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Sometimes More Equal than Others

How the choice of welfare indicator can affect the measurement of health inequalities and the incidence of public spending

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Abstract

In recent years, a large body of empirical work has focused on measuring and explaining socioeconomic inequalities in health outcomes and health service use. In any effort to address these questions, analysts must confront the issue of how to measure socioeconomic status. In developing countries, socioeconomic status has typically been measured by per capita consumption or an asset index. Currently, there is only limited information on how the choice of welfare indicators affect the analysis of health inequalities and the incidence of public spending. The paper focuses on five key health service outcomes in Mozambique. It uses the concentration index approach to measures both socioeconomic inequality in the utilization of health services and the sensitivity of measured inequality to the choice of welfare indicator. The results illustrate that, at least in some contexts, the choice of welfare indicator can have a large and significant impact on socioeconomic inequalities in service use and on the "perceived" incidence of public spending. The findings point at the need to be cautious in measuring inequality, but also to extend and deepen the analysis of service use.

JEL Classification:

1. INTRODUCTION

Health related inequalities and inequities have been receiving increasing attention from both policy circles and the academic community in recent years. A large body of empirical work—both for developed and developing countries—has focused on measuring and explaining socioeconomic inequalities in various dimensions of health (e.g. Acheson 1998; Schalick, et al. 2000; van Doorslaer, et al. 1997; Wagstaff 2000).[1] Conversely, some research has focused on socioeconomic inequalities in the distribution of health services or public spending on health care. For example, there is a sizable literature on horizontal equity in the delivery of health care in the OECD (LeGrand 1978; Propper and Upward 1992; Rosenzweig and Schultz 1991; van Doorslaer and al. 2000; van Doorslaer and Wagstaff 1992; Wagstaff, et al. 1989). Due to the methodological difficulties and data requirements associated with a focus on equity, most studies of the distribution of health services in developing countries has focused on the simpler issue of equality. In some cases, data on the use of health services have been combined with public expenditure data to assess the incidence of public spending (e.g. Castro Leal, et al. 2000; Demery 2000; van de Walle 1995). However, service-specific unit-cost estimates are often difficult to acquire in developing countries. In consequence, attention has sometimes been restricted to binary indicators of whether a person used a particular service or not (e.g. Baker and van der Gaag 1993; Makinen, et al. 2000; Sahn and Younger 2000).

In general, this work has highlighted the existence and severity of health related inequalities and inequities in many contexts. Given the commitment to equity in health, poverty focused public spending, and broad-based access to basic health care, in both national and international health policy, these findings are of considerable concern. The work has also illustrated how, in the same way that average per capita income provides very little information about social welfare, average measures of health and health service outcomes are inadequate indicators of overall health achievement. This realization has led to calls for more regular and focused monitoring of the distribution of health and health services (Gilson 1998; Gwatkin 2000), and to efforts to prepare standardized data on socioeconomic inequalities (Gwatkin, et al. 2000).

In any effort to measure and analyze socioeconomic inequalities in health, the issue of how socioeconomic status (SES) should be measured has to be confronted. Empirical work has relied on quite different measures of SES, including both continuous variables such as income and consumption, and categorical variables such as social class, occupational group, educational attainment, or race. Indeed, these differences, and the problems of comparability over time and across space that they give rise to, have been a main source of criticism of the approach (Gakidou, et al. 2000). It may be argued that different approaches simply provide a different perspective on the same issue, and that the matter is of limited concern. However, insofar as different perspectives lead to conflicting conclusions concerning the "same" issue, the sensitivity of findings to the measurement of socioeconomic status is clearly a matter of some interest.

In the case of developing countries, most of the work on socioeconomic inequalities in health related variables and on the incidence of public spending has been based on living

[1] Socioeconomic inequalities in health refer to the gradient between health and socioeconomic status, where socioeconomic status is defined in terms of some social, economic, or demographic characteristic. This can be contrasted to "pure" inequalities in health, which refers to the distribution of health itself (see, e.g., Gakidou, et al. 2000; Illsey and LeGrand 1989; Murray, et al. 1999).

standard surveys, which typically collect detailed income and consumption data. However, more recently, efforts to bring in measures of SES into the analysis of Demographic and Health Surveys (DHS) have led researchers to make use of data on household assets to construct alternative measures of welfare or living standards (e.g. Filmer and Pritchett 1998; Gakidou and King 2000). This approach is becoming increasingly important as the sometimes prohibitive costs of collecting income or consumption data is leading to increased reliance on alternative welfare measures.[2] However, although both composite asset indices and money-metric measures such as income or consumption have merit as indicators of welfare or living standard, the different approaches raise questions about comparability.

Although most contributors argue that asset indices should not be conceived as a substitute measure for consumption or income, there has been some comparative work to assess the validity of the asset index as a welfare measure (Filmer and Pritchett 1998; Sahn and Stifel 2001). There is however only limited information on how the choice of welfare indicators affects the analysis of health inequalities and the incidence of public spending. Wagstaff and Watanabe (2002) comprise an exception in this regard. They compare measured inequality in wasting and stunting for 19 countries (based on LSMS data), and find that for most countries the choice between consumption and the asset index as welfare measure makes little difference to the measured degree of socioeconomic inequality in malnutrition. This finding offers a degree of confidence to analysts who are concerned about the robustness of their results. However, the purpose of this paper is to warn against excessive confidence, and to show that at least in some contexts, the choice of welfare indicator can drive conclusions in important ways.

The paper focuses on five key health service outcomes in Mozambique: hospital visits, health facility visits, child immunizations, pregnancy controls, and medically supervised deliveries. It is motivated by conflicting conclusions emerging from the 1996/97 living standards survey for Mozambique and the Demographic and Health Survey that was implemented in the same year. Evidence from the living standards survey suggests that the incidence of public spending is quite equally distributed (Heltberg, et al. 2001) and that income is not an important determinant of the utilization of health services (Lindelow 2000). In contrast, however, descriptive statistics based on the asset index approach pointed at notable inequalities in both health outcomes and health service indicators (Gwatkin, et al. 2000). For example, an immunization rate of 19.7 percent in the bottom quintile can be contrasted with 85.3 percent in the top quintile. Similar difference were reported for other service indicators.

On the surface, the findings are difficult to reconcile. This paper exploits the considerable overlap in asset data between the two surveys, and uses the living standards survey to explore how and why the choice of welfare indicator affects measured inequality in service use. In this way, the paper seeks to illustrate the potential sensitivity of benefit incidence analyses and the measurement of health related inequalities on how socioeconomic status is measured. However, the conclusions do not simply call for caution in the interpretation of findings from these types of analyses, but also points at the need for deeper and more multifaceted analysis of the determinants of health and health service outcomes that underpin summary measures of correlation.

The paper is organized as follows. The following section discuss the methods for measuring inequality and for comparing distributions of health service use. Section 3 presents the data and

[2] This is the case, for example, with recent efforts to collect "cheap and quick" data for poverty monitoring purposes, such as the Core Welfare Indicator Questionnaire Surveys (CWIQ) of the World Bank.

the variables that are used in the analysis. Section 4 reports on the findings of the analysis. Finally, section 5 concludes.

2. METHODS

The questions posed in this paper concern (i) whether the utilization of a particular health service, h, differs in "important" ways depending on the socioeconomic status, x, of individuals; and, (ii), whether the degree to which h differs with x depends on how socioeconomic status is measured. There are different approaches to addressing these questions. A common starting point for looking at the distribution of health related variables by a continuous measure of SES is to compare the means of different welfare quintiles. While the distribution of services across quintiles of SES offers a good overview, the grouping of individuals into quintiles is somewhat arbitrary, and statistical testing of differences in service use across quintiles is cumbersome.

A more general approach is to consider the distribution as a whole. This can be represented graphically as a concentration curve. A concentration curve reflects the relationship between the distribution of a health variable and socioeconomic status. It graphs the cumulative share of the sample, from poorest to richest (according to the chosen measure of SES), on the horizontal axis, against the cumulative share of service use on the vertical axis. In other words, for a population ranked by socioeconomic variable x, the concentration curve for the utilization of health service h, is the cumulative share of h "received" by observations with a socioeconomic status less than x^*, graphed against the population share of x of those with an income no greater than x^*. In this framework, the "line of equality", where health services are equally distributed, is represented by a 45° line. A concentration curve can be compared with another curve, or with the line of equality, by testing for welfare dominance (Davidson and Duclos 1997; Yitzhaki and Slemrod 1991). However, as pointed out by Sahn and Younger (2000), the generality of this approach often makes it difficult to draw any firm conclusions from the analysis.

An alternative, more discriminating, approach is to use a specific cardinal measure of inequality to test for differences between distributions.[3] A disparate array of approaches has been proposed for the measurement of socioeconomic inequalities in health.[4] Many of these measures have been developed to summarize grouped data on health outcomes and service use, and do not meet what may be considered basic criteria for inequality measures (Wagstaff, et al. 1991a). However, the concentration index, which is directly related to the concentration curve, has been proposed as a superior measure, with the ability to capture the experiences of whole population, and to reflect changes in the distribution as they occur across the population (Wagstaff, et al. 1989). This approach is based on the techniques and indices of progressivity and distributive effect developed in the public finance literature (e.g. Kakwani 1977), and has been applied in relation to both health and health care (e.g. Propper and Upward 1992; Schalick, et al. 2000; van Doorslaer, et al. 1997).

The concentration index can be defined as the area between the concentration curve and the line of equality as a fraction of the total area under the line of inequality (or, equivalently, one

[3] Clearly, this implies a loss of generality, as any cardinal measure imposes assumptions concerning the weighting of different elements of the distribution.

[4] See, e.g., Mackenbach and Kunst (1997) and Wagstaff et al. (1991a; 1991b) for reviews.

minus twice the area under the concentration curve).[5] The relationship between the concentration curve and the concentration index is hence analogous to the relationship between the Lorenz curve and the Gini coefficient. Let h_i denote the amount of health care received by individual i.[6] For a population S, ranked by socioeconomic status, the concentration curve for h is $CC_h(p)$, where $p \in (0,1)$ is the fractional rank, or proportion of the population below a certain level of socioeconomic status. The degree of inequality, measured by the concentration index, CI_h, is then defined as:

$$CI_h = 1 - 2\int_0^1 CC_h(p)dp\,. \qquad \text{(eq. 1)}$$

For individual level data this can be calculated as

$$CI_h = \frac{2}{n \cdot m}\sum_{i=1}^{n} x_i R_i - 1, \qquad \text{(eq. 2)}$$

where m is the mean level of the health indicator in the population and $R_i = i/n$ is the fractional rank of the ith person. Alternatively, the concentration index can simply be calculated in terms of the covariance between the health variable h and the rank:

$$CI_h = \frac{2}{m} Cov(h, R_i)\,. \qquad \text{(eq. 3)}$$

This points at a convenient way of estimating the concentration index from micro data (Jenkins 1988; Kakwani, et al. 1997) as the coefficient b in the regression

$$2s_R^2\left[\frac{h_i}{\bar{h}}\right] = a + bR_i + m_i\,, \qquad \text{(eq. 4)}$$

If the correlated nature of the error structure due to the ordinal nature of the ranking variable is taken into account, this regression also provides reliable estimates of the standard error of the concentration index.[7]

As discussed by Wagstaff and Watanabe (2002), the same approach can be used to test for differences in the concentration index under different ranking variables. Specifically, the difference between two concentration indices CI_{h1} and CI_{h2}, where the respective concentration index is calculated on the basis of different ranking variables (R_{i1} and R_{i2}) can be computed by means of the regression

$$2s_{\Delta R}^2\left[\frac{h_i}{\bar{h}}\right] = a + b\Delta R_i + m_i\,, \qquad \text{(eq. 5)}$$

[5] See, e.g. Kakwani (1980) or Lambert (1993) for further details on these concepts.

[6] For many service indicators, this will simply be a dichotomous variable, taking the value 1 if the individual has used the service in question.

[7] This can be done by applying the Newey-West estimator (Newey and West 1994). Alternatively, the standard error of the concentration index can be calculated using a formula (Kakwani, et al. 1997).

where $\Delta R_i = R_{i1} - R_{i2}$ captures the re-ranking that results from changing the measure of socioeconomic status, and $\sigma^2_{\Delta R}$ is the variance of the difference in rank. Here b is a measure of $CI_{h1} - CI_{h2}$. Similarly, the significance of this difference can be tested by means of the the standard error of b.

3. DATA AND VARIABLES

The following analysis is based on the 1996/97 Mozambique National Household Survey on Living Conditions (IAF).[8] The survey was designed and implemented by the National Statistics Institute in Mozambique, and was conducted from February 1996 to April 1997. The sample covers approximately 43,000 individuals living in 8,250 households.[9] It was selected in three stages and is geographically stratified to ensure representativeness at both at provincial level and for urban/rural areas. The analysis is based on individual-level data and uses three types variables: (i) consumption; (ii) asset index; and, (iii) health service indicators.

Consumption

Per capita consumption, calculated as the person average of total estimated household consumption, comprises a commonly used money-metric welfare indicator. Given the importance of home production for many households, it is more appropriate as a measure of welfare than income. Similarly to most survey data from developing country, household consumption is measured in the IAF on the basis of recall data on expenditures and consumption collected as part of the survey. It includes expenditures and auto-consumption of food and nonfood items, as well as imputed use values for owner-occupied housing and household durable goods.[10]

Simple per capita normalization of consumption entails an assumption of no household economies of scale. This assumption is common in contexts where food makes up a large proportion of total consumption (Deaton 1997).[11] Household consumption has been deflated using spatial price indices. These were defined for 13 regional domains in the original data analysis, distinguishing urban and rural areas in provinces or groupings of provinces. The spatial price indices reflect the cost of attaining the same minimum standard of living in the respective spatial domains, considering spatial differences in consumption patterns to meet the minimum standard and in prices. It captures the tendency for prices to be lower in rural than in urban areas, and in some of the northern provinces relative to the south. In addition, nominal food consumption was deflated by the seasonal food price indices. [12]

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[8] Inquérito Nacional aos Agregados Familiares Sobre as Condições de Vida (IAF). Details concerning the survey can be found in Datt et al. (2000) and MPF et al. (1998).

[9] For the purposes of the analysis in this paper, a number of observations had to be dropped due to missing values in the variables of interest. The resulting sample contains 41856 observations.

[10] Data on major food items and some typical non-food item were collected with a 7 day recall period (collected on three separate visits); data on regular non-food expenditures were collected with one month recall; data on major non-food expenditures refer to a three-month recall period.

[11] In order to assess the sensitivity of the results to this assumption, the impact of applying commonly used equivalence on the distribution of service use across income quintiles was considered. The application of equivalence scales does not have a notable impact on the findings and this analysis is not reported here.

[12] See Datt et al. (2000) for details on how the consumption variable was constructed.

The asset index

A composite measure of household assets comprises an alternative welfare indicator. It has the considerable merit of requiring only data that can be easily and quickly collected in a single household interview, and, although lacking somewhat in theoretical foundations, provides a convenient way to summarize the economic situation of a household. Aside from ease of collection, asset data are less prone to fluctuation than income or consumption, and may therefore be considered a better measure of long-term household welfare. Asset indices have been shown to be closely correlated with expenditure based measures of welfare in some contexts, and to have considerable explanatory power (Filmer and Pritchett 1998; Sahn and Stifel 2001). However, in other contexts, the correlation between consumption and the asset index may be weak.[13] It is used here as an alternative measure of welfare to consumption with a view to assess how important the choice of welfare indicator is in the measurement of health related inequalities.

The standard approach to constructing an asset index is to define it as the weighted sum of household assets (and other characteristics), where the weights are derived from principal components analysis (Filmer and Pritchett 1998).[14] Principal components analysis seeks to describe the variation of a set of multivariate data in terms of a set of uncorrelated linear combination of the original variables, where each consecutive linear combination is derived so as to explain as much as possible of the variation in the original data, while being uncorrelated with other linear combinations. The asset index for individual i is defined as the first principal component:

$$A_i = \sum_k \left[f_k \frac{(a_{ik} - \bar{a}_k)}{s_k} \right], \qquad \text{(eq. 6)}$$

where a_{ik} is the value of asset k for household i, a_k is the sample mean, and s_k is the sample standard deviation.

In order to facilitate comparisons with DHS data, the assets included in the index were chosen to reflect the index constructed for the Mozambique DHS by Gwatkin et al. (2000).[15] A list of variables included, their sample means, and the scoring coefficients are reported in Table A 1. Due to differences in the IAF and DHS questionnaires, there is not a perfect overlap in

[13] Sahn and Stifel (2001) report Spearmank rank correlation coefficients ranging between 0.31 and 0.71 for 10 developing countries.

[14] In contrast to the principal component methodology proposed by Filmer and Pritchett (1998), Sahn and Stifel (2001) construct a welfare index on the basis of factor analysis of various household characteristics. Factor analysis proceeds by assuming that there is a common, unobserved factor – "welfare" – behind the respective household characteristics. They argue that factor analysis is preferable to principal component method because it does not force all of the components to accurately and completely explain the correlation structure between the assets. Also, the methodology can provide some guidance in determining which assets to include in the index. Despite the perceived advantages, Sahn and Stifel note that the Spearman rank correlation between the principal components and factor analysis asset indexes is about 0.98 for each of the samples considered. Given the limited number of variables in the beneficiary assessment sample, and the evidence of consistency between the two methods, we opted to derive the weights from principal components analysis.

[15] The IAF contains a number of other variables on assets and household characteristics that could potentially be used to construct a more discriminating index, or to better predict household expenditure. However, the purpose of this exercise is to look at how the use of a simple asset index, including of the type that can be constructed with DHS data, affects measured inequality relative to the use of consumption as a welfare measure. For this reason, more complex indices are not considered.

the assets and household characteristics for which data are available. In addition, there are some differences in the answer codes in the two surveys. As a consequence, it is not possible to compare the IAF-based asset directly with the asset index constructed for the DHS by Gwatkin et al. In order to facilitate comparison, an alternative asset index was constructed for the DHS data for a comparable set of variables on household assets and characteristics.

As can be seen from the table, the means for the respective household variables are quite similar across the surveys. Moreover, with few exceptions, the scoring coefficients—i.e. the weights for the respective household assets and characteristics in the asset index—are broadly similar for the DHS and the IAF, suggesting a similar variance-covariance structure for the variables in the two surveys.

Health service outcomes

Data are available for five key health service outcomes in the 1996/97 IAF: hospital visits, health facility visits, child immunizations, pregnancy controls, and medically supervised deliveries. In all cases, the variables are of binary nature, simply reflecting whether an individual reports having used a particular service or not. Sample and sub-sample means are reported in Table 1 below.

The variables on hospital or health centre visits refer to a recall period of four weeks. Individuals were only asked about the use of curative care if they had reported an incidence of illness or injury during the recall period. This suggests the use of self-reported illness as a criteria for need. However, similarly to many other surveys in developing countries, richer households (as measured by consumption) are more likely to report having been ill in the last four weeks. This may be because richer households have a lower tolerance threshold for their definition of "ill" than do poorer households. Also, recall of illness episodes may be related to education and formal treatment episodes. Both of these factors would make illness reporting by wealthier households more likely for a given health status.[16] However, this is difficult to reconcile with the notion that poor households are exposed to greater health risks and are less able to protect themselves against these risks. In this sense, considering only the sub-sample of those who report illness or injury risks underestimating any bias in utilization against the poor.[17] In what follows, we therefore consider unconditional use of curative health services.

The immunization variable refers to whether a child between the age of 12 and 48 months has received a complete set of immunizations, including three doses of polio and DTP, and one dose of measles and BCG respectively. Other possible immunization variables, e.g. whether a child under one has received any immunizations show a similar distribution by income, and are therefore not considered.

Finally, two forms of maternity care are considered for women (between the age of 12-49) who report having delivered a child in the last 5 years: whether the woman attended a pregnancy control during her last pregnancy; and whether she delivered her child in a hospital, health centre, or other clinic.

[16] Wolfe and Behrman (1984) provide some evidence of this.

[17] This is because we may end up excluding from the sub-sample poor individuals who, although "objectively" in as great a need of health care as richer individuals who report themselves as ill, may not consider himself or herself ill.

Table 1 – Sample and sub-sample means for health service outcomes

Variable	Service use (sample mean)	Sub-sample*	Service use (sub-sample mean)
Hospital visit	2.0%	11.2%	18.5%
Health centre visit	3.0%	11.2%	28.1%
Complete immunizations	5.0%	11.9%	44.4%
Pregnancy control	10.0%	12.2%	63.9%
Institutional delivery	7.0%	12.2%	42.3%

n=41856

** The sub-sample refers to (i) self-reported illness for 4 week recall in case of hospital and health center visits; (ii) children aged 12-48 months in case of complete immunizations; (iii) women who delivered a child in the last 5 years in the case of maternity care.*

4. FINDINGS

Are there differences in measured inequality?

The first question to answer is whether the choice of welfare indicator has an impact on how service use is distributed by socioeconomic status. As has been noted, an appropriate starting point is to look at the distribution by welfare quintiles, where the quintiles are defined on the basis of consumption and the asset index respectively. These results are reported in Tables A2 to A4 in the appendix. With the exception of health center visits, the utilization of health services appears far more equally distributed when we rank households by consumption than by the asset index. For example, in the case of child immunizations, when we rank households by consumption, the bottom quintile accounts for 21.4 percent of all immunizations, compared to 18.3 percent by the top quintile. If, instead, we rank households by the asset index, the bottom quintile accounts for only 9.6 percent of immunizations, compared to 32.1 percent by the top quintile. Put differently, the immunization rates range from 18.5 (bottom quintile) to 70.4 percent (top quintile) when we measure welfare by the asset index, indicating considerable inequality. Similar differences can be found for the other health service indicators, with the notable exception of health center visits. In this case, utilization is more equal when households are ranked by the asset index.

This pattern is also reflected in the concentration curves of Figures 1 to 5 in the appendix. In order to assess the extent and significance of differences in inequality, we can look at the concentration index for the different services. These are reported in Table 2 below. The results broadly confirms the observations above, and offers some statistical corroboration. In the case of consumption as welfare measure, the concentration index indicates statistically significant inequality in favor of richer households for all services. With households ranked by the asset index rather than consumption, the inequality is greater for all services except health center visits, for which the concentration index indicates inequality in utilization in favor of poorer households. The differences between the two concentration indices are significant for all services.

Table 2 – Concentration indices

	Consumption		Asset index		Difference $CI_C - CI_{AI}$	t-value for difference
	CI	t-value	CI	t-value		
Hospital visits	0.166	8.72	0.231	12.94	-0.065	-3.35
Health centre visits	0.066	3.85	-0.136	-8.49	0.202	9.99
Complete immunizations	0.059	8.35	0.194	34.69	-0.135	-19.1
Delivery control	0.063	11.86	0.154	35.01	-0.091	-15.27
Institutional delivery	0.089	11.31	0.266	43.26	-0.176	-20.06

Hence, it is clear that our conclusions about the degree of socioeconomic inequality in health service use depends in important ways on our choice of welfare indicator. If we address this question using consumption as a measure of socioeconomic status we conclude that although there is some inequality in service use, the inequality is quite moderate for all services. If, in contrast, we use the asset index as measure of SES, the distribution of service use by socioeconomic status appears far less sanguine. These findings are of some interest in their own right, but they also beg the question of what is driving the observed differences

What explains the observed differences?

As was discussed above, changes in the concentration index as we change the ranking variable depends on the correlation between the health service variable (h_i) and the change in individual ranking (ΔR_i) that results from re-ranking individuals using the alternative welfare measure. In the case of the Mozambique IAF, the Spearman rank correlation coefficient between individual consumption and the asset index is only 0.374, and moving from consumption to the asset index as measure of socioeconomic status results in a considerable re-ranking. This can be seen from Table 3, which shows a cross-tabulation of quintile membership under the alternative welfare indicators. Clearly, if there were no re-ranking, all the diagonal cells of the table would be 20, with the remaining cells being 0. This is far from the case.

Table 3 – Consistency of ranking under alternative welfare indicators

		Consumption				
		Q1	Q2	Q3	Q4	Q5
Asset index	Q1	5.39	4.55	4.91	4.31	2.17
	Q2	3.76	4.34	3.44	3.61	3.63
	Q3	5.08	4.16	3.90	3.76	3.02
	Q4	3.78	4.32	4.28	3.96	3.63
	Q5	2.00	2.62	3.46	4.38	7.53

However, in addition to re-ranking, the changes in the concentration index require that the re-ranking is correlated with the health service indicator of interest. This correlation seems to be present. In order to understand why this correlation, it is necessary to look more carefully at the re-ranking that is taking place. One way of doing this is to look at who it is that gains and looses rank as we move from a ranking based on consumption to one based on the asset-index, and then to ask why these movements are likely to be related to service use.

This turns out to be a largely spatial effect. Moving from consumption to the asset index as the ranking variable substantially increases rank of households in urban areas (controlling for

other factors). Moreover, controlling for the effect of living in urban areas, there is also a systematic re-ranking based on the province of residence, with households in two remote and poor province (Zambezia and Cabo Delgado) loosing rank, while households in southern provinces (Inhambane, Maputo, Gaza, and Maputo City) and a central province (Sofala) gaining rank. Finally, households that live in remote areas (as measured by distance from a health center or health post) loose rank even after we control for these other factors.

Considering the type of assets and household characteristics that are included in the asset index, this re-ranking is not very surprising. Households in urban and more integrated areas of the country are more likely to live in more sophisticated dwellings, and to benefit from public or collective services such as running water. This may reflect lower cost and greater ease of acquiring (or renting) assets in these areas (which may partly be due to historic factors), and is therefore not necessarily reflected in consumption. It is also not surprising to find that this re-ranking is strongly correlated with the utilization of health services. This is due to the fact that, on average, households in areas where physical access to services tends to be greater (urban areas and the southern provinces) gain rank as we shift from consumption to the asset index as a welfare indicator. Conversely, households from rural and remote areas, who has less access to (and make less use of) health services, loose rank.[18] The consequence is that individuals are who are less likely to use health services get concentrated in the lower quintiles under the new ranking, whereas households with better access and greater utilization concentrate in higher quintiles. The effect of this is to increase inequality.

5. DISCUSSION

It is clear from the preceding analysis that, at least in some contexts, the choice of welfare indicator can have a large and significant impact on socioeconomic inequalities in service use and on the "perceived" incidence of public spending. In consequence, we can reach very different conclusions about the "same" issue depending on how we define socioeconomic stats. In cases where both asset and consumption data are available, analysts are in a position to qualify any analysis of these issues by reference to parallel analysis based on alternative measures. However, data on both consumption and assets are often not available. In these cases, the potential sensitivity of the findings should be explicitly recognized.

The observed differences in measured inequality are however not particularly surprising. They reflect the fact that consumption and the asset index measure different things, or at least are different proxies for the same underlying variable of interest. In some contexts, the correlation between consumption and measured assets and household characteristics may be weak. Where the difference in ranking that this gives rise to is also correlated with the health variable of interest, the choice of indicator is likely to have an important impact on the findings.

In such situations, it is natural to ask which measure is the better. Consumption will often be the preferred measure as it is typically used to define the poor, and the research may be driven by policy question relating to the poverty focus of public spending or biases against the poor in access to health care. On the other hand, a strong case can be made in favor of a wealth or

[18] Health services are undoubtedly more readily available in urban areas. Even for the rural areas, the southern provinces are, in general, better served in terms of health facility infrastructure and staffing. For example on the basis of recent health staff data, the population per health worker ranges from just over 2000 to 2606 in Maputo, Gaza, Inhambane, and Sofala, which can be compared with 5995 for Zambezia and 3606 for Cabo Delgado (MoH/SDC).

asset index to measure household living standards. In general, it is not possible to provide a definite answer to which welfare indicator is preferable. In any event, the choice of indicator is typically driven by data availability rather than conceptual concerns, so we may well have to reconcile ourselves to the fact that it will not always be possible to reach any unqualified conclusions in respect of health related inequalities and public expenditure incidence.

This is however not a counsel of despair. Rather, it points at the need to be cautious, but also to extend and deepen the analysis of service use. The correlation between health service and socioeconomic status is undoubtedly an interesting issue. The relationship is often of particular interest due to the extent and persistence of inequality along the socioeconomic dimension in many contexts. However, the bivariate perspective is also quite restrictive. It confounds the impact of many different determinants of health or health service outcomes. The focus on socioeconomic inequalities should hence be considered only a starting point for further analysis of the determinants of health service use.

For example, in the case of Mozambique, a large proportion of the population is not availing itself of health services that have the potential of improving their health. The analysis suggests that physical access to health services is a key factor in explaining this pattern. Most likely other factors are also at play, including at individual, household, and community level. Because of the way these factors are distributed across the population, and correlated with our measures of socioeconomic status, we may or may not observe systematic differences in the utilization of health services by socioeconomic status. We can therefore only draw qualified conclusions about socioeconomic inequality. Yet, the analysis serves as a useful starting point for a deeper analysis of the determinants of service use, including the exploration of inequalities along other dimensions than socioeconomic status.

TABLES

Table A 1 – Household assets and scoring coefficients

Household asset variable	IAF*		DHS**		DHS***		IAF*	DHS**	DHS***
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Scoring coefficient		
Has electricity	0.04	0.20	0.09	0.29	0.09	0.29	0.19304	0.16137	0.13945
Has radio	0.28	0.45	0.33	0.47	0.33	0.47	0.10730	0.09012	0.07580
Has refrigerator	0.03	0.17	0.05	0.21	0.05	0.21	0.19164	0.16310	0.14424
Has television	0.03	0.18	0.05	0.22	0.05	0.22	0.10831	0.15818	0.14143
Has bicycle	0.13	0.34	0.15	0.36	0.15	0.36	0.00631	0.00100	-0.00213
Has motorcycle	0.01	0.10	0.02	0.13	0.02	0.13	0.06131	0.05290	0.03378
Has car	0.01	0.11	0.02	0.14	0.02	0.14	0.11117	0.10593	0.09875
Has telephone	0.02	0.15	0.02	0.14	0.02	0.14	0.12228	0.12135	0.12254
Works own or family's agric. land					0.43	0.50			-0.05701
Piped drinking water in residence	0.05	0.22	0.28	0.45	0.07	0.25	0.20397	0.16469	0.13465
Piped into neighbor's residence					0.09	0.28			0.03067
Piped drinking water in public tap					0.12	0.33			0.00161
Inside well drinking water	0.18	0.38	0.10	0.30	0.04	0.18	0.06819	0.02835	-0.00690
Well in neighbor's residence					0.07	0.25			-0.00832
Uses a public well	0.41	0.49	0.37	0.48	0.37	0.48	0.00000	-0.00352	-0.04942
Uses river, canal or surface water	0.32	0.47	0.24	0.43	0.24	0.43	-0.00458	0.00000	-0.03889
Uses water from a tanker truck	0.04	0.18	0.00	0.07	0.00	0.00	0.04565	0.01828	0.00983
Uses rain water					0.00	0.07			0.00279
Has own flush toilet	0.03	0.18	0.04	0.19	0.03	0.18	0.16580	0.14592	0.13731
Uses shared flush toilet					0.00	0.06			0.01889
Has traditional pit latrine	0.32	0.47	0.38	0.48	0.35	0.48	0.03730	0.04103	0.12740
Has latrine					0.01	0.09			0.02831
Uses bush or field as latrine					0.58	0.49			-0.07548
Has other type of latrine					0.00	0.01			0.00001
Dirt floor in dwelling	0.63	0.48	0.75	0.43	0.75	0.43	0.00000	0.00000	-0.11458
Cement floor	0.13	0.34	0.19	0.39	0.19	0.39	0.20588	0.23631	0.07935
Tile or brick floor	0.00	0.06	0.00	0.05	0.00	0.05	0.01771	0.04247	0.02827
Adobe floor	0.22	0.41	0.03	0.18	0.03	0.18	0.09139	0.06029	-0.00339
Parquet or polished wood floor	0.01	0.11	0.02	0.15	0.02	0.14	0.17918	0.16773	0.11983
Wood or plank floor					0.00	0.03			0.01745
Other type of flooring	0.01	0.10	0.00	0.05	0.00	0.03	0.03986	0.04187	0.00399
Number of h.h. members per room	0.44	0.28	0.53	0.49	2.50	1.59	0.00607	0.00212	-0.01416

* *IAF refers to the 1996/97 living standards survey. Means and scoring coefficients were estimated using sampling weights to correct for sample design. The estimation of standard errors considers the effect of clustering due to the three stage sampling procedure.*

** *Data from the 1997 DHS. Asset variables and household characteristics were constructed to correspond to the variables available in the 1996/97 IAF. Means and scoring coefficients were calculated using sampling weights.*

** *Data from the 1997 DHS. Asset variables and household characteristics as reported in Gwatkin et al. (2000). Following Gwatkin et al., the estimates for the scoring coefficients are unweighted.*

Table A 2 – Hospital and health centre visits by quintile

Quintile	Hospital visits		Health centre visits	
	% who made visit	% of total visits	% who made visit	% of total visits
Socioeconomic status measured by consumption				
1	1.5%	**14.4%**	2.1%	**13.3%**
2	1.7%	**15.9%**	3.0%	**19.2%**
3	1.7%	**16.4%**	2.9%	**18.5%**
4	2.6%	**24.2%**	4.2%	**26.7%**
5	3.1%	**29.0%**	3.5%	**22.4%**
Socioeconomic status measured by asset index				
1	1.0%	**10.1%**	3.0%	**20.3%**
2	1.5%	**13.8%**	4.0%	**24.1%**
3	1.9%	**18.0%**	3.5%	**22.4%**
4	2.6%	**24.7%**	3.3%	**21.3%**
5	3.5%	**33.5%**	1.9%	**11.9%**
Total	**2.1%**	**100.0%**	**3.1%**	**100.0%**

n=41856

Table A 3 – Immunizations by quintile

Quintile	% children (1-4)	% of children immunized	% of total cases of complete immunizations
Socioeconomic status measured by consumption			
1	13.4%	39.7%	**21.4%**
2	13.4%	40.0%	**20.5%**
3	12.0%	41.4%	**19.6%**
4	11.6%	42.4%	**20.2%**
5	9.0%	50.2%	**18.3%**
Socioeconomic status measured by asset index			
1	12.4%	18.5%	**9.6%**
2	10.6%	33.1%	**13.5%**
3	12.8%	38.7%	**19.8%**
4	12.2%	53.1%	**25.0%**
5	11.4%	70.4%	**32.1%**
Total	**11.9%**	**42.3%**	**100.0%**

Table A 4 – Maternity care by quintile

Quintile	Women who delivered child in last 5 years (% of quintile)	% of group that had a pregnancy control	% of all pregnancy controls performed	% of group that had medically supervised delivery	% of all medically supervised deliveries
Socioeconomic status measured by consumption					
1	11.2%	55.5%	**16.9%**	35.2%	**16.2%**
2	13.1%	64.2%	**20.2%**	42.8%	**20.4%**
3	12.6%	62.5%	**20.1%**	40.2%	**19.5%**
4	13.3%	67.2%	**22.9%**	44.9%	**23.1%**
5	11.0%	71.2%	**19.9%**	49.4%	**20.9%**
Socioeconomic status measured by asset index					
1	12.6%	45.2%	**15.5%**	23.9%	**12.4%**
2	11.6%	57.6%	**16.0%**	29.1%	**12.2%**
3	13.5%	58.6%	**20.1%**	35.3%	**18.3%**
4	12.2%	71.3%	**22.2%**	50.6%	**23.8%**
5	11.2%	91.7%	**26.2%**	77.2%	**33.3%**
Total	**12.2%**	**64.1%**	**100.0%**	**42.4%**	**100.0%**

FIGURES

Figure 1 - Concentration curve for visits to hospital (4 week recall)

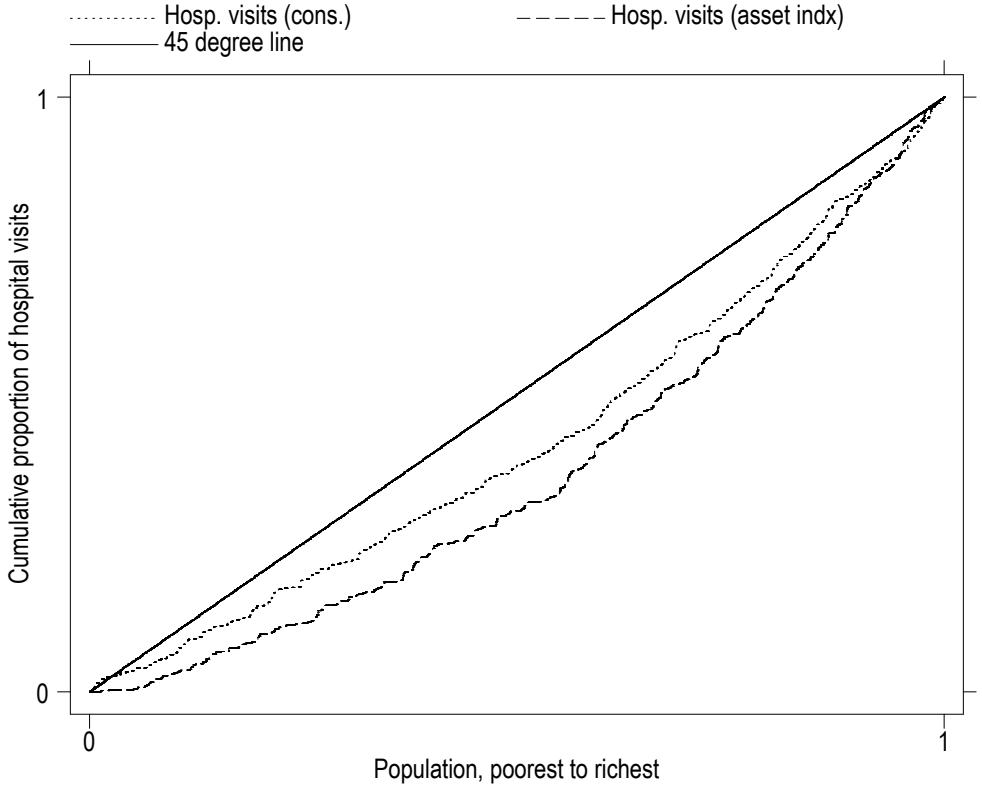


Figure 2 - Concentration curve for visits to health centre (4 week recall)

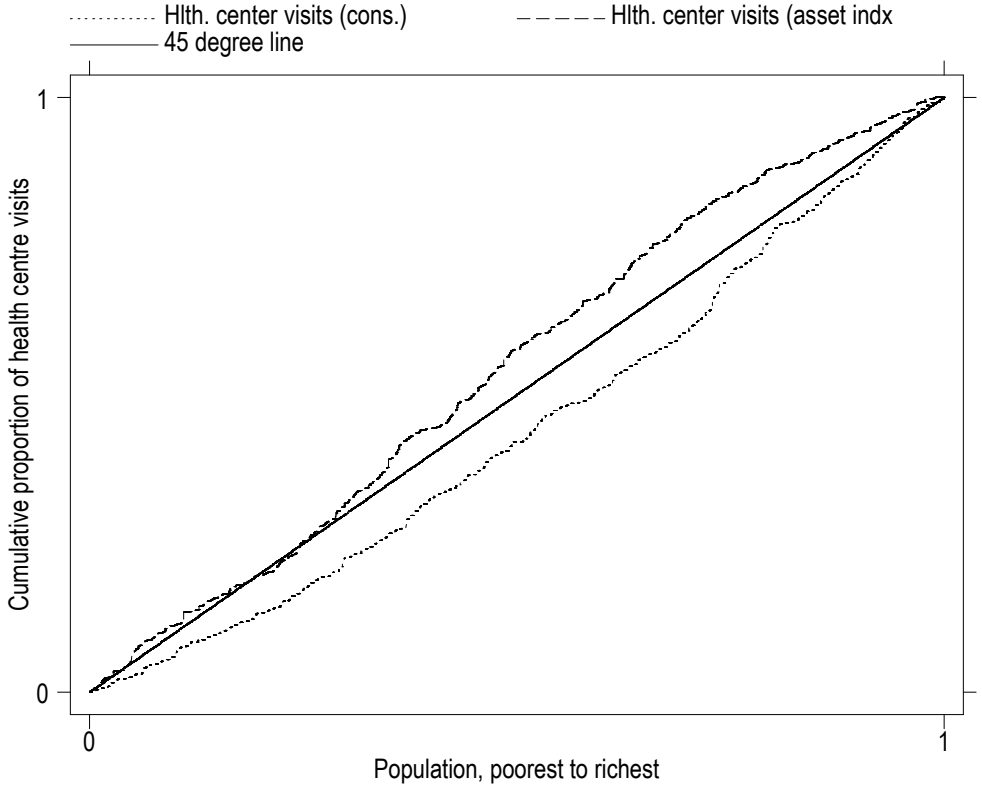


Figure 3 - Concentration curve for complete set of immunizations

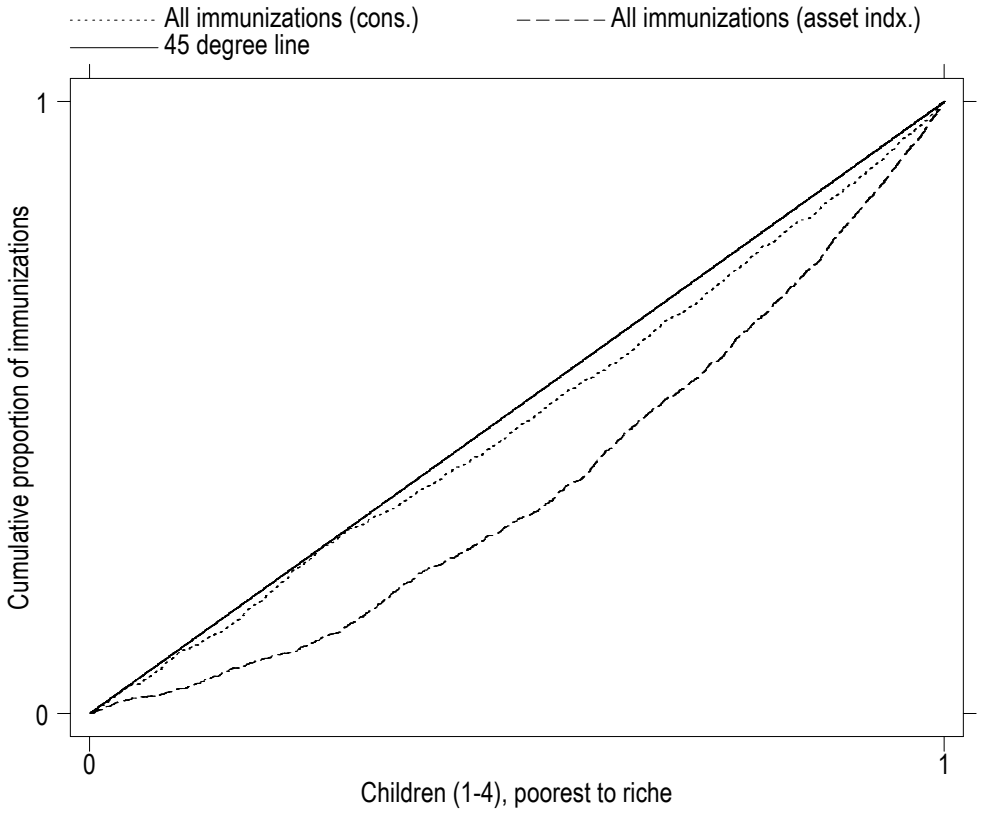


Figure 4 - Concentration curve for pregnancy control during last pregnancy

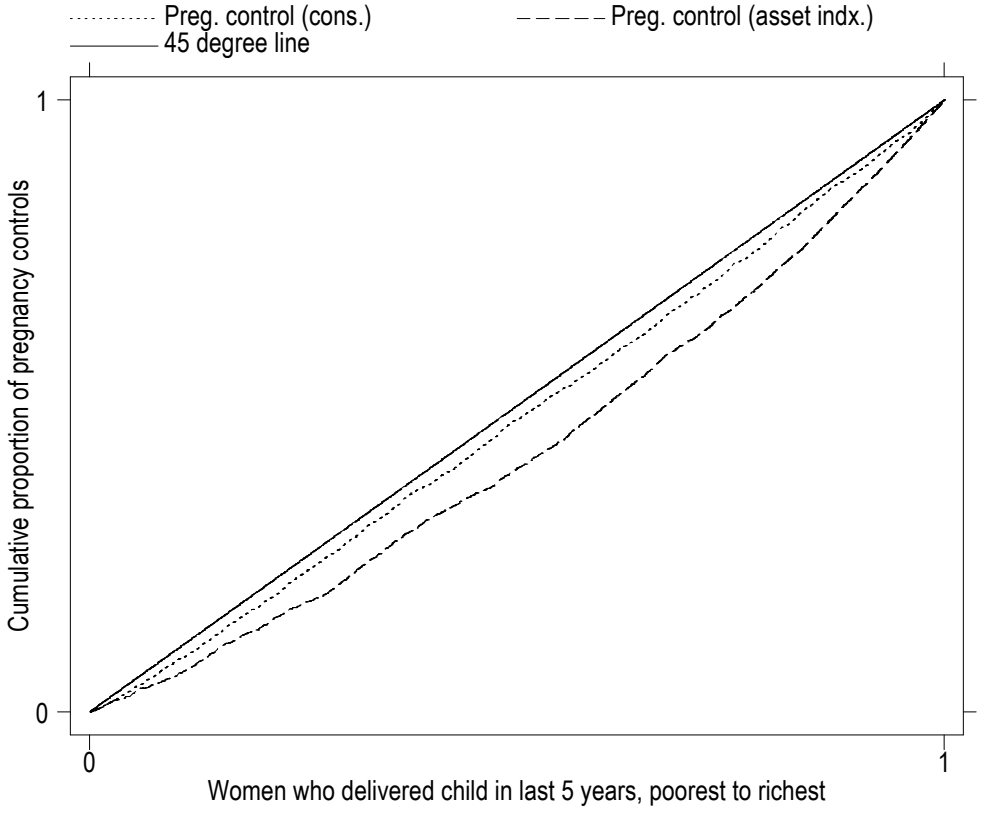
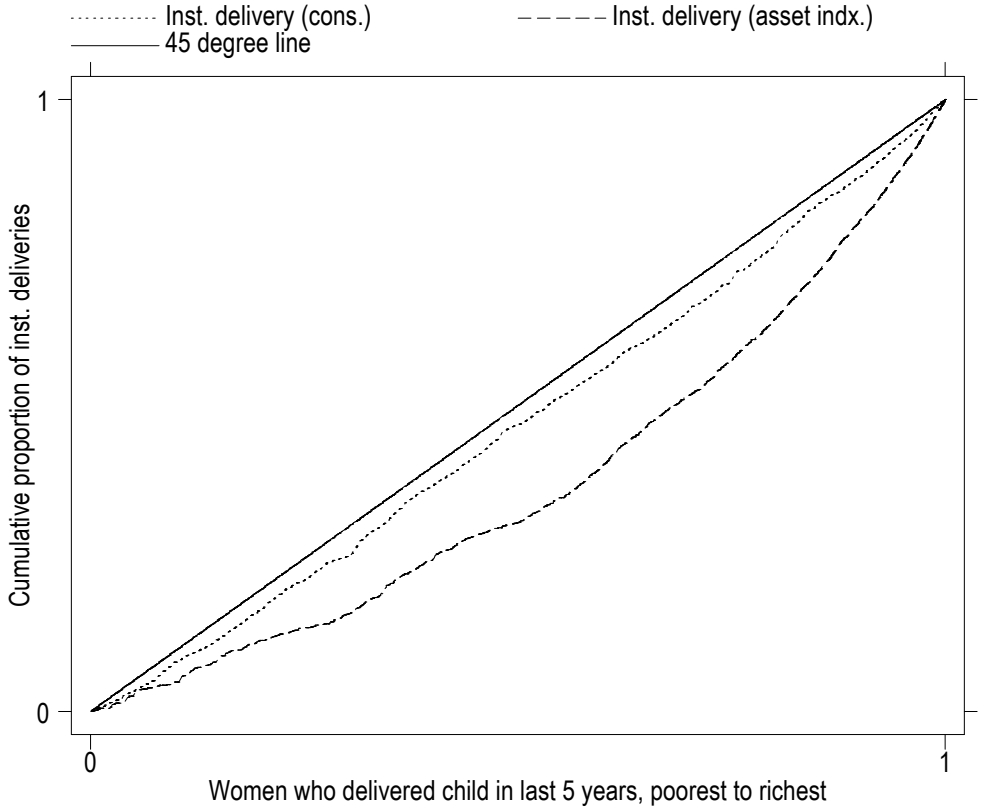


Figure 5 - Concentration curves for delivery in hospital or other health facility



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