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Does the distribution of healthcare utilization match needs in Africa?

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An equitable distribution of healthcare 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 18 SSA countries and find that considerable inequalities in healthcare use exist and vary across countries. For almost all countries studied, healthcare utilization is considerably higher among the rich. When decomposing these inequalities we find that wealth is the single most important driver. In 12 of the 18 countries wealth is responsible for more than half of total inequality in the use of care, and in 8 countries wealth even explains more of the inequality than need, education, employment, marital status and urbanicity together. For the richer countries, notably Mauritius, Namibia, South Africa and Swaziland, the contribution of wealth is typically less important. As the bulk of inequality is not related to need for care and poor people use less care because they do not have the ability to pay, healthcare utilization in these countries is to a large extent unfairly distributed. The weak average relationship between need for and use of health care and the potential reporting heterogeneity in self-reported health across socio-economic groups imply that our findings are likely to even underestimate actual inequities in health care. At a macro level, we find that a better match of needs and use is realized in those countries with better governance and more physicians. Given the absence of social health insurance in most of these countries, policies that aim to reduce inequities in access to and use of health care must include an enhanced capacity of the poor to generate income.

Keywords: Healthcare utilization, need, Africa, inequality, decomposition

KEY MESSAGES

- Healthcare use is mainly determined by wealth instead of need in Sub-Saharan Africa.
- Countries with better need responsiveness are those with higher income and a better educated population.
- Conventional tools for measuring inequity in healthcare delivery tend to underestimate inequities in Sub-Saharan Africa.
- The poor not only understate their needs, they or the healthcare system—on average—also respond inadequately to needs.

Introduction

The extent to which healthcare use is distributed equitably, i.e. according to people's needs rather than ability to pay, is an important goal featuring on many health policy agendas worldwide. Income-related inequities in healthcare delivery have been documented for Organisation for Economic Co-operation and Development (OECD) countries and some high-income Asian countries (Van Doorslaer *et al.* 2000; Van Doorslaer and Masseria 2004; Van Doorslaer *et al.* 2004; Lu *et al.* 2007) but comparative studies for lower income settings, in particular Sub-Saharan Africa (SSA), are scarce. The widely reported fact that health outcomes in Africa are poor in general, tends to obscure the existence of a steep socio-economic gradient in these outcomes. Gwatkin *et al.* (2007) find that socio-economic inequalities in under-five mortality (U5M), underweight and diarrhoea are considerable in SSA and to the disadvantage of the poor. The existence of these inequalities is not only a societal concern in itself, their persistence may also cement a possible health-poverty trap that can retard economic growth (Strauss and Thomas 1998; Sala-i-Martin 2005). A fair(er) distribution of healthcare delivery is therefore integral to success in reaching the targets of the Millennium Development Goals (MDGs) related directly and indirectly to health (United Nations Economic Commission for Africa 2008).

The literature on socio-economic inequalities in healthcare delivery in SSA is surprisingly thin. Earlier work has focused on access to maternal and child care (De Brouwere and Van Lerberghe 2001; Magadi *et al.* 2003; Schellenberg *et al.* 2003; Zere and McIntyre 2003; Cissé *et al.* 2007; Gwatkin *et al.* 2007; Zere *et al.* 2011) or on interventions for specific conditions such as HIV/AIDS (Scott *et al.* 2005; Loewenson 2007). While maternal and child care are indeed crucial components of emerging healthcare 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 Aikins *et al.* 2010) will add to the currently dominant burden of infectious diseases, creating further challenges for healthcare systems.

This article aims to fill a gap in our current knowledge by measuring, comparing and decomposing inequalities in healthcare delivery beyond those observed in child and maternity care and drawing policy implications from this. We document and explain inequalities in healthcare delivery across SSA using rank-based measurement methods as outlined in O'Donnell *et al.* (2008). We use data from demographic and health surveys (DHS) and World health surveys (WHS) from a set of 18 countries in SSA.

The remainder starts with a description of our data and methods. This is followed by results on inequalities in healthcare utilization and the factors driving these. Thereafter we discuss limitations in the application of conventional tools to measure unfair inequalities in healthcare delivery in SSA and the potential downward bias these have on the results presented. We end with a conclusion and three policy implications.

Methods

Data

We use nationally representative data from 18 SSA countries for which a WHS and—in most cases—also a DHS was available. We use WHS data to study healthcare utilization among the general population and DHS data to investigate the utilization of maternity related care. Table 1 shows the countries included, the years in which the surveys took place and sample sizes for both WHS (adults and children) and DHS (children). The WHS sample sizes range from 1827 (Comoros) to 5524 (Malawi) respondents and for the DHS from 1989 (Comoros) to 14 238 (Mali) respondents.

In addition to these micro-level data, we use two sources of macro-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, population health and governance quality. Table 1 shows that all countries in our sample belong to the group of lower and middle-income countries, but vary widely in their Gross Domestic Product (GDP), population size, population health and education levels.

World health surveys

The WHS were collected by the World Health Organization (WHO) in 2003 across a large set of countries and provide information on both the household and individual level, with one adult per household randomly selected for an in-depth interview. The WHS contain detailed data on adults' health status, allowing for more extensive measurement of needs than most other commonly available data sets. However, the information on healthcare use is more limited. Respondents are asked about inpatient care use in the last 5 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 and inpatient care in the last 5 years.

Need for medical care is proxied by a rich set of 41 mostly self-reported health problems. Self-assessed health is measured on a five-point scale from very good to very bad. For six chronic diseases—arthritis, angina, asthma, depression, psychosis and diabetes—respondents are asked about diagnosis and symptoms experienced in the last 12 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 'limitation 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.

Table 1 Data and country characteristics

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
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	10 645	5635	1989	4835	1992	9861	2992	6079	10 915	14 238	n/a	n/a	5168	10 933	n/a	2812	6401	5247
DHS, for other calculations	8142	4414	921	3858	1477	3873	2385	5082	8045	10 793	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 (× 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

Source: Authors' calculations based on WHS (2003), DHS (1996–2008) and World Development Indicators (2007–09). PPP = Purchasing Power Parities; OOP = Out of pocket.

Furthermore, we have indicator variables for reported symptoms of tuberculosis (TB) in the last year or the use of TB medication in the last 2 weeks; for reported oral problems or the use of medication for the mouth or teeth in the last year; for being involved in an accident in the last year and for women having given birth in the last year or the last 5 years. Demographics are captured by a set of age/gender indicators. The summary Table A1 only contains a variable for gender (1 = female) and a continuous variable for age.

The non-need related determinants of healthcare utilization consist of marital status, occupational status (no work as reference category) and highest educational achievement (no education as reference category). While these are used as separate indicators in the analysis, the summary Table A1 simply contains the dichotomous variable primary or higher education. To measure socio-economic status, we used wealth quintiles (wealth very low as reference category) derived from a wealth index that was constructed using principal component analysis on a set of variables related to household dwelling characteristics and asset ownership[1] (Filmer and Pritchett 2001). Most of the DHS surveys are released with a wealth index, but for three DHS and for the WHS we had to construct a similar wealth index from the assets and housing characteristics included in the dataset. Rural–urban differences are captured by an indicator for urban vs rural areas.

Demographic and health surveys

The DHS data have the advantage of being updated regularly and being available for many countries, but they only contain information on healthcare use and health status of women at childbearing age and their children. Descriptive statistics of all variables are shown in Table A2 in the appendix.

To measure healthcare 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 skilled health worker) and whether there was skilled birth attendance. Both outcome measures are used worldwide, including in the MDGs, to monitor progress in equitable access to mother and child care (United Nations Department of Economic and Social Affairs 2010).

To investigate heterogeneity in self-reported health, we use 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 include 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 and Watanabe 2000). The measures reported by the mother include indicators for episodes of diarrhoea, acute respiratory infection (ARI) and fever in the 4 weeks preceding the survey. These three self-reported measures are important proximate determinants of stunting and underweight (Rice *et al.* 2000; Caulfield *et al.* 2004; Sahib El-Radhi *et al.* 2008) and, eventually, also child mortality (Pelletier *et al.* 1993; Verwimp 2011). Indicator variables for under-one mortality (U1M) and U5M were constructed using information about children born between 1 and 10 years before the survey.[2] 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 (Ndong *et al.* 1994; Curtis 1995; Stanton *et al.* 2001; Arudo *et al.* 2003). We therefore consider mortality rates as another (quasi) self-reported health outcome instead of an objective measure.

Measuring and decomposing inequality and inequity in healthcare delivery

We measure socio-economic inequalities in healthcare use, i.e. variation in healthcare use across socio-economic status, by means of a corrected concentration index (CCI) as suggested by Erreygers (2009) which is appropriate when the variable of interest is dichotomous.[3] The Erreygers-CCI is calculated as:

$$\mathrm{CCI}(y) = 8\mathrm{cov}(y_i, R_i) \tag{1}$$

where y_i refers to the healthcare 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 healthcare utilization. If the healthcare variable of interest, y_i, can be explained by a linear regression[4] on K need related variables, x_k, and J non-need related variables, z_j, i.e.:

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

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

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

with $\bar{x}_k$ and $\bar{z}_j$ representing the means of x_k and z_j, respectively, and $\mathrm{CI}(x_k)$ and $\mathrm{CI}(z_j)$ their concentration indices, GC_ε is a residual term. Equation (3) illustrates that socio-economic inequality in healthcare 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 healthcare use. The higher this inequality (CI) or the semi-elasticity, the higher the contribution.

Socio-economic inequalities in healthcare utilization are only considered unfair, or inequitable, when these do not correspond to differences in need for health care across socio-economic groups. The literature differentiates between 'horizontal' and 'vertical' equity. Horizontal equity means that individuals in equal need for care should receive equal amounts of care irrespective of other characteristics such as socio-economic status or area of residence. Vertical equity describes the extent to which persons with greater medical needs are treated more favourably (Wagstaff and Van Doorslaer 2000). In line with existing literature, this study focuses on horizontal inequity. An index of horizontal inequity I can be obtained by subtracting the need contributions in (3) from the CCI:

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

which reflects any 'unfair' differences in healthcare utilization.

We first estimate the CCI [Equation (1)] and I [Equation (4)] for each country for all healthcare use variables. We then estimate a linear probability model as specified in Equation (2) with need related variables x_k and non-need related variables z_j on the probability of any care use and inpatient care use.

We use the linear probability models to decompose the CCI [see Equation (3)] into five factors: need, wealth, education, other non-need and an error term. For any variable to contribute to inequality in healthcare use, two conditions have to hold: (1) it needs to be correlated with use and (2) it needs to be unequally distributed across socio-economic status as measured by the CCI.[5]

For the sake of parsimony in the linear probability models and the cross-country analysis, we aggregate all 41 need related variables into a single ill-health index using factor analysis. As a sensitivity check we also estimate the models with the full set of need related variables. The decomposition is initially based on the full set of need indicators but subsequently also grouped into one factor for ease of interpretation.

As this article is only concerned with measuring socio-economic inequalities, we refer to socio-economic inequalities as 'inequalities' in the remainder.

Measuring cross-country differences in healthcare system responsiveness to needs

We complement our micro-level analyses with some macro-level trends in the responsiveness of healthcare use to needs by performing an exploratory cross-country correlation analysis. We use the regression coefficient of the ill-health index from our linear probability model as a crude proxy for the responsiveness of a country's healthcare system to the needs of its population. We correlate this proxy with eight macro-level indicators of economic and social development: GDP per capita, primary completion rate, urban population (% of total), physicians (per 1000 people) and four indicators for the quality of governance (voice and accountability, government effectiveness, rule of law and control of corruption) as obtained from the World Bank governance indicators (Kaufmann *et al.* 2010). Given the limited number of observations and the lack of panel data, we abstain from regression analysis.

Results

Descriptive statistics

Tables A1 and A2 show descriptive statistics of all covariates and dependent variables used from the WHS and DHS data, respectively. 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. Ethiopia also has the lowest use of antenatal care and skilled birth attendance (17% and 18%, respectively), while this is among the highest in Swaziland (77% and 80%, respectively).

Inequality in maternity care use (DHS data)

Table 2 shows estimated CCI 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 healthcare use is homogeneous across the sample, irrespective of income and education. This means that any measured inequality directly implies inequity. Both forms of maternal care are more concentrated among the better off in all countries, with estimated CCI 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 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 $P = 0.018$).

Inequality in general healthcare use (WHS data)

Table 2 also presents CCIs for any care and inpatient care and illustrates that again considerable inequalities in favour of the rich exist. Countries with lower 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, by far the richest in our sample—healthcare use is more concentrated among the poor. The largest inequality is found in Côte d'Ivoire (0.16), whereas 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). Inequality is virtually absent in Mali which is largely driven by the very low level of utilization (3%, Table A1). Comparing 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 inequality in general healthcare use as measured by the CCI might partly reflect differences in the distribution of the need for care. In a later section we therefore decompose inequality in healthcare use and analyse to which extent the measured degree of inequality can be considered 'inequitable'.

Explaining and decomposing inequalities in healthcare use

Determinants of healthcare 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. The results illustrate that in almost all countries, need—as measured by the ill-health index—is significant and positively associated with any healthcare use (15 of 18 countries) and with inpatient care (12 of 18 countries) but the effects are relatively weak. Regarding the non-need related variables, we find that being

Table 2 CCI for maternal and general health care and inequity indices (I) for general health care

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
Maternal care																		
Sufficient antenatal care (CCI)	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 (CCI)	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 (CCI)	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 (CCI)	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

All CCIs are significantly different from 0 at $\alpha = 0.05$ apart from the two in italics.

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

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
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**

*Significant at 5%; **significant at 1%.

Table 4 Coefficients from linear regression on the use of inpatient care in the last 5 years

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
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**

*Significant at 5%; **significant at 1%.

employed is in most countries positively correlated with any healthcare 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 healthcare use, except for Zambia and Zimbabwe where any healthcare 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 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–healthcare 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–healthcare use relationship.[6] Higher wealth is associated with a higher probability of using care, but the coefficients are typically large and significant for the upper wealth quintile(s) only, indicating that in many of these countries large shares of the population are marginalized and only the (much) better off have better access to care.

Decomposition of inequalities in healthcare use

The decompositions of the CCI [Equation (3)] for the use of any care and inpatient care are shown in Figures 1 and 2, respectively, with the height of the bars representing the degree of inequality (CCIs in Table 2). For any variable to contribute to inequality in healthcare use, two conditions have to hold: (1) it needs to be correlated with use (Tables 3 and 4) and (2) it needs to be unequally distributed across socio-economic status as measured by the concentration index.[5] 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 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 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 inequality in the use of any care, and in 8 countries (Burkina Faso, Chad, Comoros, Côte d'Ivoire, Malawi, Mali, Mauritania and Senegal) wealth explains more of the inequality in utilization than all other factors together. As shown in Figures 1 and 2, the contributions for the 'other non-need' category (other than wealth) which covers marital status, employment and urban/rural setting is rather small, highlighting the dominance of the wealth contributions. 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,

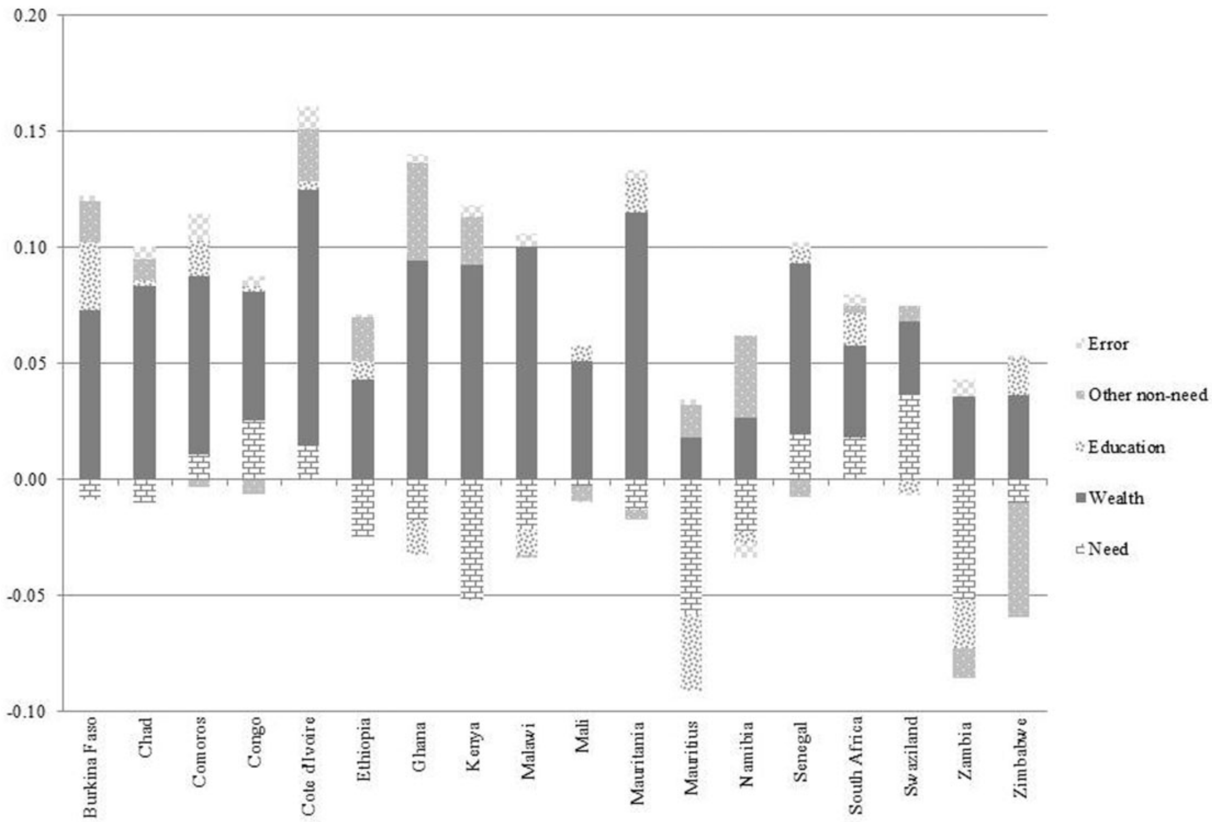

Figure 1 Decomposition CCI of any care use.

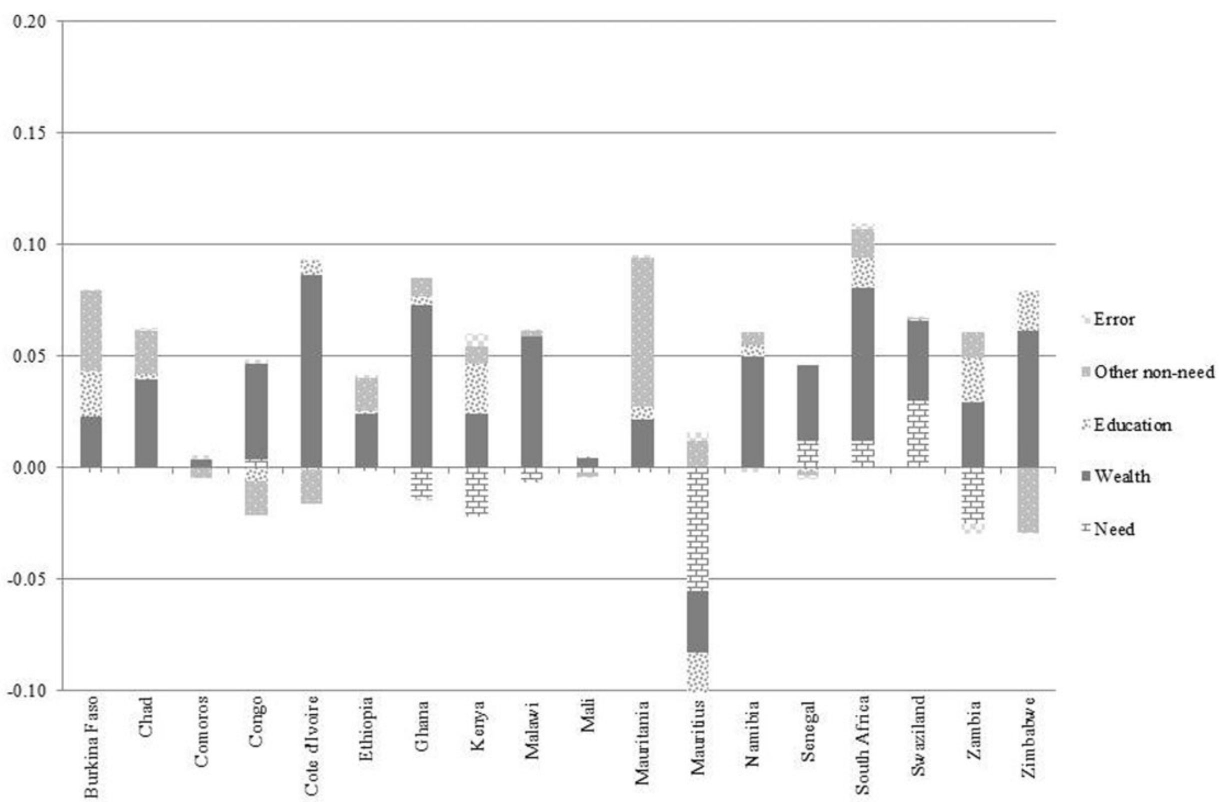

Figure 2 Decomposition CCI of inpatient care use.

Mauritania and Senegal) the contribution of education is positive, while for most other, Anglophone countries, it tends to be negative. This seems to derive from the combined facts that higher education is typically more concentrated among the rich (positive CI) but also associated with a lower use of health care (negative coefficient) in several countries. The historical literature suggests that colonial policies explain a large part of the schooling differences observed between the former British and French colonies. In British more than in French colonies, efforts have been made to organize formal education to the local population. Today, the former British colonies still seem to hold an 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 the Francophone countries in Western and Central Africa compared to the Anglophone countries in Southern Africa (Anyanwu and Erhijakpor 2007; United Nations 2010) may explain why education tends to reinforce inequalities in healthcare utilization: the better educated appear to be capable of getting more out of a healthcare system than the less well educated if the system is of poor quality.

The distribution of need related variables contributes negatively to inequality in any healthcare utilization, implying that it makes use more concentrated among the poor, in two-thirds of the countries, but only substantially (i.e. more than 75%) in Kenya, Mauritius and Zambia (see Figure 1). This stems from the combination of need being more concentrated among the poor (negative CI) and showing a clear positive relation with healthcare 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 healthcare 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 inequality in any healthcare use, indicating that the bulk of 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 and Masseria 2004) and we return to the possible reasons for this finding in our later section on limitations.

Figure 2 shows that the decomposition results for inpatient care differ somewhat from those for any care, but the general pattern is similar. 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 inequality in inpatient care, implying higher healthcare utilization among the lower income groups. In only five countries (Ghana, Kenya, Malawi, Mauritius and Zambia) the need variables jointly contribute negatively to inequality (see Figure 2). This implies that standardizing 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 our section on limitations. The relatively large contributions of the other non-need related variables in Burkina Faso and Mauritania are mostly driven by urbanicity. 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 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 healthcare utilization in these countries.

Cross-country differences in healthcare system responsiveness to needs

While there is considerable heterogeneity in the cross-country results, some clear trends in the responsiveness of healthcare use to need 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 healthcare 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 eight macro-level indicators of economic and social development. 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 5 years. The same holds for the primary education completion rate and the number of physicians per 1000 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 for inpatient care where we would expect responsiveness to be better for those living closer to hospitals. In the literature good institutions are often considered as a precondition for adequate healthcare provision (see e.g. Deaton 2006). We find that three measures of good governance (voice and accountability, government effectiveness and the rule of law) are significantly and positively correlated with need responsiveness for any care. Government effectiveness also correlates positively with inpatient care responsiveness. While these correlations can obviously not be interpreted as causal evidence, they nonetheless suggest interesting research hypotheses that need testing to enhance our understanding of the causes of insufficient responsiveness to healthcare needs.

Limitations in 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 healthcare use for differences in

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 and 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

Need responsiveness for any and inpatient care is measured by the coefficient of the ill-health index in Tables 3 and 4, respectively. Macro-level indicators are taken from the World Development Indicators. *Significant at 5%.

the distribution of need. There are two important limitations in the conventional tools for measuring income-related inequity in healthcare use, as applied in this article, especially in the context of low- and middle-income countries (LMICs). The first relates to the measurement of '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 (Salomon *et al.* 2003; Lindeboom and Van Doorslaer 2004; Bago d'Uva *et al.* 2008). While this problem is not unique to LMIC, it is likely to be of greater importance in settings where awareness of healthcare needs is less widespread and more likely to be correlated with socio-economic status than in developed countries. Unfortunately, no objective health indicators are available in the WHS data that could be used to directly test this hypothesis. We therefore explore this issue using DHS data by comparing inequalities in objective child health measures (stunting and underweight) with their self-reported proximate determinants (ARI, diarrhoea and fever). We would expect the CCIs to have the same sign and be of similar size for both measures. If this is not the case, we have an indication of reporting heterogeneity. Figure 3a–d shows plots of CCIs for underweight (x-axis) against CCIs for the self-reported measure (y-axis), respectively, ARI, diarrhoea, fever and U5M. All countries (except Swaziland) are above the diagonal, indicating that the self-reported measures of ill-health are less concentrated among the poor than the objective measures. For example, the inequality in underweight is greatest in Senegal (CCI −0.18), while the poor do not seem to report disproportionally more ARI and fever episodes than the rich (CCI 0.07 and 0.01, respectively). Self-reported U5M is also less disproportionately concentrated among the poor compared to the objective measure of underweight (Figure 3d).

Figure 4 plots the same CCIs of the self-reported measures against the CCI of stunting—for parsimony all four figures are combined into one. It confirms the finding of a much weaker 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 inequality in self-reported measures does however suggest that poorer population groups may be under-reporting their ill-health conditions compared to other, richer groups.

The second limitation in 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 healthcare delivery, the average population relationship between the need for and the use of care [coefficients β_k in Equation (3)] is an appropriate vertical equity norm. This assumption has been referred to as 'on average, the system gets it right' (Van Doorslaer and 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 (Van de Poel *et al.* 2012). 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 article. We suffice here by stating that these limitations are likely to lead to an underestimation of actual inequities in health care.

Conclusion

We examined the extent to which healthcare 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 SSA confirm earlier findings (e.g. De Brouwere and 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 homogenous across pregnant women, this is clearly an inequitable situation.

Adding to existing knowledge, we also find significant socio-economic inequalities in general use of healthcare services in all countries. The decomposition analysis demonstrates that the larger part of these inequalities is related to factors that are not indicators of need and can therefore be labelled as inequities. Our results suggest that socio-economic inequalities 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, maybe surprisingly, not so much by their ill-health or need for care. 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,

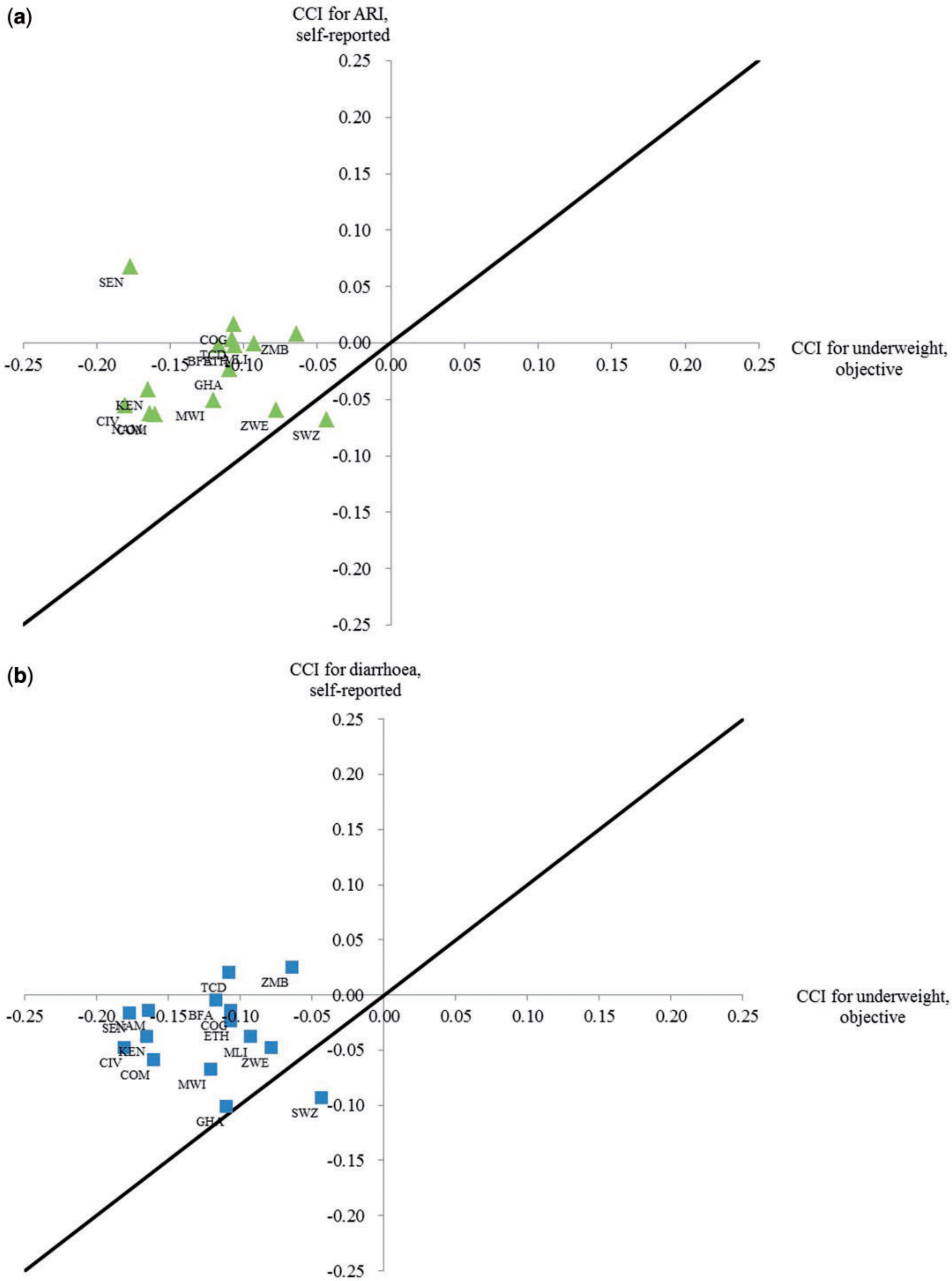

Figure 3 (a–d) CCI for underweight and self-reported child health measures. Note: The abbreviations of the countries represent Burkina Faso (BFA), Chad (TCD), Comoros (COM), Congo (COG), Côte d'Ivoire (CIV), Ethiopia (ETH), Ghana (GHA), Kenya (KEN), Malawi (MWI), Mali (MLI), Mauritania (MRT), Mauritius (MUS), Namibia (NAM), Senegal (SEN), South Africa (SAF), Swaziland (SWZ), Zambia (ZMB) and Zimbabwe (ZWE).

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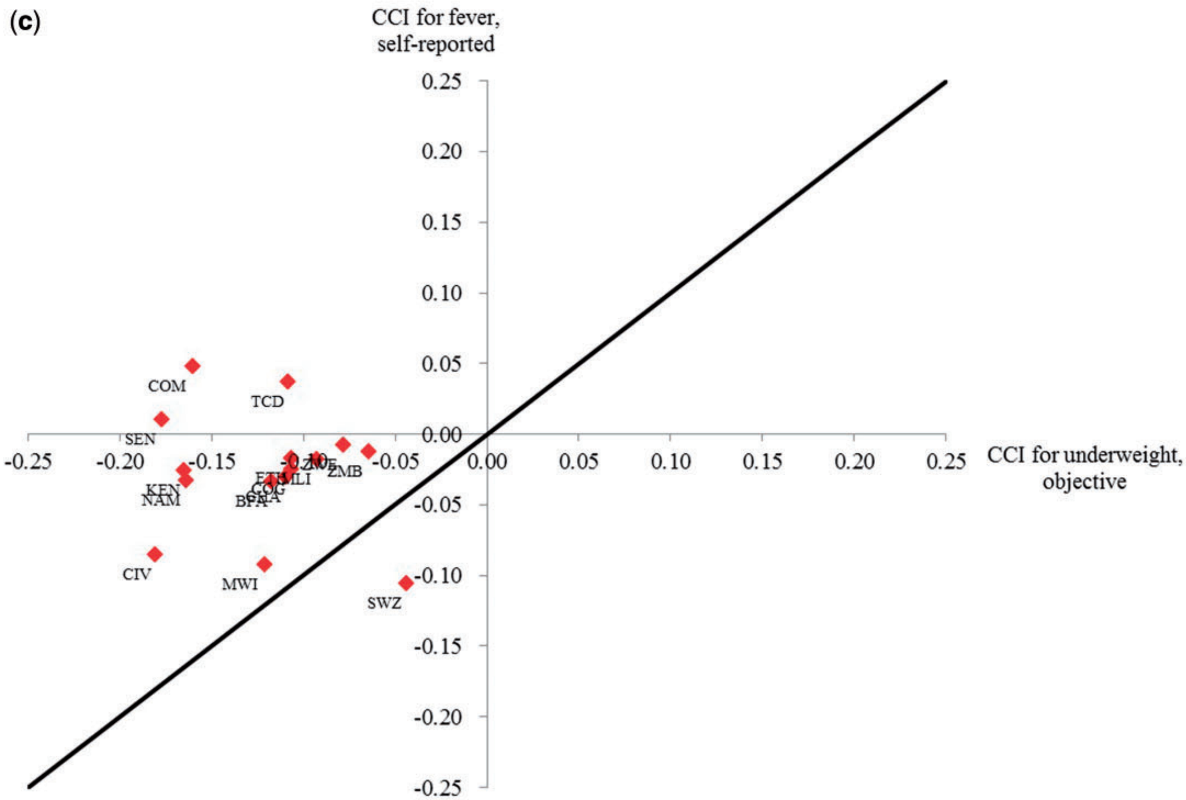

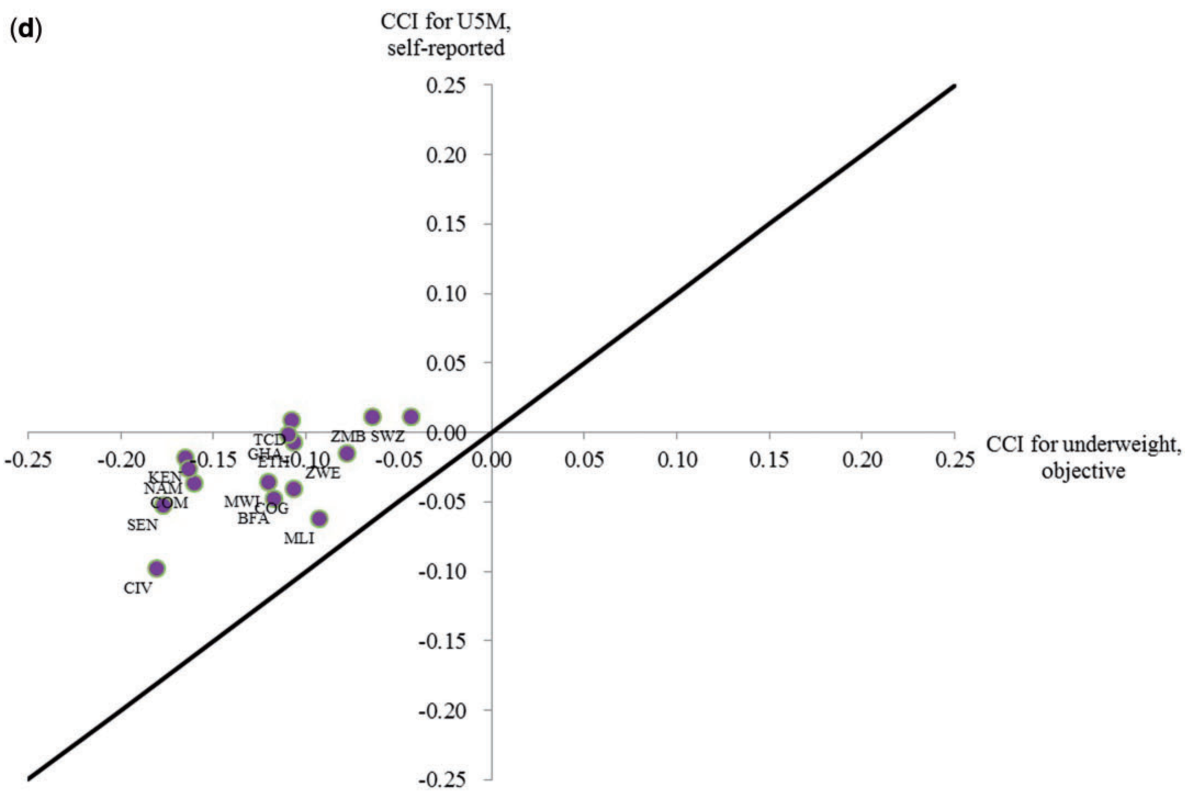

Figure 3 Continued.

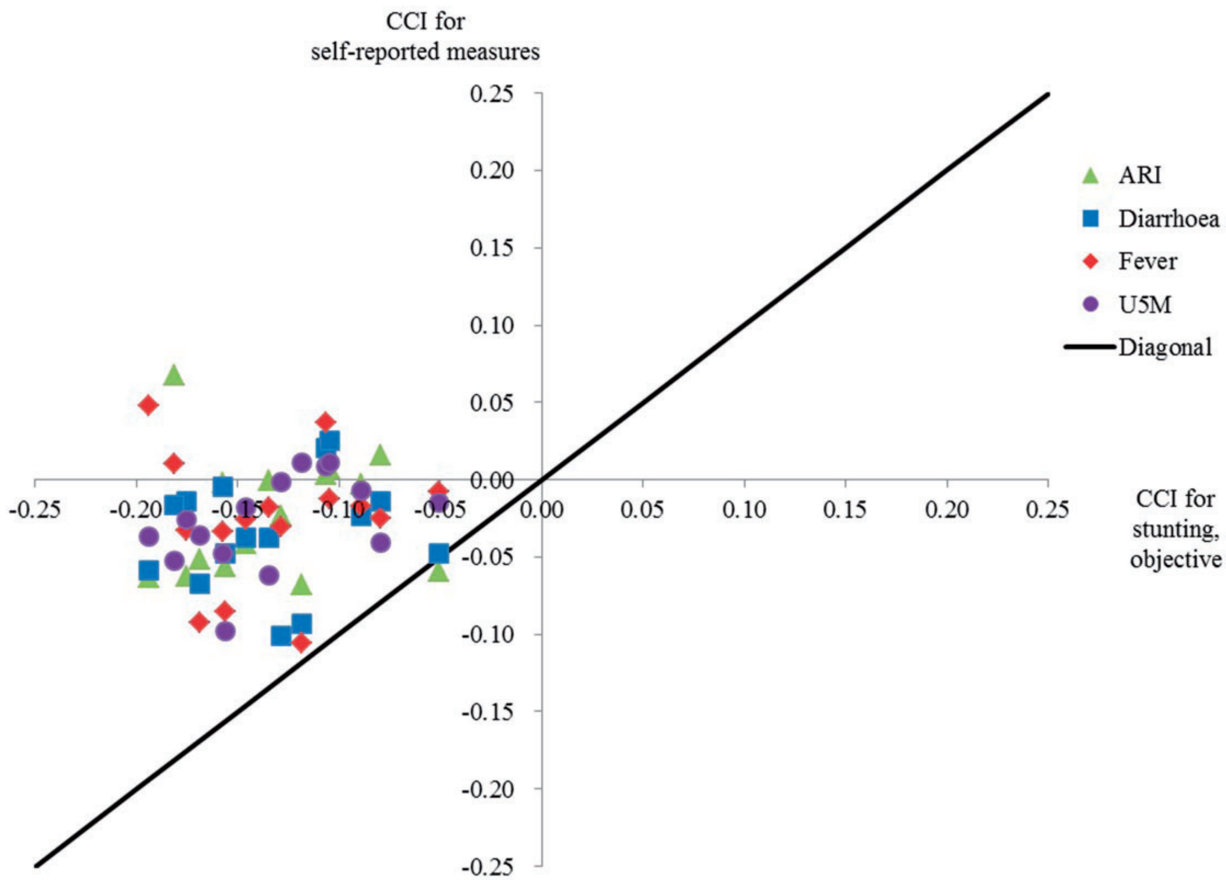

Figure 4 CCI for stunting and self-reported child health measures.

given Mauritius' relatively high GDP, it is an outlier that more resembles the typical patterns observed in OECD countries and 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. Surprisingly we find that the need responsiveness of any care use is higher in countries with a higher urbanization rate but that this is not the case for inpatient care.

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 healthcare inequity in Africa. This suggests that interventions that raise education levels among the worse off, thereby increasing the awareness of health needs and how to adequately respond to them, may prove to be a particularly effective route to reducing inequity. Third, an exploratory cross-country comparison demonstrates that indicators of good governance are positively associated with responsiveness to health needs. This suggests a potential role for good governance in improving healthcare equity.

Our analysis also draws attention to two important methodological problems encountered when measuring inequities in healthcare delivery in resource poor settings. The first one is the reporting bias in self-reported measures of ill-health which is specifically large among poorer respondents. To alleviate this problem future research should aim at obtaining better measures of need. The use of anchoring vignettes in the adjustment of reporting scales holds some promises in this respect (Bago d'Uva *et al.* 2008, 2011), 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 healthcare delivery. If the average relationship between need and use is not an acceptable norm, then it deserves consideration to use others, like, for example, the average need-use relationship in Mauritius for other SSA countries, or the average relationship holding for a group with better access, like the wealthier or those with higher education.

The answer to the question posed in the title of this article is therefore negative: healthcare utilization does not match self-reported needs in SSA. Rather its distribution is much more determined by people's ability to pay and education. This generates further questions regarding wealth redistribution, risk sharing arrangements such as health insurance, the regulation of health systems in poor countries and the effectiveness of these options towards universal coverage. Conventional tools for measuring inequity in healthcare delivery underestimate inequities since the poor seem to under-perceive and under-report their health needs and, on average, they themselves or the healthcare system also respond inadequately to these needs. Given the importance attached to equitable access by national and international health policy makers worldwide, it is vital to increase the income generating capacity of poor households and to develop more robust equity measures relevant to LMICs.

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Notes

[1] 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.

[2] We also calculated U5M 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.

[3] Erreygers (2009) has shown that the CI, when applied to dichotomous 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.

[4] 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).

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

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

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Appendix

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

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
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
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
Limitation in any 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
TB	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
Healthcare 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

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

	Burkina Faso	Chad	Comoros	Congo	Côte d'Ivoire	Ethiopia	Ghana	Kenya	Malawi	Mali	Mauritania	Mauritius	Namibia	Senegal	South Africa	Swaziland	Zambia	Zimbabwe
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
Healthcare 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
ARI	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