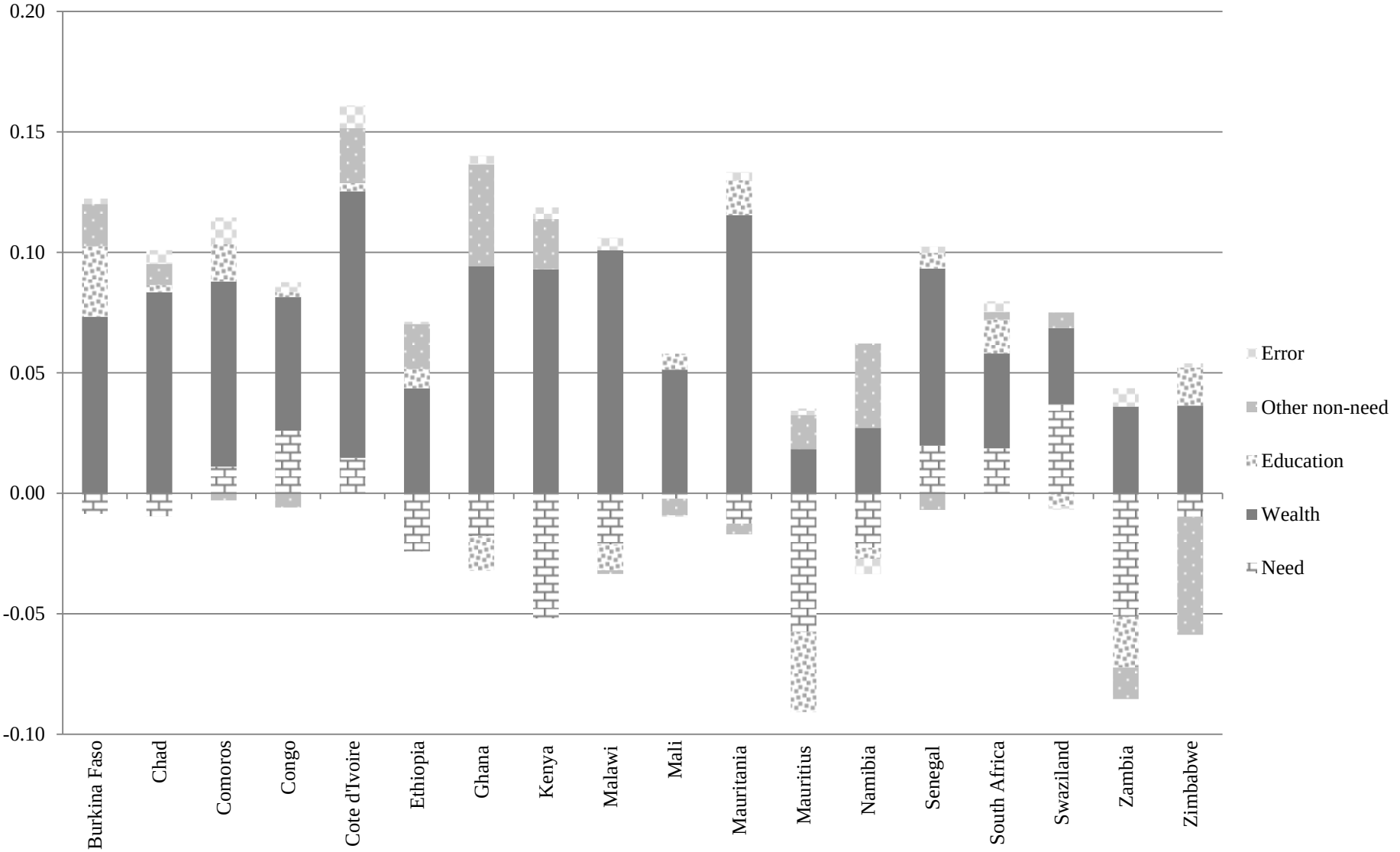


Figure 2: Decomposition concentration index of inpatient care use

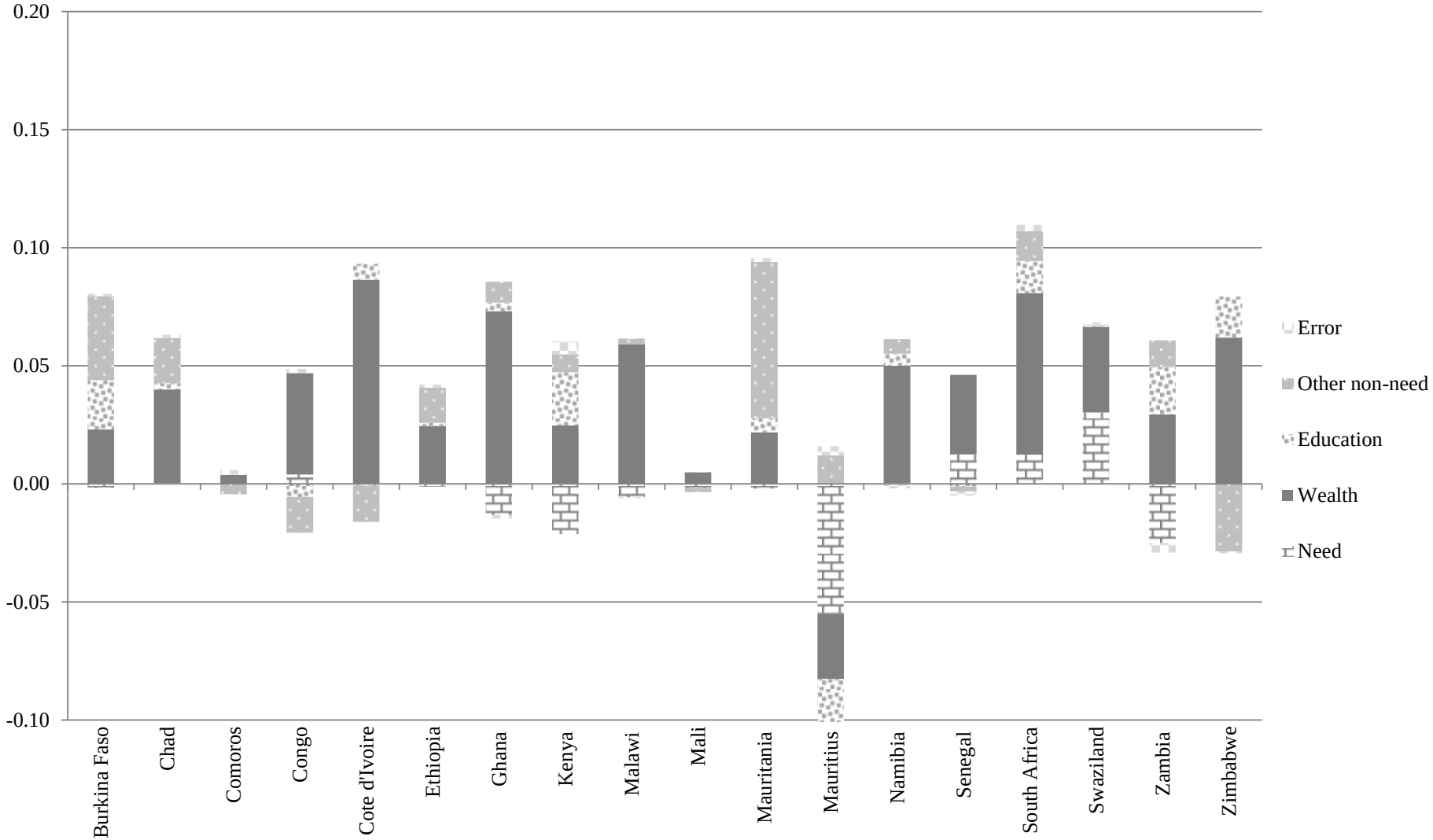


Figure 3a: Concentration indices (CI) for underweight and acute respiratory infection (ARI)

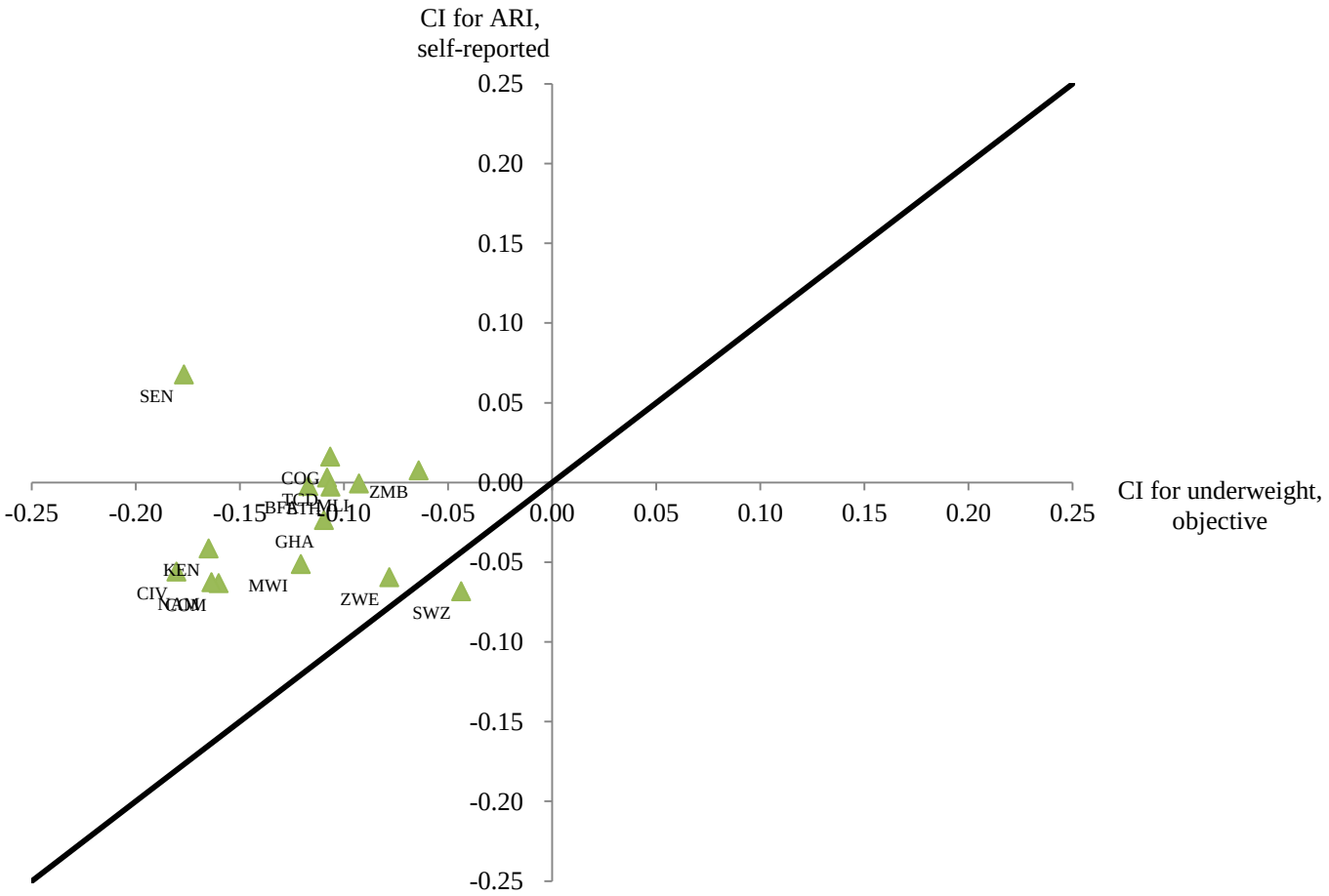


Figure 3b: Concentration indices (CI) for underweight and diarrhoea

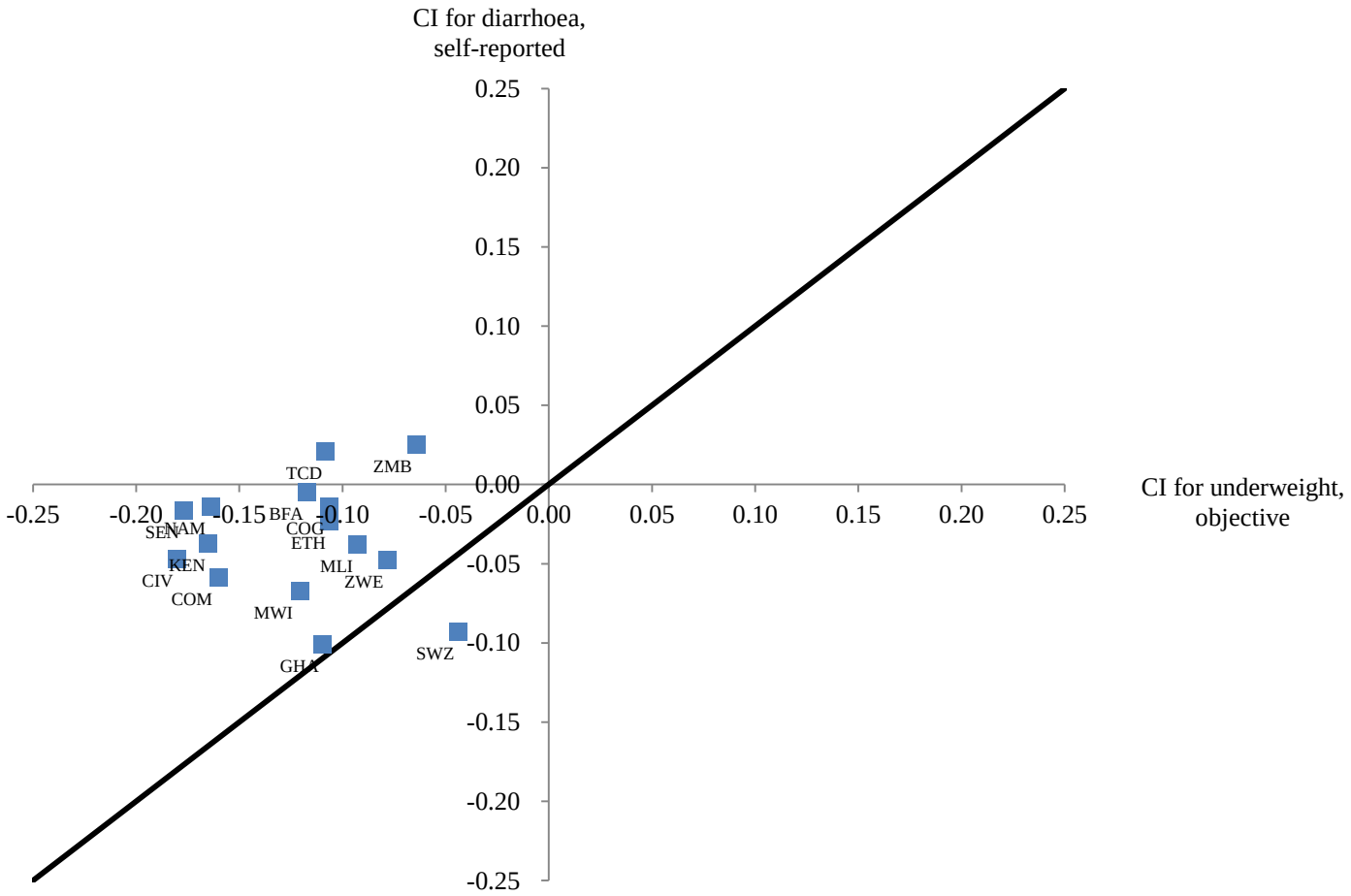


Figure 3c: Concentration indices (CI) for underweight and fever

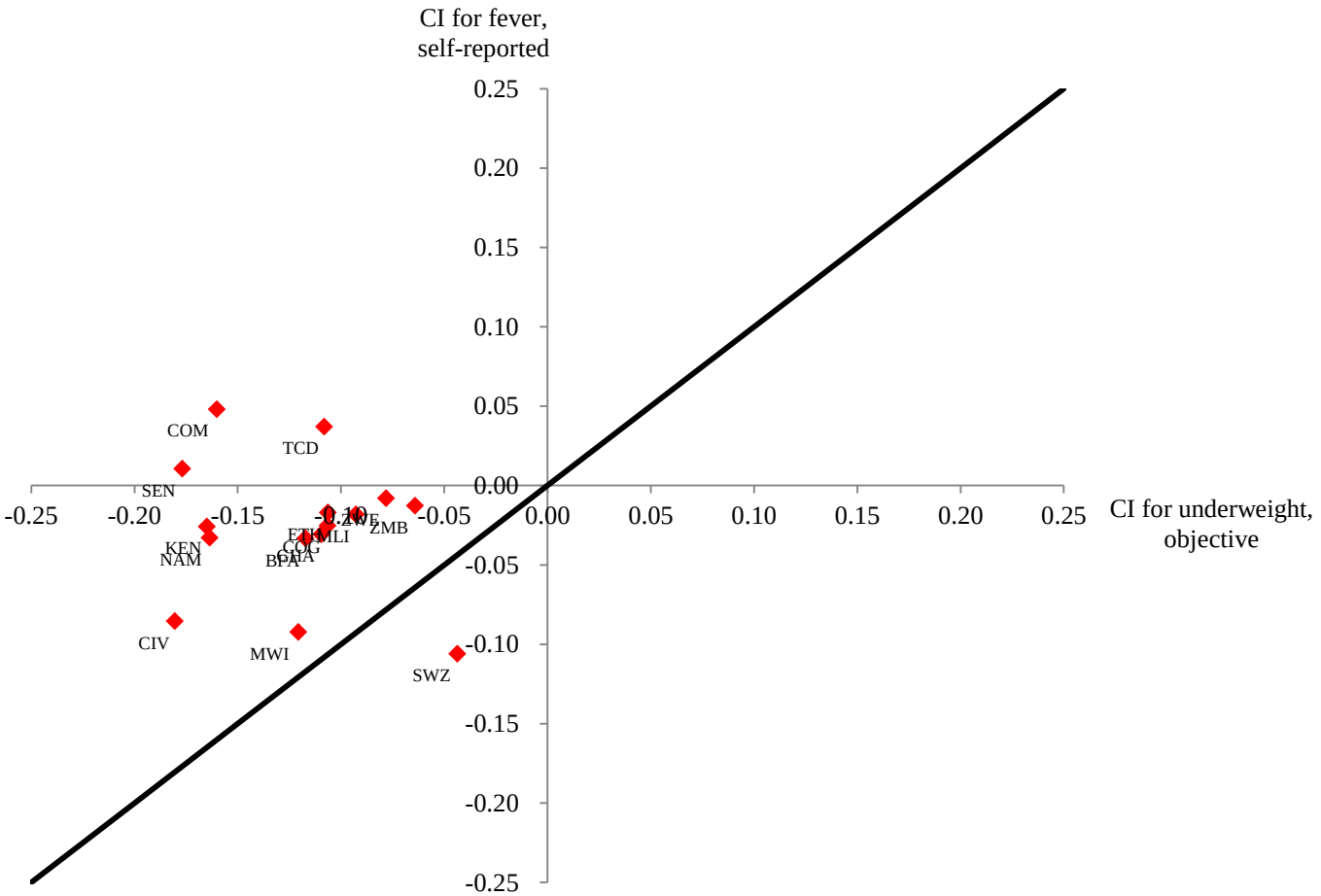


Figure 3d: Concentration indices (CI) for underweight and under-five mortality (U5M)

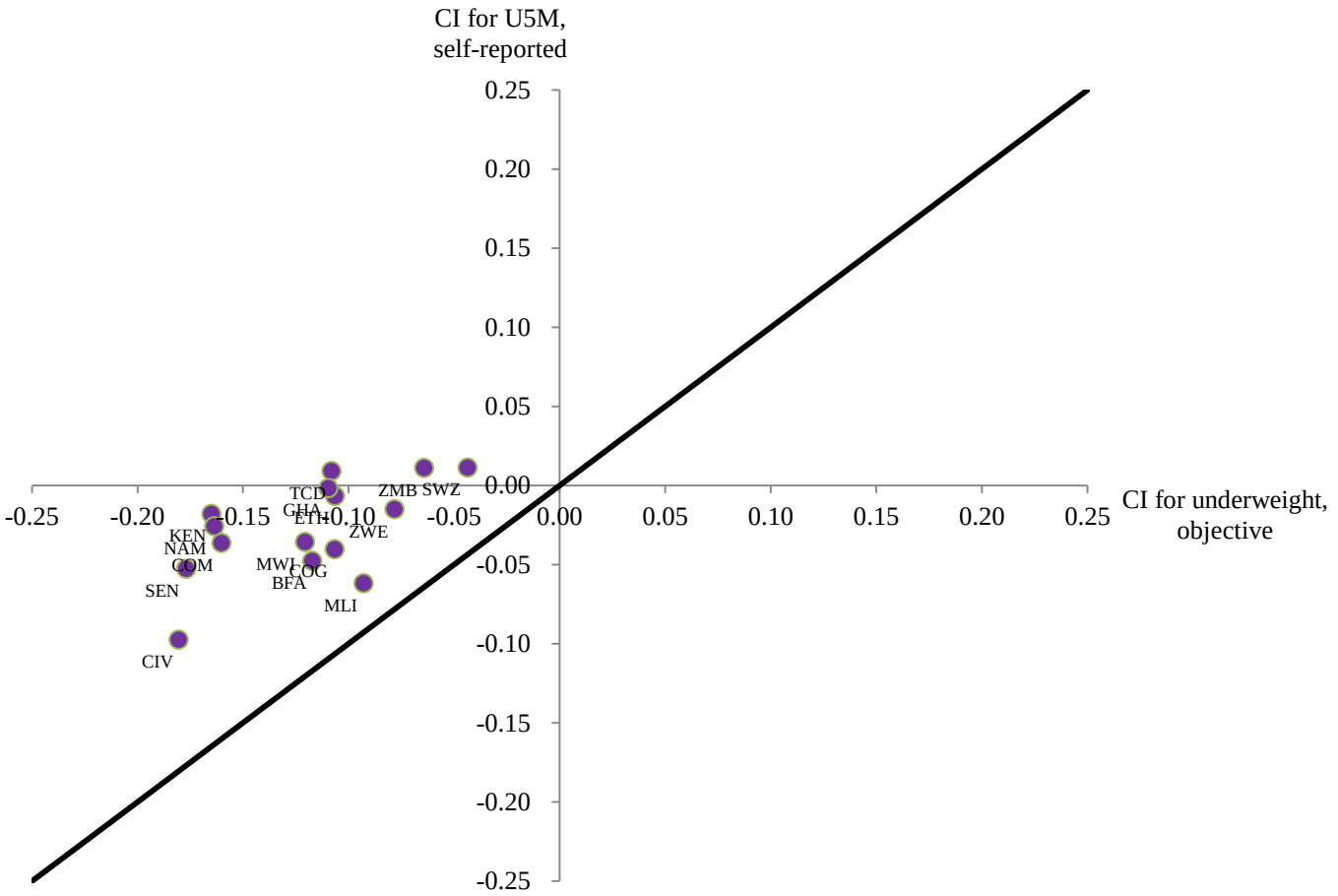
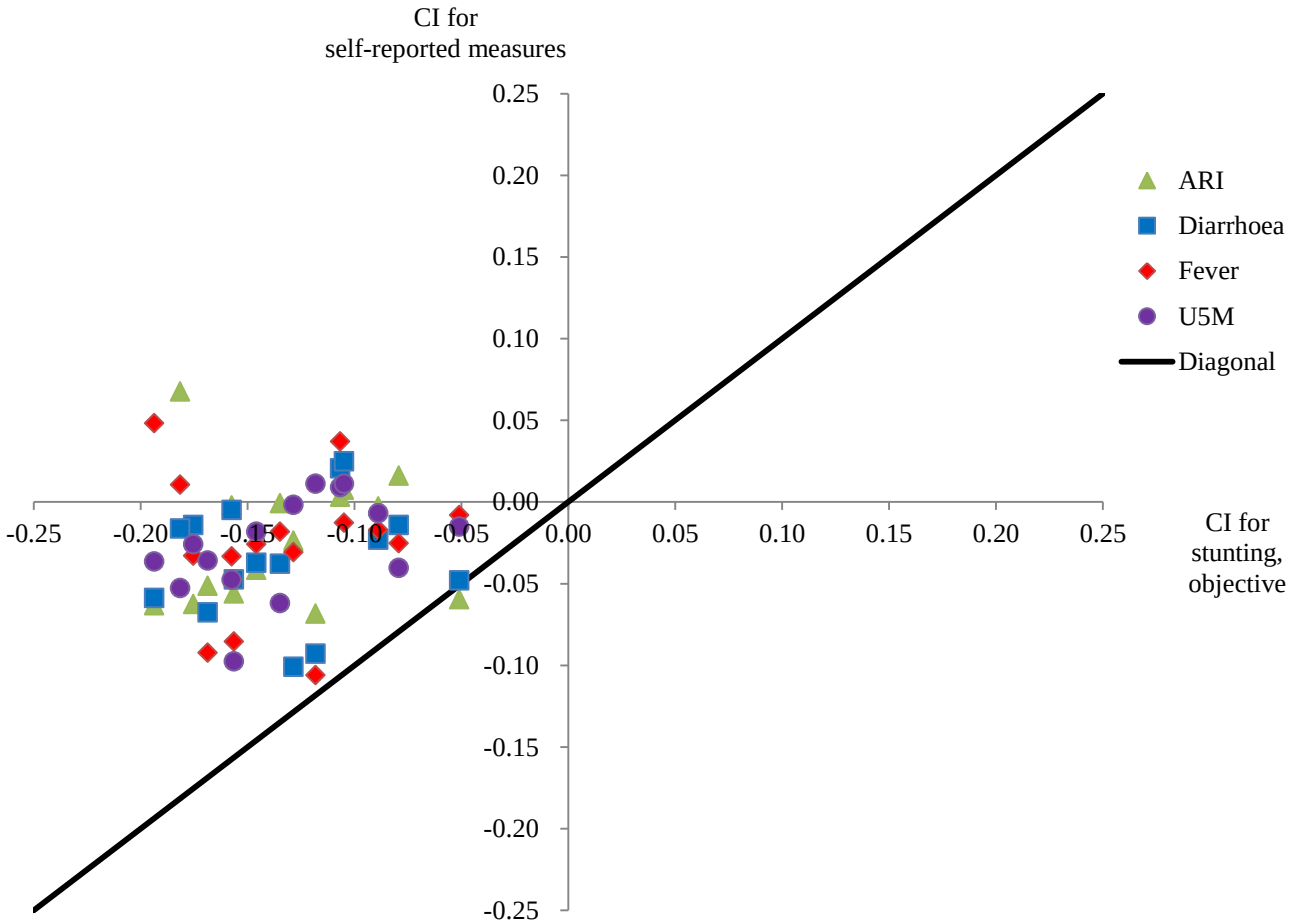


Figure 4: Concentration indices (CI) for stunting and self-reported child health measures



Erasmus University Rotterdam

INSTITUTE OF HEALTH POLICY & MANAGEMENT

Visiting address
Burgemeester Oudlaan 50
3062 PA Rotterdam

Postal address
P.O. Box 1738
3000 DR Rotterdam
The Netherlands

Telephone +31 10 408 85 55
Internet www.bmg.eur.nl
E-mail research@bmg.eur.nl

ERASMUS UNIVERSITEIT ROTTERDAM
INSTITUTE OF
HEALTH POLICY & MANAGEMENT