Sometimes More Equal Than Others

How Health Inequalities Depend on the Choice of Welfare Indicator

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Abstract

A large body of empirical work in recent years 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 affects the analysis of health inequalities and the incidence of public spending. The purpose of this paper is to illustrate the potential sensitivity of the analysis of health-related inequalities to how socioeconomic status is measured. Using data from Mozambique, the paper focuses on five key health service indicators and tests whether measured inequality (concentration index) in the five health service variables is different depending on the choice of welfare indicator. The paper shows that, at least in some contexts, the choice of welfare indicator can have a large and significant impact on measured inequality in utilization of health service and on the perceived incidence of public spending. Consequently, we can reach very different conclusions about the "same" issue depending on how we define socioeconomic status. The results call for more clarity and care in the analysis of health-related inequalities and for explicit recognition of the potential sensitivity of findings to the choice of welfare measure. The results also point to the need for more careful research on how different dimensions of socioeconomic status are related, and on the pathways by which these dimensions affect health-related variables.

1. Introduction

Income-related health inequalities and inequities have been receiving increasing attention from policy and academic communities in recent years. A large body of empirical work in developed and developing countries has focused on measuring and explaining socioeconomic inequalities in various dimensions of health (e.g., Acheson 1998; Schalick and others 2000; van Doorslaer, Wagstaff, and Bleichrod 1997; Wagstaff 2000).[1] Some research has also focused on socioeconomic inequalities in the distribution of health services or public spending on health care. In OECD countries, this work has been concerned with horizontal equity in the delivery of health care (LeGrand 1978; Propper and Upward 1992; Rosenzweig and Schultz 1991; van Doorslaer and others 2000; van Doorslaer and Wagstaff 1992; Wagstaff, van Doorslaer, and Paci 1989). In contrast, most work on the distribution of health services in developing countries has focused on the narrower issue of equality.[2] 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 and others 2000; Demery 2000; van de Walle 1995). However, in the absence of service-specific unit cost estimates, many studies have restricted attention to binary indicators of whether a person used a particular service or not (e.g., Baker and van der Gaag 1993; Makinen and others 2000; Sahn and Younger 2000).

In general, this work has highlighted the existence and severity of health-related inequalities and inequities in many contexts, and led to calls for more regular and focused monitoring of the distribution of health and health services (Gilson 1998; Gwatkin 2000). However, while the concept of socioeconomic inequalities in health and health care has intuitive appeal, the empirical analyses of these issues have been based on different measures of socioeconomic status (SES), including both continuous variables such as income and consumption and categorical variables such as social class, occupational group, educational attainment, or race.[3] In the case of developing countries, most of the work on socioeconomic inequalities in health and on the incidence of public spending has been based on living standard surveys, which typically collect detailed income and consumption data. However, more recently, efforts to bring 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

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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, Murray and Frenk 2000; Illsey and LeGrand 1989; Murray, Gakidou, and Frenk 1999).

[2] Equity requires that people in equal need of treatment receive the same treatment irrespective of their income. Hence, if illness incidence is unequally distributed along income lines, equity requires that utilization of services related to that specific illness be similarly distributed. In contrast, equality is concerned only with the distribution of the service itself. As this perspective does not require the analyst to control for need, data requirements are relaxed considerably.

[3] The resultant lack of comparability over time and across contexts has been an important source of criticism of this literature (Gakidou and others 2000).

(e.g., Filmer and Pritchett 1998; Gakidou and King 2000).[4] 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.

The purpose of this paper is to illustrate how the analysis of health-related inequalities can be sensitive to measures of socioeconomic status. Using data from Mozambique, the paper focuses on five key health service indicators: hospital visits, health facility visits, child immunizations, ante-natal care visits, and medically supervised deliveries. Evidence from the 1996/1997 living standards survey suggests that the incidence of public spending is equally distributed (Heltberg, Simler, and Tarp. 2001) and that income is not an important determinant of the utilization of health services (Lindelöw 2000). In contrast, however, descriptive statistics from a Demographic and Health Survey (DHS) implemented in the same year point at notable inequalities across asset index quintiles in both health outcomes and health service indicators (Gwatkin and others 2000). On the surface, these findings are difficult to reconcile. The paper exploits the considerable overlap in the list of assets covered by the two surveys, and uses the living standards survey to test whether measured inequality in the five health service variables is different depending on the choice of welfare indicator. The results indicate that, with the exception of curative visits to primary-level facilities, measured inequality in the utilization of health services is greater when individuals are ranked according to an asset index rather than consumption. This difference, which is shown to be the product of spatial differences in the respective measure of SES, makes it clear that, at least in some contexts, the choice of welfare indicator can drive conclusions about income-related health inequalities in important ways.

The paper is organized as follows. Section 2 discusses the methods for measuring inequality and for comparing distributions of health service use. It also provides an overview of approaches to the measurement of living standards or socioeconomic status. Section 3 presents the data and the variables used in the analysis. Section 4 reports on the findings of the analysis. Section 5 concludes.

2. Methods

2.1 Measurement of Socioeconomic Inequalities in Health Variables

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

[4] 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. 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.

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.

By testing for welfare dominance, a concentration curve can be compared with another curve, or with the line of equality (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.[5] A disparate array of approaches has been proposed for the measurement of socioeconomic inequalities in health.[6] Many of these measures have been developed to summarize grouped data on health outcomes and service utilization, and do not meet what may be considered basic criteria for inequality measures (Wagstaff, Paci, and van Doorslaer 1991). 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, van Doorslaer, and Paci 1989). The concentration index 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 and others 2000; van Doorslaer, Wagstaff, and Bleichrod 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 minus twice the area under the concentration curve).[7] Let h_i denote the

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

[6] See, e.g., Mackenbach and Kunst (1997) and Wagstaff , van Doorslaer, and Paci (1991); Wagstaff, Paci, and van Doorslaer (1991) for reviews.

[7] The relationship between the concentration curve and the concentration index is hence analogous to the relationship between the Lorenz curve and the Gini coefficient. See, e.g., Kakwani (1980) or Lambert (1993) for further details on these concepts.

amount of health care received by individual *i*. For many service indicators, this will simply be a dichotomous variable, taking the value 1 if the individual has used the service in question. 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 socioeconomic level. The degree of inequality, measured by the concentration index, CI_h, is then defined as:

$$CI_h = 1 - 2\int_0^1 CC_h(p)dp \, .$$

For individual level data this can be calculated as

$$CI_h = \frac{2}{n \cdot \mu} \sum_{i=1}^{n} h_i R_i - 1 \, ,$$

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

$$CI_h = \frac{2}{\mu} Cov(h, R_i) \, .$$

This points at a convenient way of estimating the concentration index from micro data (Jenkins 1988; Kakwani, Wagstaff, and van Doorslaer 1997) as the coefficient β in the regression

$$2\sigma_R^2 \left[\frac{h_i}{\bar{h}} \right] = \alpha + \beta R_i + \varepsilon_i \, .^{8}$$

As discussed by Wagstaff and Watanabe (2003), 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

$$2\sigma_{\Delta R}^2 \left[\frac{h_i}{\bar{h}} \right] = \alpha + \beta_{diff} \Delta R_i + \varepsilon_i \, ,$$

where $\Delta R_i = R_{i1} - R_{i2}$ captures the re-ranking that results from changing the measure of SES, and $\sigma^2_{\Delta R}$ is the variance of the difference in rank. Here β_{diff} is an estimate of CI_{h1}-

[8] The ordinal nature of the ranking variable results in autocorrelation. This can be taken into account by using the Newey-West estimator (Newey and West 1994) to provides reliable estimates of the standard error of the concentration index. Alternatively, the standard error of the concentration index can be calculated using a formula (Kakwani, Wagstaff, and van Doorslaer 1997).

CI_{h2}. Similarly, the significance of this difference can be tested by means of the standard error of β. The relationship suggests that moving from one measure of SES to another will only result in differences in measured inequality when (i) the shift in SES measure results in a re-ranking of individuals; and (ii) the change in individual ranking (ΔR_i) is correlated with the health variable (h_i) of interest.

2.2 Measures of SES: Consumption and the Asset Index

The literature on socioeconomic inequalities in health has defined the concept of socioeconomic status (SES) in very different ways. SES has often been conceived broadly as an individual or household's position in society, where that position is determined by focal variables such as education, prestige, occupation, wealth, or some other dimensions of "social standing."[9] Economists have tended to favor a more narrow conception of welfare, in particular income and consumption, both as a proxies for well-being in a broader sense, and as important enabling factors for improving nonmaterial dimensions of living standards.[10] However, income and consumption data are both expensive and difficult to collect. As a consequence, many otherwise useful data sources lack direct measures of living standards (e.g., the Demographic and Health Surveys). On the face of it, this precludes the analysis of socioeconomic inequalities of health, as well as testing of hypotheses relating to the impact of living standards on health and health service outcomes. Moreover, the exclusion of living standards measures in multivariate analysis raises the possibility that other coefficient estimates are rendered biased. These concerns have prompted researchers to use data on household assets and other characteristics to construct alternative measures of welfare or living standards (e.g., Filmer and Pritchett 1998; Montgomery and others 2000; Sahn and Stifel 2000).

Consumption

The focus on consumption and income as measures of welfare are grounded in the proposition that, under certain conditions, household welfare can be represented in monetary terms (*money-metric utility*), as the value of the household's consumption bundle at a set of reference prices (Samuelson 1975). This can be approximated by adding up all expenditures of a household, and dividing by an appropriate price index (Deaton and Zaidi 2002). In many cases, there are good reasons for preferring consumption over alternative money-metric measures of welfare, such as income or expenditure. Unlike income, consumption tends to be "smoothed" over time, and is therefore more directly related to current living standards than current income, at least for short reference periods. Although many components of consumption are measured by looking at household expenditures, expenditure excludes consumption that is not based on market transactions. Moreover,

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[9] In one of the earliest uses of the term SES (U.S. Bureau of the Census 1963), it referred to a multi-dimensional index reflecting education, income, and occupation (Bollen, Glanville, and Stecklov 2001).

[10] Even economists have increasingly accepted that welfare is a multidimensional phenomena, which includes not only material factors, but also the ability of individuals to enjoy basic freedoms (Sen 1985; 1999). This is an important perspective; a broader conception of living standards may drastically change the perception of who in a population is poor, and may provide a more appropriate basis for designing and targeting interventions.

consumption should ideally capture the benefits derived from the use of a good, rather than the value of the purchase itself. However, in the case of some goods and services—consumer durables and some bulk purchases—the use value is different from the purchase price (for reference periods shorter than the life of the item), hence driving a wedge between consumption and expenditure.

In general, consumption estimates are constructed as the sum of different components of measured consumption, where the key components are (i) food consumption (expenditures, home-produced, and in-kind); (ii) nonfood expenditures; (iii) use value from consumer durables and household assets; and (iv) use value from housing.[11] The use value (or rental equivalent) of consumer durables or assets is comprised of the opportunity cost of funds tied up in the durable good, as well as the depreciation of the good. In the case of general household durables or assets, the use value is typically imputed with reference to the age and reported replacement value of the item (Deaton and Zaidi 2002). For housing, the use value is approximated by rent payments in a well-functioning rental market. However, in many countries, only a small proportion of the population rent their housing. For households that do not report rent, use value for housing can be imputed using coefficients from a hedonic regression that relates rent to housing characteristics (e.g., number of rooms, type of floor, type of roof, access to water, type of toilet) for the subset of households that report rent. The resultant household consumption aggregates are then adjusted to reflect household size and composition, and deflated to reflect regional differences in prices.[12,13] In other words,

$$C = \frac{\sum \text{food items} + \sum \text{nonfood items} + \sum_n \hat{v}_n a_n + \hat{H}(\text{housing})}{\text{price index} \times \text{adult equivalents}},$$

where a_n are asset dummies, $\hat{v}_n$ are estimates of imputed use values for the respective assets, and $\hat{H}$ is either rent or imputed rent, i.e.,

$$\hat{H}_n(\text{housing}) = \begin{cases} \text{rent} \\ \sum_k \hat{w}_k^d h_k \end{cases},$$

[11] Due to the difficulty in defining meaningful shadow prices, most consumption measures exclude publicly supplied goods and services. Similarly, conceptual problems in establishing the value of leisure typically makes it impractical to include leisure as a component of consumption.

[12] In the simplest case, we can use the number of household members to convert household consumption into individual consumption. However, while per capita household consumption is a convenient measure of living standards, it ignores household economies of scale, which arise because some goods and services that are consumed by the household have public good characteristics—they generate benefits for other household members beside the primary consumer. There may also be age- or gender-specific differences in consumption needs (Deaton 1997; Deaton and Zaidi 2002).

[13] Prices tend to be lower in rural than in urban areas, at least for some goods and services. In general terms, a price index is constructed as a weighted sum of price ratios of different commodities. For details, see, Deaton and Zaidi (2002).

where $\hat{w}_k^d$ is the coefficient estimate for housing characteristic k for spatial domain d from the hedonic regression, and h_k are housing characteristics.

Asset Index

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 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:

$$A = \sum \left[f_n \frac{(a_n - \overline{a}_n)}{s_n^a} \right] + \sum \left[f_k \frac{(h_k - \overline{h}_k)}{s_k^h} \right],$$

where f_n and f_k is the factor loading for asset and housing characteristics, a_n and h_k are asset dummies and housing characteristics, $\overline{a}_n$ and $\overline{h}_k$ are sample means, and the sample mean is the value of the asset for household i, $\overline{a}_k$ is the sample mean, and s_n^a and s_k^h represent standard deviation.

Relationship between Consumption and the Asset Index

At a conceptual level, there are important differences between consumption and the asset index as a measure of living standards. In particular, asset data are likely to be less prone to fluctuation than consumption, and may therefore be considered a better measure of long-term household welfare or wealth.[15] At an empirical level, the correlation between

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[14] In contrast to the principal components approach proposed by Filmer and Pritchett (1998, 1999), Sahn and Stifel (2000) construct a welfare index on the basis of factor analysis. They argue that factor analysis is preferable to the principal component method because it does not force all of the components to accurately and completely explain the correlation structure between the assets. Despite the perceived advantages, they note that the Spearman rank correlation between the principal components and factor analysis asset indices is about 0.98 for each of the samples considered. In addition to the principal component and factor analysis, there are two other approaches to constructing welfare indices. First, some studies have used what may be referred to as "naïve" indices to proxy or control for living standards, often constructed as the sum of the indicator or dummy variables for whether a household possesses certain assets (see Montgomery and others 2000, Falkingham and Namazie 2002, and Morris and others 2000 for a discussion). In cases where complementary consumption data are available from a past or parallel survey, a living standard index can be constructed with weights derived from a "consumption regression." This approach draws on the techniques from the targeting literature, which seeks to identify a set of variables that predict consumption (Ahmed and Bouis 2001; Grosh and Baker 1995).

[15] A household's wealth at any given time can be defined as the difference between its stock of assets and its stock of liabilities. Unlike the flows of income, consumption and saving, wealth or "net worth" is a stock figure. It changes over time by being added to through saving and capital transfers. It may also be depleted by incurring liabilities, by liquidating assets to finance consumption, or by transferring assets to another entity. Wealth is likely to be an important determinant of consumption, although the relationship will vary depending on life-cycle considerations, the nature of asset and credit markets, and other factors (Deaton

consumption and the asset index is often weak. For example, Sahn and Stifel (2001) report Spearman rank correlation coefficients ranging between 0.31 and 0.71 for 10 developing countries.[16]

Why would two households with the same level of measured consumption look different when compared on the basis of an asset index? The weak correlation between consumption and an asset index is explained by three key factors.

1. The asset index does not consider direct consumption of food items and most nonfood items. Hence, although there tends to be important overlap in terms of consumer durables and housing, which are also important components of consumption, the asset index excludes the most important components of aggregate consumption. Moreover, housing characteristics and ownership of consumer durables are likely to be only weakly correlated with food and other nonfood consumption in most contexts. Households for which consumer durables and housing comprise a larger share in aggregate consumption look relatively better-off under an asset-based welfare measure than under consumption.

2. For common asset and housing components, the weighting of different items in the construction of the welfare measures is different. In the case of consumption, the weights reflect use value. In contrast, the factor loadings are statistically derived, and reflect the variance-covariance structure of the variables under consideration, rather than some underlying economic concept.

3. Consumption, unlike the asset index, reflects spatial price differences. These differences are captured both through deflation of aggregate consumption (or selected components) by a spatial price index that reflects spatial price differences, and by estimating different hedonic rent regressions for different spatial domains.

As a consequence of the imperfect correlation between consumption and the asset index, individuals in a population are likely to be ranked differently depending on the choice of welfare indicator. As noted, the extent to which the difference in rank is correlated with the health variables of interest determines the impact on measured inequality. Although the extent of re-ranking and the correlation with health variables of interest are likely to be highly context specific, the previously mentioned differences point at possible reasons why this correlation may arise. First, the relative share of housing and consumer durables in aggregate consumption, or ownership of particular assets picked up by a survey, may be systematically related to spatial or other factors that are also correlated with the health variable of interest. This could be due to differences in preferences, or

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and Muellbauer 1983). However, given the limited set of assets covered by many asset indices, they are likely to be poor proxies for overall wealth.

[16] Montgomery and others (2000) show that although asset indices are often poor predictors of consumption, they may still be valid proxies in testing hypotheses about the impact of consumption on health outcomes, in particular where sample sizes are large and there is a lot of variation in consumption. They also find little evidence that the use of asset indices to proxy for consumption results in biased coefficient estimates on other variables of interest.

because some types of assets and housing characteristics are complementary to public investments. This is the case, for example, with electricity, refrigerators, televisions, piped water, and flush toilets. For any level of consumption, these types of assets are therefore more likely to be found in households in urban and more economically advanced areas. Second, if the health variable of interest is correlated with the spatial domain, and the if the use of domain-specific weights for assets and housing characteristics has a big impact on the relative position of households in the ranking, the re-ranking that results from moving from one welfare measure to the other can have a big impact on measured inequality.

3. Data and Variables

The following analysis is based on the 1996/97 Mozambique National Household Survey on Living Conditions (IAF).[17] 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.[18] 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 of variables: (i) consumption; (ii) asset index; and, (iii) health service indicators.

3.1 Consumption

Following the approach set out above, per capita consumption is calculated as the person average of total estimated household consumption.[19] Similar 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 consumption of home-produced food and nonfood items, as well as imputed use values for owner-occupied housing and household durable goods.[20] Household consumption has been deflated using spatial price indices. These were defined for 13 geographic areas 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

[17] Inquérito Nacional aos Agregados Familiares Sobre as Condições de Vida (IAF). Details concerning the survey can be found in Datt and others (2000) and Ministry of Planning and Finance (1998).

[18] 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 41,856 observations.

[19] 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). 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.

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

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.[21]

3.2 The Asset Index

In order to facilitate comparisons with DHS data, the assets included in the index were chosen to mirror, as far as possible, the index constructed for the Mozambique DHS by Gwatkin and others (2000).[22] A list of variables, including their sample means and the scoring coefficients are reported in appendix Table A1. Due to differences in the IAF and DHS questionnaires, there is not a perfect overlap in the assets and household characteristics for the data 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 and others. 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 factor loadings—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.

3.3 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 a binary nature, simply reflecting whether an individual reports having used a particular service or not. Sample and subsample 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.[23] This suggests the use of self-reported illness as a criteria for need. However, similar 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

[21] See Datt and others (2000) for details on the construction of consumption aggregates for the IAF.

[22] 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 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.

[23] The questionnaire only permitted one care-seeking episode. If several consultations were made in the last month, answers refer to the last consultation.

of these factors would make illness reporting by wealthier households more likely for a given health status.[24] 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 subsample of those who report illness or injury risks underestimating any bias in utilization against the poor.[25] In what follows, we therefore consider unconditional use of curative health services.

The immunization variable refers to whether a child between 12 and 48 months of age 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 the age of one has received any immunizations show, a similar distribution by income, are therefore not considered.

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

Table 1. Sample and Subsample Means for Health Service Outcomes

Variable	Service use (sample mean)	Subsample*	Service use (subsample mean)
Hospital visit	2.0%	11.2%	18.5%
Health center 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 = 41,856			

* The subsample refers to (i) self-reported illness for four- 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 five 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 appendix tables A2 to A4. With the exception of health center visits, the utilization of health services appears far more equally distributed when we rank

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

[25] This is because we may end up excluding from the subsample 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.

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. The reasons for this seeming anomaly is discussed further below.

This pattern is also reflected in the concentration curves of appendix figures 1 to 5. 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. The results broadly confirm the observations above, and offer 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 center 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 depend 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 a 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 are related to 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 be correlated with the health service indicator of interest. This correlation seems to be present. In order to understand why this correlation arises, 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 loses 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) losing 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) lose rank even after we control for these other factors.

Considering the type of assets and household characteristics 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, and the complementarity of some assets and housing characteristics—electricity, refrigerator, running water, flushing toilet, etc.—with public infrastructure. 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

have less access to (and make less use of) health services, lose rank.[26] The consequence is that individuals 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. While this explains some of the observed patterns, the impact on the distribution of outpatient visits to health centers and health posts is less clear. However, primary-level health facilities are far less concentrated in urban and southern areas than hospitals. As a consequence, curative visits to health centers and health posts are less likely to be correlated with the re-ranking, which, as we have seen, is largely spatial in nature.

5. Discussion and Conclusions

This paper has shown that in Mozambique, the choice of welfare indicator has a large and significant impact on socioeconomic inequalities in service utilization and on the "perceived" incidence of public spending. The analysis suggests that, relative to consumption, the asset index overestimates SES for households in urban and more economically developed areas. The most important reasons for this overestimation appears to be the lack of a spatial price deflator in the construction of the asset index, and the complementarity of some assets and housing characteristics with public infrastructure. The differences between consumption and the asset index are systematically correlated with the utilization of health services, resulting in a significant difference between measured inequality for the two measures of SES. In other words, the paper shows that we can reach very different conclusions about the "same" issue depending on how we define socioeconomic status. This conclusion can be contrasted with Wagstaff and Watanabe (2003), who find that the choice of welfare indicator makes little difference to measured inequality in wasting and stunting in 19 countries. While the results by Wagstaff and Watanabe (2003) provide a degree of confidence about the robustness of health equity analysis to the choice of welfare indicator, the purpose of this paper has been 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.

It is natural to ask which measure is better. Consumption has more theoretical grounding as a measure of welfare, and will therefore often be the preferred measure of SES. On the other hand, a strong case can also be made—on both conceptual and practical grounds—in favor of a wealth or asset index to measure household living standards. In general, however, it is not possible to provide a definite answer to which welfare indicator is preferable. Indeed, it may be argued that the observed differences in measured inequality simply 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, and that there are good reasons to be concerned about inequalities along both measures of SES. In any event, the choice of indicator is typically driven by data availability rather than conceptual

[26] 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 2,000 to 2,606 in Maputo, Gaza, Inhambane, and Sofala, which can be compared with 5,995 for Zambezia and 3,606 for Cabo Delgado (MoH/SDC).

concerns, so we may well have to reconcile ourselves to the fact that it will not always be possible to reach any unqualified conclusions about health-related inequalities and public expenditure incidence.

That said, the results call for more clarity and care in the analysis of health-related inequalities. 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, few analysts are afforded such a luxury. In cases where only one SES measure is available, the potential sensitivity of the findings should be recognized. Analysts should be explicit about how socioeconomic status is measured, and about the limitations of conclusions and policy implications. Particular caution is required in contexts where there is considerable spatial variation in access to health services or in health-related attitudes and preferences, in particular if there is also reason to suspect that consumption and the asset index differ systematically across geographical areas.

Finally, the results also call for more careful research on how different dimensions of SES are related, and on the pathways by which different dimensions impact on health-related variables. Moreover, it should be noted that the measurement of socioeconomic inequalities in health-related variables provides only a descriptive perspective. These measures are of considerable interest in their own right, but should also be considered the starting point for further analysis aimed at understanding the determinants of health service utilization and at disentangling the sources of observed inequality.

Tables

Table A1. 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 and others (2000). Following Gwatkin and others, the estimates for the scoring coefficients are unweighted.

Table A2. Hospital and Health Center Visits by Quintile

	Hospital visits		Health centre visits	
Quintile	**% 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 A3. 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 A4. 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)

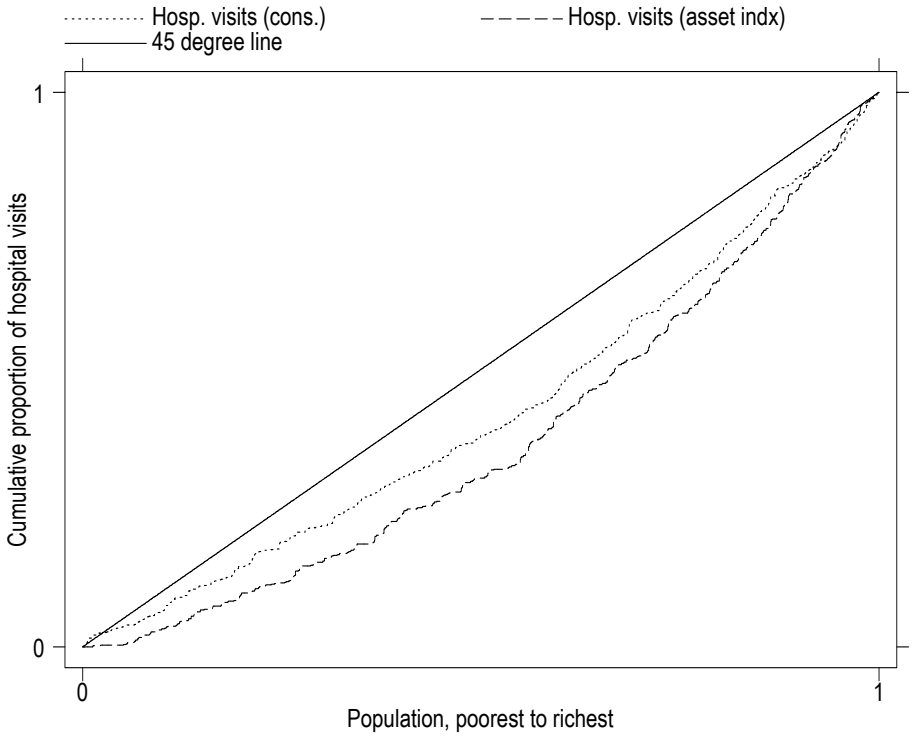


Figure 2. Concentration Curve for Visits to Health Center (4 week recall)

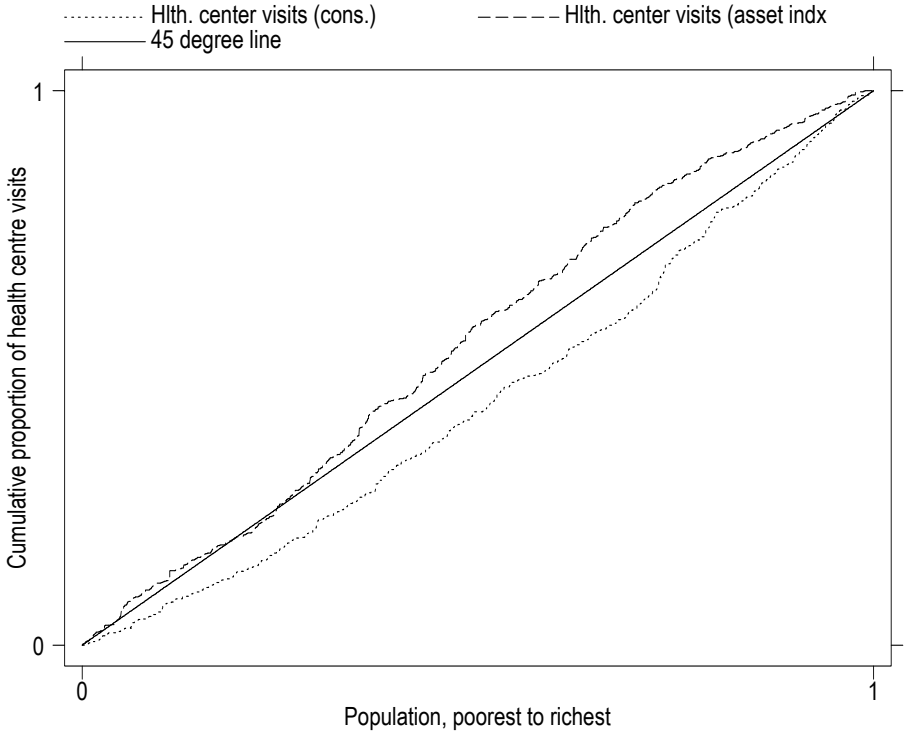


Figure 3. Concentration Curve for Complete Set of Immunizations

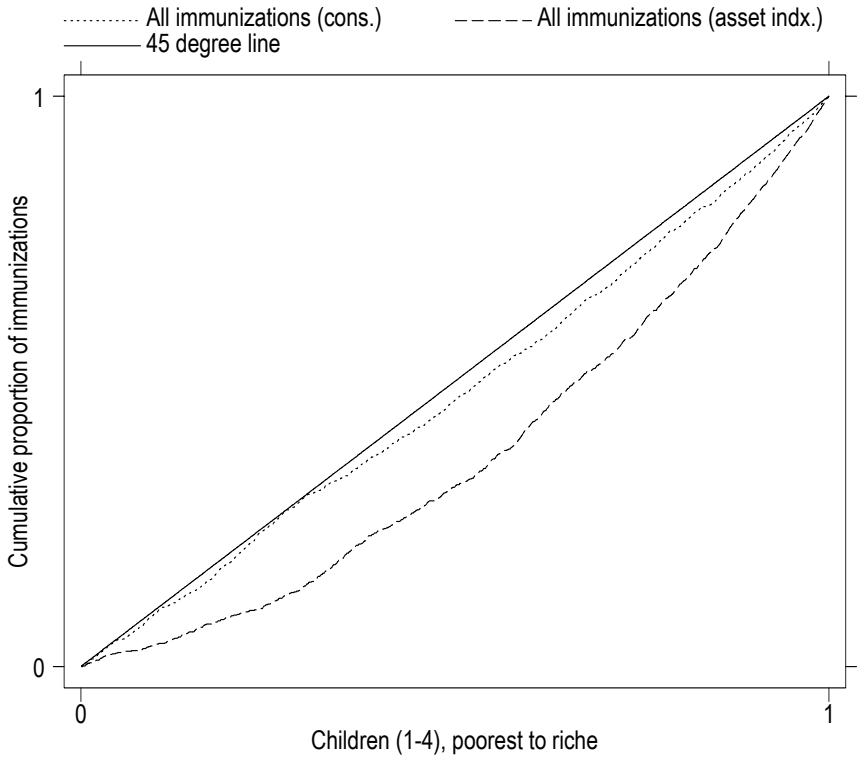


Figure 4. Concentration Curve for Pregnancy Control during Last Pregnancy

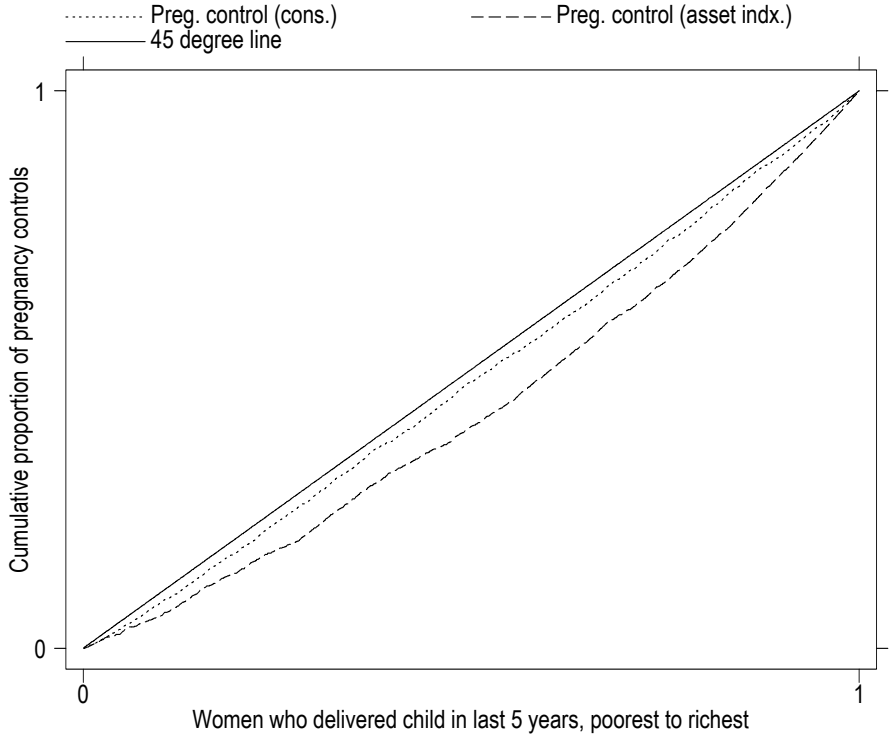
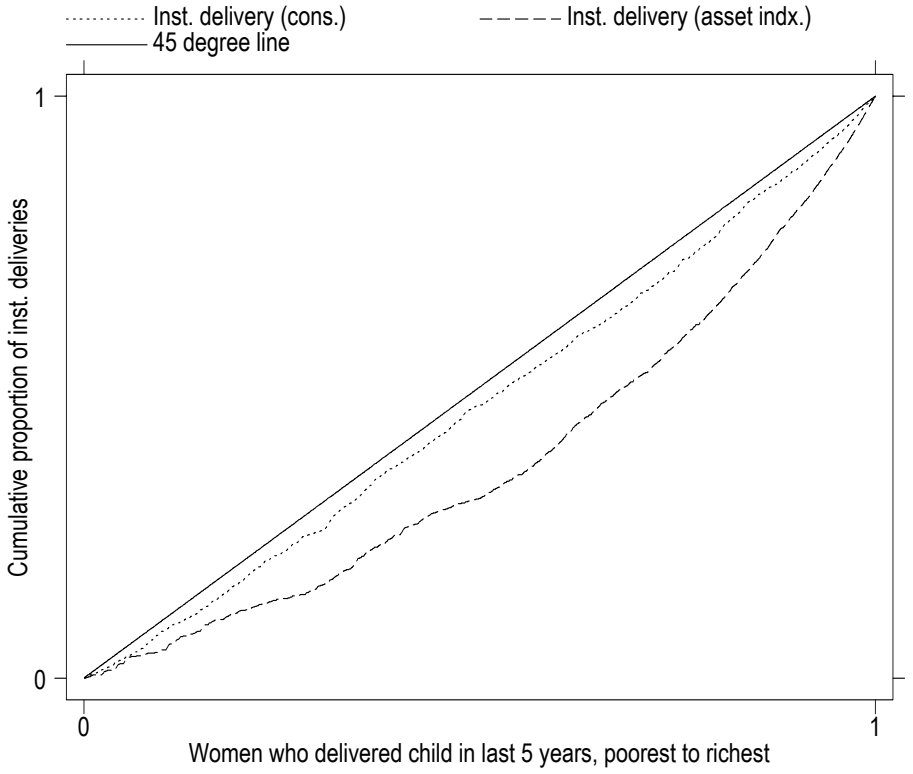


Figure 5. Concentration Curves for Delivery in Hospital or Other Health Facility



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