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## **Health Inequality across Populations of Individuals**

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## I. Introduction

Health inequality is a broad concept that examines the dispersion of the distribution of health and is a relative concept, independent of the mean. There are two compelling questions: why should we concern ourselves with the distribution of health, and not just the distribution of income, which is the normal metric for examining inequality? and why should we worry about “relative” health status, beyond being concerned with the absolute level of health?

In regard to the first question, a number of policy statements and papers have vigorously emphasized the need to reduce the differences in health status between countries and between socioeconomic groups within countries (e.g., WHO 1983, 1986; Whitehead 2000). A number of considerations motivate this interest. First, Sen (1979, 1985, 1987) argues that the notion of poverty is inadequately captured by money metrics such as income or expenditure. Poverty is the deprivation of basic capabilities, or the failure of certain basic functionings, not just low levels of income. Low incomes are only *instrumentally significant*, while deprivation of capabilities, such as poor health, is *intrinsically important*. Health is thus a more direct measure of capability deprivation, or poverty, than is income or expenditures.

Health inequality is also more likely to capture the notion of absolute deprivation in the population than is the measurement of income inequality. This reflects the differences in the underlying attributes of the distributions of income and health. In the former case, an increase in inequality is usually caused by a lengthening of the right-hand tail of the distribution – that is, the rich getting richer. In addition, observed increases in income inequality can be relatively easily offset by increases in mean incomes, implying the potential for greater social welfare despite worsening inequality. For health, unlike incomes, improvements have a biological limit, at least given the present and foreseeable state of medical technology. Therefore, the distribution of health will likely not have a pronounced right-hand tail. Worsening health inequality is thus more likely to be a consequence of dispersion in the left-hand tail of the distribution, which implies that there is a greater likelihood that substantial health inequality places more weight on the welfare of those at the lower end of the distribution.

A third reason for being concerned about health inequality relates to the possible health risks associated with disparities in socioeconomic circumstances (Wilkinson 1996, 1997). Wilkinson asserts that there are “neuroendocrine” pathways through which psychosocial risk factors link health to the inequality in a broad range of dimensions, so that implicitly, inequality of health status (as well as other measures of well-being) is a risk factor for poor health.

Finally, there are pragmatic motivations for examining inequality in health, rather than alternative metrics such as incomes. First, incomes and expenditures are generally measured at the level of the household. This contrasts with health, which can be measured for individuals. Thus, it is not necessary to make unsupportable assumptions about the intra-household allocation of well-being when using health indicators, in contrast to money metric indicators.

Second, making comparison of incomes and expenditures across time or place is notoriously difficult in developing countries. Challenges include imputing the costs of home production and housing, valuing the rental value of durables, dealing with the problems that arise when own-account enterprises and self-employment make up large shares of consumption, the related difficulties of calculated profits from self-employment, and so forth. Furthermore, deviations in survey design, such as the recall period or the number of commodities in the consumption module, can influence the outcomes of these surveys (e.g., Pradhan 2001; Scott and Amenuvegbe 1990). There is also the challenge of deciding what deflators to employ to create comparable units across time and place. Comparing income inequality across countries also requires accurate purchasing power parity indices, which again are in short supply in developing countries.

In contrast, several health indicators are easily comparable across time and location. Additionally, they are not plagued by the problems of survey design, comparability of nominal units, or socioeconomic definitions that affect other welfare measures. So, we are better able to make inter-temporal and inter-country comparisons when focusing on an objective health outcome indicator, rather than trying to define comparable income levels of socioeconomic groups, the latter of which also tend to change in composition over time.

In regard to the second question, why would we concern ourselves with the distribution of health in addition to the levels of health, the answer is perhaps first and foremost to be found in the relationship between inequality and social justice. It would seem compelling that to the extent that there is legitimate concern for the relationship between social justice in any space, for example, in income or various freedoms, that these concerns over fairness must apply to equity in the dimension; this, by virtue of health's central role as a condition of human existence. Beyond the centrality of health in defining human capabilities, the concern over the distribution of health may find some support in terms of how this dispersion may affect other considerations, such as growth and political stability.

## **II. Capabilities, Outcomes, and Access to Services**

Motivating an interest in health inequality still leaves us with numerous conceptual challenges, including defining what we mean by inequality of health. One particular challenge is that health is a multi-dimensional concept. There is no simple or single measure that captures the entirety of a person's health status.

A second issue is whether to define equity in terms of health achievements or the capability to achieve good health. Equalizing health outcomes may be unrealistic and arguably an inappropriate policy objective, especially in the face of different preferences and risk behaviors that are not under the control of policy-makers. Likewise, there are observable and unobservable (e.g., genetic) factors that affect health outcomes, over which policy makers can exert little influence. Despite the drawbacks of defining equity in terms of outcomes, the reality is that this is often the preferred approach, given the challenges associated with defining and measuring capabilities.

Another aspect of health inequality, and perhaps easiest to understand and operationalize, is examining the progressivity of access to health services. Further distinction can be made between analyzing the progressivity of all health care, including that of private providers, and that supplied publicly by government. The extent to which the distribution of services, especially those provided by the public sector, will map to health outcomes is interesting and the source of considerable conjecture and controversy. For example, public spending on health care may crowd out private sector spending. Second, there is the distinct possibility that publicly

provided care is synonymous with low quality services. And third, it could also be the public sector chooses to provide the wrong services. These considerations suggest that where possible, it is not enough to simply look at the distribution of publicly provided services, but the efficacy of such spending, along with the effect upon, and quality of private sector services as well.

What really makes the analysis of the distribution of health services vexing is that there are inherent conflicts in objectives of public intervention. The tension is between equity and efficiency. There is the distinct possibility that public intervention in the health sector, particularly services such as primary health care, may prove ineffective in improving health for reasons noted above. This might be the case even if they are progressive, in terms of being well targeted. Likewise, many publically subsidies health services might not comply with the criteria of having a large public goods component. However, it may equally be true that such health expenditures are progressive, and thus effective in transferring resources to the poor. But if the latter is the major criteria to judge health expenditures, it is equally arguable that the comparison in terms of progressivity should not be only with other health services, but with other types of public spending, such as for education, food subsidies, and so forth. Indeed, there may also be certain types of expenditures, such as communicable disease control that is justified both on equity and efficiency criteria. But the challenge remains that any consideration of the distribution of health care must carefully delineate goals, the metrics of progressivity, and the tensions between equity and efficiency that inevitably arise.

A final qualification regarding the need to consider health inequality in the broader context is discussed by Sen who argues that inequality of health should be analyzed along with other dimensions of social arrangements, and more specifically, the overall allocation of resources to health. As he points out, it is possible to achieve health equality by withdrawing a life saving treatment from a man of means, and instead encouraging him to spend the implied savings on a luxury yacht. It would be difficult to argue that such an arrangement is either Pareto improving, or defensible as a policy to improve equality in health. If, however, the savings are allocated to health

spending that raises the mean level of health, such a policy of redistribution would be far more defensible.

### III. Univariate and Gradient Approaches to Health Inequality

Two major approaches to defining health inequality are found in the literature. The first, representing the vast majority of the work in this area, involves examining inequality in health across a variety of dimensions of social and economic stratification. These include income, race, ethnicity, location, and gender. Making comparisons of health across populations with different social and economic characteristics is often referred to in the literature as the so-called “gradient” or “socioeconomic” approach to health inequality.

The second approach, which has been referred to as the univariate approach to measuring pure health inequality, involves making comparisons of cardinal or scalar indicators of health inequality and distributions of health, regardless of whether health is correlated with welfare measured along other dimensions. This univariate approach measures pure inequalities in health in a fashion that is similar to what is done for income distribution. Instead of ordering individuals along the x-axis by income (or expenditures) and drawing Lorenz curves using cumulative income, health is used instead to both order individuals from the least to most healthy, and describe the distribution of health.

This can be expressed more formally where we start from an Atkinson (1970) type social welfare function,  $S$ , which is defined in terms of the additively separable utilities across persons  $i$ . Instead of individual utility being measured in terms of income alone, however, I define the utility function with two arguments, say, income,  $y$ , and health,  $h$ , where utility is an increasing and concave function of both these arguments, such that:

$$S = \frac{1}{N} \sum_{i=1}^N U(h_i, y_i)$$

(1)

The gradient or socioeconomic inequality approach assumes that the two factors, income,  $y$ , and health,  $h$ , are substitutes in the social welfare function,  $U''_{hy} <$

0, while the univariate approach implies  $U''_{hy} = 0$ , or  $U(h) + U(y) = U(h,y)$ . There is an important implication of the perspective that the two factors are substitutes: that a worsening in health status of a population can be compensated in part by poor health being less concentrated among the income poor. This substitutability also implies the social welfare function is greater if poor health is concentrated less among the poor, even if the distribution of pure health inequality worsens. Pure inequality, in contrast, assumes that the two factors are independent.

The preponderance of the literature on health inequality is focused on the gradient, with myriad examples of papers that document the socioeconomic correlates of poor health. It is possible, however, to draw only modest policy conclusions from examining the positive correlation between health and many indicators of socioeconomic status or various measures of social stratification. This derives from the production function literature that admonishes that correlations between health and other social indicators, including income and expenditures do not imply causality, and even the correlations themselves are often quite modest (Appleton and Song 1999). Instead, a wide variety of social and economic circumstances and behaviors are not captured by the gradients reported in this literature.

One interesting implication of the low correlations often found between health and socioeconomic status variables, such as incomes, is that reducing the slope of the health:income gradient will not necessarily be an effective way of reducing with pure or univariate inequality in health – that is, inequality of health ordered by the health status of the population. This is especially the case because income distributions have a long right tail, an issue I will come back to in more detail later in this paper.

An additional conceptual weakness of measuring health inequality based on the gradient approach is well illustrated by Deaton (2003), who considers two populations, A and B, with equal levels of average health and equal levels of pure health inequality. Assume that in population A there is a strong correlation between health and income and in B, the correlation between health and income is weak – that is, in the latter case the gradient is quite flat. I would question the view that health inequality in population A is a more serious public policy problem than population B. It is still possible that the univariate distribution of health inequality may be worse in population B than A, despite that the correlation between income, or bivariate health

inequality, is greater in the latter. Similarly, I would be reluctant to have to make a strong ethical argument that an improvement in health of a wealthy person is of less value than a poor person, especially to the extent we were focused on health capabilities. Of course, if we were unable to measure equality of health capabilities, rather than health outcomes, this becomes a more difficult argument to make.

There is additionally the option of exploring the equality of health services, as alluded to in the introduction. Basically, the focus on the delivery and or use of health care corresponds to the concept of expenditure incidence, which refers to the distribution of benefits, direct and indirect, that individuals receive from public expenditure. This concept and related methods for incidence analysis have been widely discussed in the literature (Sahn and Younger 2000) and will not be repeated in any detail here. Indeed, there are many challenges that need to be addressed, for example, providing an estimate of the value of a public subsidy or service to recipients. If it were possible, we would want a *monetary* estimate, just as we usually want a monetary representation of households' welfare (money metric utility). For some public expenditures, the monetary estimate is straightforward, but not so for health. This particularly applies to health spending with externalities, or the public goods components of health spending where we have no easy way of knowing what quantity each individual consumes or its value to him or her. Thus, we are left relying on estimates of budgetary costs or costs of service delivery, or even bivariate outcomes such as whether or not an individual receives a service, which are generally poor proxies for the utility gains of accessing health care.

Similarly, the descriptive nature of expenditure incidence only provides information on the incidence of existing health services which may in fact diverge markedly from the incidence of marginal spending on health. Conceptually, this problem could be overcome by more careful use of existing data, although in some cases, particularly the introduction of new services or the expansion of existing ones to new beneficiaries, existing descriptive data are insufficient. Similarly, there is tendency to focus the attention of benefit incidence studies on the actions of the public sector. While there is some logic in doing so, it also neglects the fact that household and private providers are likely to adjust their behavior in response to any change in the government provision of health services. Thus, ideally one would engage in

econometric estimation to model behavior responses that represents a counter-factual exercise that compares health access under existing and alternative choices in terms of health care delivery policies. Econometric estimates can also begin to address an even more fundamental question of whether spending on health services are effective in improving health, and if so, what are the distribution of the benefits in terms of health outcomes. This is where the concepts of benefit incidence and health outcomes converge into the broader objective of policy analysis.

#### **IV. Measuring Health: Options for Exploring Inequality**

Health status is multidimensional, and there are a vast number of health indicators that are widely used in the biomedical and allied health sciences. They capture a range of physical, mental, and social processes that contribute, along with genetic and phenotypic influences, to various aspects of health status. Some are measures of stocks of health, and others, flows; some indicators capture narrow aspects of health, and some of which are more general in their interpretation. There is also a distinction that can be made between indicators that are appropriate to define health status of individuals, while others are measures for populations. Clearly this distinction is important since it will determine the level of disaggregation possible in terms of exploring inequality across countries, within countries and even within households.

Among the most obvious other candidates for measuring inequality in health are those indicators most often used to define population health status: life expectancy, and mortality and morbidity rates. Variants on life expectancy that take into account “healthiness” of the lifespan also exist.<sup>1</sup> All have the advantage of being broad measures of health status. Data on these outcomes are also universally available, at least at the country level. There are, however, serious limitations of such

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<sup>1</sup> There are methods for measuring healthiness of a lifespan, particularly based on the use of health state weights. Among the obvious problems with such approaches is the arbitrariness of the health state weights themselves that would indicate the degree to which someone is living in a state of less than full health. It is also noteworthy that serious measurement problems exist in terms of collecting and comparing data on non-fatal health outcomes that can be used to arrive at notions such as health expectancy. It would be a monumental challenge to collect such comparable data across countries, and in any event, such data do not exist to realize our objectives of assessing world health inequality.

measures for distributional analysis. First, they are characterized by considerable measurement problems. In the case of life expectancy, the life tables used for these calculations are based on data collected at a time in the (hopefully recent) past, but that time does not correspond to the future experiences of those presently alive (Deaton 1999). Similarly, the use of related indicators such as health risk, which are based on probabilities of death and incidence and remission of non-fatal health outcomes, cannot be measured at the individual level. Instead, approximations of health risk, as a function of age, must be made based on tenuous and incomplete information.<sup>2</sup>

In the case of infant or child mortality, death remains a rare event, even in poor countries, so that reliable studies using infant mortality would require very large samples (Mosley and Chen 1984). Furthermore, one cannot study inequality with a discrete variable, so any use of infant mortality requires estimating each child's probability of death. But econometric mortality models suffer from poor predictive capability, so the variation in predicted mortality will be substantially less than the true variation in mortality probability. Consequently, while the prediction may be useful for measuring levels of mortality, using predicted mortality will under-report inequality.

Beyond the use of population indicators are the potentially more informative indicators of individual health status. As noted above, measures at the level of individuals enable health inequality analysis to go beyond global inter-country distributions. Among the obvious candidates for measuring inter-personal differences in health is morbidity. However, the mis-measurement of self-reported illness is well documented for both specific ailments and general health status (Kroeger 1985; Hill and Mamdani 1989). One prominent manifestation of the bias in self-reported illness is the nearly universal finding from surveys conducted in developing countries that the rich are more likely to report being ill than the poor (Over et al. 1992), and that reported illness is a positive function of one's education (Schultz and Tansel 1997). Factors such as greater health awareness among the rich, and the poor's tendency to

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<sup>2</sup> See Gakidou, Murray, and Frenk (2000) who estimate individual health risks by age and summarize them in a health survivorship function. A critique of this approach is found in Wolfson and Rowe (2001).

disregard illnesses to which they are accustomed, may explain this finding.<sup>3</sup> Such bias in reporting is not random, further limiting the usefulness of such indicators to characterize the distribution of health.

A number of other possible indicators of health status, such as questions about general health status (GHS), and specific activities of normal daily living (ADLs) are also discussed in the literature.<sup>4</sup> These suffer from various problems for distributional analysis, such as the difficulty of defining the reference for GHS type questions and the difficulty of defining “normal” when relying on ADLs. These problems are particularly acute when contemplating making health comparisons across countries with great economic, social, and cultural differences

There are also a series of bio-markers that can be considered to capture health status of individuals. Many can in principle be used as the basis for distributional analysis. These include options such as hemoglobin and c-reactive protein. However, both tend to measure a relatively narrow aspect of health status, are invasive in terms of collecting a drop of blood, and are relatively expensive, and thus not widely available.

While all the above indicators thus have serious limitations, perhaps the most promise for examining health inequalities lies in the use of anthropometric measures. Most noteworthy is the widely used and abundantly available metric of standardized heights, especially, but exclusively as applied to pre-school age children.<sup>5</sup>

Although measuring heights of children avoids issues of the ethnic and racial composition of the population, this is not the case for adults. Nonetheless, heights still have a valuable place in terms of measuring inequality among adults. The use of attained stature has been particularly widespread among economic historians.<sup>6</sup> But of

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<sup>3</sup> Bound (1991) also discusses the prospect of mis-reporting illness to facilitate eligibility in health-related transfer programs.

<sup>4</sup> See Strauss et al. 1993, Dow et al. 1997; Newhouse et al. 1993.

<sup>5</sup> In an interesting recent paper, Jörg Baten (2002) relies on the variation in adult heights of women to explore the relationship between inequality and globalization.

<sup>6</sup> See, for example, Steckel and Floud (1997), Komlos (2003), and Fogel (1994).

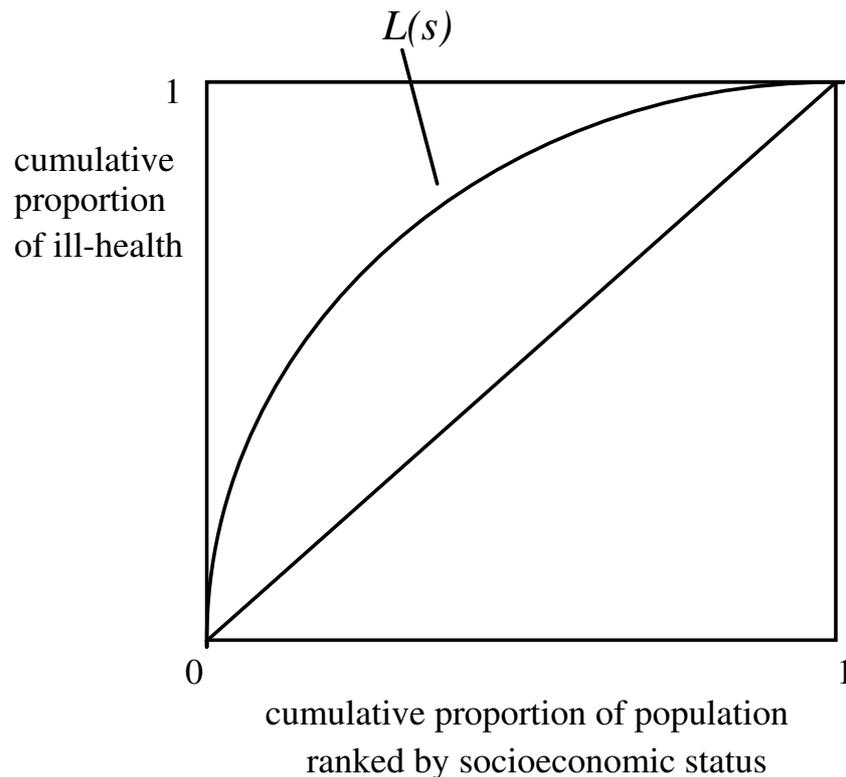
greater relevance to this paper, adult heights have been useful in terms of measuring health inequalities (Duclos, LeBlanc, and Sahn 2009).

Beyond the reliance on heights, another physical measure of health is the body mass index (BMI), which is defined as a person's weight in kilograms divided by height in meters squared. BMI has a peculiar property in as far as both low and high levels of BMI imply a health risk. This, of course, makes the use of BMI as a distributional indicator of health quite problematic. That being said, BMI may still be a useful indicator of health inequality in very poor populations in Africa and Asia where there is very little obesity and overweight.

## **V. Inequality Comparisons**

Once we have decided on our measure of health inequality, including the choice of indicator, whether we are using a univariate approach to health inequality or a gradient approach where well-being is ordered by some socioeconomic variable such as income, or even if we are looking at the delivery of services (i.e., expenditure incidence), we will ideally next make statistical comparison of concentration curves. We can begin doing so by estimating concentration curves. These curves are similar to Lorenz curves in that they plot households or individuals along the x-axis where they are ordered from those with the worst health to best health, or poorest to the wealthiest. Along the horizontal axis we plot the cumulative level of health, or proportion of benefits received, for all individuals.

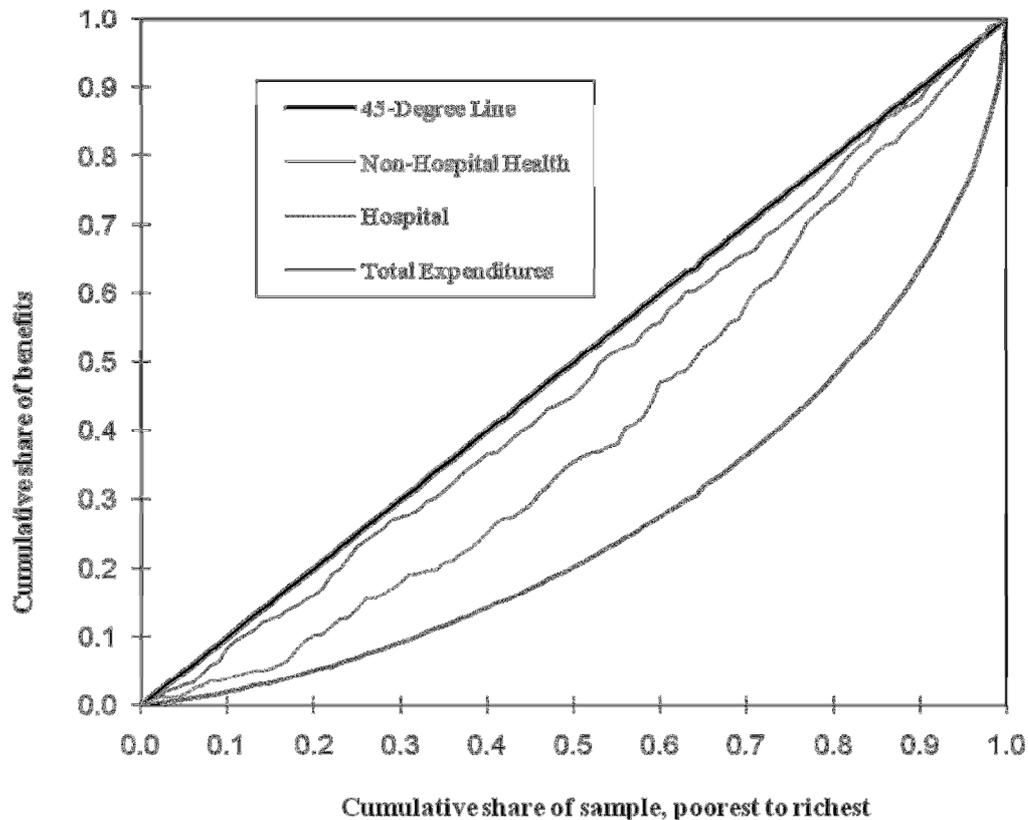
If everyone has the same level of health, the concentration curve will be a 45-degree line that extends from the bottom-left corner to the upper right corner, as shown in Figure 1, where the concentration curve is for the bi-variate approach to assessing health inequality. When the curve is concave, and captures an outcome such as being malnourished or the numbers of infant deaths, it implies that this negative outcome is more concentrated among the poor.

**Figure 1: Health Concentration Curve**

Alternatively, we can construct a concentration curve for benefits of health spending, as illustrated in Figure 2, which is the same formula as above with the benefit substituted for health.

If this concentration curve is everywhere above the 45-degree line, which reflects perfect equity in distribution, we will call such a distribution per capita progressive.

More generally, if a given curve is always above another's, the first distribution can be said to dominate the second. This concept is quite attractive in that it frees the analyst from choosing a particular welfare function: *any* function in the broad class of increasing, anonymous, and equity-preferring social welfare functions will give the same preferences.

**Figure 2. Health Benefit Incidence Concentration Curve, Côte d'Ivoire**

Much of the literature that applies dominance techniques does not do so statistically. But empirical Lorenz and concentration curves are clearly statistical, i.e. they are estimates of the true distribution and therefore have standard errors. To address the need to test statistically for welfare dominance, an issue discussed in some detail by Yitzhaki and Slemrod (1991), we turn to the discussion of Davidson and Duclos (2000). They show how to estimate the orderings and to perform statistical inference on concentration curves using stochastic dominance tests that can be applied to the entire distributions of a given health indicator.

There is an important drawback to making dominance comparisons which is that they may be inconclusive. The fallback option is to either accept the absence of a conclusion on the changes in, or comparisons of inequality across time and/or population, or adopting a *specific* welfare function which may or may not have parameters that allow us to vary the weight applied to each household.

The Gini coefficient is by far the most common approach employed in this regard, but there are many others available in the literature. One alternative measure

to the Gini that is widely used is the Theil entropy measure, especially because it is decomposable into groups, something of considerable use as we will discuss further below.

## VI. Decompositions

Having examined both levels and pattern of health inequality, whether at the global, country, or household inequality, it is also possible to decompose overall inequality into its two components: between-group and within-group inequality. The Theil entropy measure of global, country, or even household level inequality discussed above can easily be decomposed.

Another widely used decomposition method that is applicable to health is proposed by Datt and Ravallion (1992). The components of the total change in poverty can be captured using a class of poverty measures that are fully characterized by the poverty line ( $z$ ), the mean of the distribution ( $\mu$ ), and the Lorenz curve ( $L$ ). For date  $t$  the poverty measure can be written as

$$P_t = P(z, \mu_t, L_t).$$

(13)

A change in poverty between period  $t$  and  $t+n$  can then be decomposed as follows:

$$P_{t+n} - P_t = G(t, t+n; r) + D(t, t+n; r) + R(t, t+n; r)$$

(14)

growth      redistribution      residual  
 component   component

The growth component,  $G()$ , is defined as the change in poverty due to a change in the mean of the distribution, holding the Lorenz curve constant at that of the reference year  $r$ :

$$G(t, t+n; r) \equiv P(z, \mu_{t+n}, L_r) - P(z, \mu_t, L_r).$$

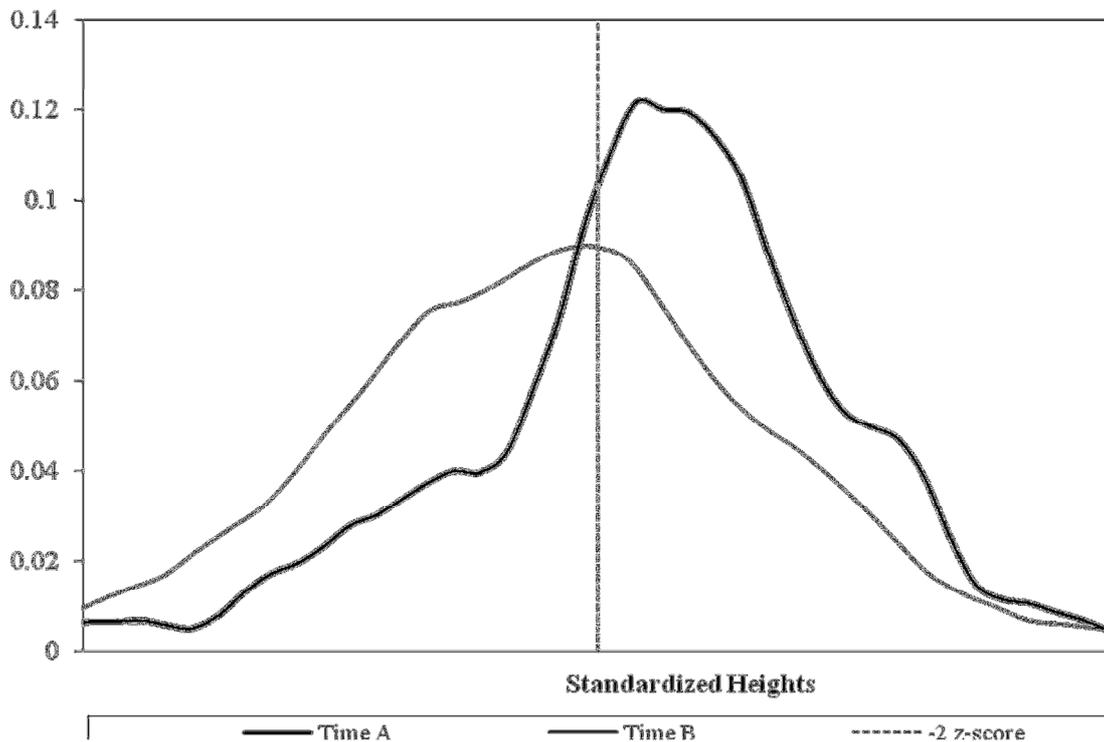
(15)

Similarly, the redistribution component,  $D()$ , is defined as the change in the Lorenz curve while keeping the mean of the distribution constant at that of the reference year  $r$ :

$$D(t, t + n; r) \equiv P(z, \mu_r, L_{t+n}) - P(z, \mu_r, L_t).$$

(16)

Sahn and Younger (2005) have adapted this methodology to the analyses of children's standardized heights using the  $-2$  z-score cut-off point based on the reference population as the threshold that distinguishes health and malnourished children. This can be thought of as the height (health) poverty line, and we can make a standard probability argument that if a child's height falls below this level, it is probable that he or she suffers from stunting and poor health. Two curves are shown, marked A and B in Figure 3 below. Assuming this stylized example represents a country at two points in time, it can be seen that a substantial share of the population is malnourished in both periods. However, the share of persons malnourished increases from time A to B. In this case, it is due to both changes in the distribution (which is more skewed to the left), and changes in the mean (which has also shifted to the left). It is precisely the contribution of those two changes to the overall increase in the area to the left of the poverty line that we decompose. Sahn and Younger thus show how it is possible to decompose the anthropometric measure of health, analogous to the poverty headcount. They find compelling evidence that when the average height of children in a country improves, the heights of stunted children improve as well. This result is similar to existing results for changes in income poverty. But, unlike the literature on income inequality that suggests at best a neutral relationship between the growth and redistribution components, they show that there is a positive association between average improvements in children's heights and the distribution of those heights.

**Figure 3. Example of Changes in Mean and Redistribution in Heights**

*a. Decomposing causes of health sector inequalities*

Yet another type of health decomposition is one which focuses on the gradient approach to measuring health inequalities, and specifically a method for decomposing the causes of health inequalities and changes therein over time. More specifically, the technique initially proposed by Wagstaff, van Doorslaer, and Watanabe (2003), is designed to decompose inequalities in health across the income distribution. The approach that they employ is useful for addressing why there are differences in health inequalities in different populations, and changes therein over time. Additionally, Wagstaff, van Doorslaer, and Watanabe extend their method to address the role of policies and programs in causing or mitigating the growth of health inequalities

As their point of departure, they estimate concentration coefficients, similar to those discussed above, to describe the level of inequality in the percent of malnourished children across the cumulative income distribution. These can be used to rank the extent to which there is inequality in health across the income gradient, analogous to what I show above for access to health services. They go on to show

how it is possible to decompose changes in these concentration indexes over time. The essence of their approach is built upon a standard reduced form model of health, estimated using linear regression. They too employ standardized child heights as their measure of health, and regress it on a vector of child and household level variables, employing community fixed effects. They use the regression results to examine the extent to which different covariates contribute (e.g., explain) nutritional outcomes, and using models from two years, which covariates are primarily contributing to changes in the malnutrition. They proceed to employ an Oaxaca-type decomposition to determine the extent to which changes in levels of malnutrition over time were attributable to changes in elasticities of nutrition with respect to consumption, rather than changes in inequality in consumption. Furthermore, their approach allows for a determination of the reasons behind the changes in the elasticities: that is, that which is explained by the coefficient on the variable (e.g, consumption) and the mean of the variable itself. So, for example, it is plausible that the elasticity may remain constant, despite the fact that the coefficient may increase. This could be due to a fall in the mean of the variable. Thus, in sum, their approach allows for an examination of the changes in inequality of the health outcome, decomposed into three components: changes in the extent of inequality in its determinant (e.g., changes in inequality of consumption), changes in the means of the determinant (e.g., changes in mean consumption), and changes in the impact (e.g, changes in the coefficient of how income affects health). Table 2 illustrates the results from the Wagstaff, van Doorslaer, and Watanabe (2003) study from Vietnam. The results, for example in the case of the consumption variable, suggest that changes in the means and inequalities of consumption (the concentration index, or CI), as well as the regression coefficient (or beta-parameter) have all contributed to worsening inequalities in terms of the health outcome, in this case a child's height-for-age z-score.

**Table 2:**

Total differential decomposition of change in inequality, 1993–98

	$\beta$ 's	Means of $x$ 's	CI's	GC	Total
Child's age (in months)	0.003	0.011	-0.002		0.012
Child's age squared	0.003	-0.010	0.001		-0.006
Child = male	0.001	0.000	0.000		0.001
Household consumption	-0.005	-0.005	-0.002		-0.011
Safe drinking water	-0.002	0.000	0.000		-0.003
Satisfactory sanitation	0.003	-0.002	0.000		0.001
Years schooling household head	0.001	0.000	-0.001		0.000
Years schooling mother	0.005	0.000	-0.001		0.004
Commune fixed effects	0.000	-0.014	-0.010		-0.025
"Residual"				0.005	0.005
Total	0.010	-0.021	-0.016	0.005	-0.021
Column as % total	-47%	98%	74%	-25%	

*From A. Wagstaff et al., Journal of Econometrics 112 (2003), p. 218*

## VII. Health Inequality, Absolute Health, and the Distribution of Income

### *b. Health inequality, income inequality, and their impact on health status*

Does health inequality have a distinct affect on health status? Wilkinson (1996, 1997) initially proposed that inequality in health within a population is a health risk in as far as it contributes to a lack of social cohesion and other disparities in socioeconomic circumstances, and that such risk goes beyond the correlation between low levels of income and low level of health. Wilkinson's case rests on what he refers to as the "neuroendocrine" pathways through which psychosocial risk factors link health to the inequality in socioeconomic circumstances. Similarly, Marmot and Wilkinson (1999) and Bruner and Marmot (1999) have discussed how relative deprivation contribute to stress, and subsequently, to compromised health status. Indeed, these two links, between relative deprivation and stress, and between stress and health status, are well documented in the psychological and bio-medical literature.

Inequalities adversely affect health through a number of other mechanisms. First, in populations characterized by large inequality, there is a lower likelihood that social networks and mutual assistance relationships will mitigate the deleterious effects of health shocks that compromise health status directly. Second, inequality is associated with those at the lower end of the income distribution facing greater

barriers in terms of access to credit needed both to expand economic opportunities, but to enable high return health investments. Third, it may also be that inequalities contribute to differences in preferences, and thus reduce political support for investments in public goods. That is, heterogeneity in preferences that derive from various forms of inequalities may make impede the types of political consensus required to promote spending on health-related public goods or services with large externalities, such as vaccinations, water and sanitation, health research, and so forth. Inequality therefore contributes to public institutions that are both inefficient and unequal in terms of protecting and promoting the needs of those in greatest need. Furthermore, there is the prospect that economic inefficiency will result from political tensions contributing to disproportionate shares of budgets and state and private resources being allocated to political repression, internal security, and other spending, rather than promoting the health and well-being of the population.

Of course, there is another relatively straightforward economic explanation for the negative impact of income inequality on health that revolves around the observation that there is a concave functional relationship between health and income. By implication, health will be worse in a population with the same level of average income, but greater with income inequality.

A comprehensive review of the empirical literature on the relationship between income inequality and health is found in Deaton (2003), who critically reviews both cross-country and within-country studies. His major conclusions are that income inequality is not a major determinant of population health; and that instead of focusing on the role of inequality, more attention should be accorded understanding the role of income levels in determining health outcomes.

### **VIII. Conclusions and Implications for Future Research**

This paper has discussed the many dimensions of health inequality, focusing both on defining the concept of health inequality, and related issues of methods employed to assess its magnitude and characteristics. Perhaps the most important consideration that evolves from this review is that health inequality is a multi-faceted concept, which merits attention above and beyond the issues of absolute levels of health. And furthermore, the focus on inequality of health is clearly something that goes beyond an academic exercise, and needs to be considered by policy makers who

have a more general interest in issues of social justice and economic efficiency, as well as broader concerns in the domain of the result of policy for overall equality and equity in the population. Of course, when it comes to the role of public policy, it is easiest and most convenient to highlight the issues of equality in the provision of public services. This narrow perspective, however, should be avoided. Instead, policy makers and researchers need to keep their attention focused on issues related to the equality of health outcomes, as well as equality in the dimension of the capability of achieving health.

One issue that is particularly problematic when examining the issue of health inequality is the potential tradeoff between the potential conflict between the competing goals of promoting health equality and improving mean outcomes. I have avoided this subject explicitly, although, it lurks in the background just as it does when it comes to income inequality and poverty reduction. In fact, some of the analytical issues discussed in this paper, such as the decomposition techniques that enable one to determine the extent to which an increase in inequality is associated with increasing inequality in consumption versus increasing in means of consumption, implicitly address this issue. Similarly, the analysis of fiscal incidence inevitably draws attention to the tradeoffs between equity and efficiency in the delivery of health services.

While there is a wide-ranging discussion of conceptual issues in this paper, most of it has been devoted to outlining approaches to empirical analysis of health inequality. The objective has been to provide an introduction to the topic and motivate research in this area as part of the overall project on health, poverty, and economic growth. While the discussion of the breadth of methods is necessarily limited in order to keep the length of this paper manageable, it does provide a range of possible research ideas and approaches that will hopefully motivate increased research on Africa in the area of health inequality.

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