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Urban-Rural Inequality in Living Standards in Africa

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Abstract

In this paper we examine the relative importance of rural versus urban areas in terms of monetary poverty and seven other related living standards indicators. We present the levels of urban-rural differences for several African countries for which we have data and find that living standards in rural areas lag far behind those in urban areas. Then we examine the relative and absolute rates of change for urban and rural areas and find no overall evidence of declining differences in the gaps between urban and rural living standards. Finally, we conduct urban-rural decompositions of inequality, examining the within versus between (urban and rural) group inequality for asset inequality, education inequality, and health (height) inequality.

Keywords: welfare, poverty, growth, income distribution
JEL classification: I3, R11, D31

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1 Introduction

Nearly three decades ago, Michael Lipton (1976) brought to the fore the concept of an urban bias in the process of economic development. Like others before him,[1] he noted the spatial differences or inequalities in poverty between urban and rural areas, and argued further that the consequential conflict between the rural and urban classes was an overriding source of struggle in poor countries—eclipsing even the well-articulated conflicts between labor and capital, and between foreign and national interests. Mellor (1976) and others were also pointing out the relative neglect of the rural sector, while at the same time highlighting the forward and backward linkages in agriculture and the critical importance of agricultural growth in producing much needed wage goods and in creating employment.

The promotion of rural development in general, and of agriculture as the leading engine of growth in particular, was also reflected in the evolution of Sir Arthur Lewis' thinking about the role of agriculture which had shifted from his dual-sector model and its focus on the surplus of labor in agriculture (Lewis 1954) to an emphasis on increasing the productivity of food producers and domestic demand (Lewis 1978). As Meier (1989) put it, 'agriculture must be viewed not merely as a source of surpluses to support industrialization, but also as a dynamic source of growth, employment, and better distribution of income'.

In the past decade, the emphasis on the needs of the rural sector, and importance of rural development in the process of economic growth continued to be heard. Sahn, Dorosh and Younger (1997) and Duncan and Howell (1992), for example, argue that one of the potential benefits of adjustment programs is the reduction in rural poverty through the terms of trade becoming more favorable to agriculture.[2] Stewart (1994) and Wagoa (1992), however, caution that such changes as promoting export-oriented agriculture may come at the expense of the food security for the poor.

While the debate on the role and relative neglect of the rural sector in economic development continues, a number of recent papers, as well as actions among international donors, have highlighted the growing concern over poverty and malnutrition in urban areas. Haddad, Ruel and Garrett (1999:1,900), for instance, argue that 'for a majority of countries, not only has the absolute number of the urban poor and undernourished increased in the last 15-20 years but they have done so at a rate that outpaces

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[1] See, for example, Dudley Seers who discusses the 'capital city' bias in development.

[2] Thorbecke (1996) also notes the adverse effects of distorted terms of trade on agricultural production in Nigeria. Block (1994) also found that real exchange rate depreciation, along with lagged research expenditures, explain most of the improvement in total agricultural factor productivity in Africa in the mid 1980s.

corresponding changes in rural areas'. Similarly, von Braun et al. (1993) suggest that rural-urban gaps in living standards are declining as urban inequality is growing; and Maxwell (1998) discusses how problems such as urban malnutrition and food insecurity are often overlooked and, unlike similar conditions in rural areas, are not recognized or addressed in by policy-makers.[3]

This paper has two objectives. The first is to address what the data for sub-Saharan Africa reveal about the relative importance of rural versus urban areas in terms of asset poverty and other related living standards indicators. The second objective is to measure overall inequalities in measures of living standards in African countries, and to determine the extent to which these observed inequalities are a consequence of inequalities between urban and rural areas, as opposed to inequalities within urban and rural areas. This objective is differentiated from the first objective in that it measures dispersions, rather than being a measure of central tendency. Nonetheless, to the extent that policy-makers are willing to trade higher average levels of living standards for lower inequality in the standard of living, it is worthwhile exploring overall inequality in welfare outcomes, and decomposing this inequality into components that focus policy-makers attention on the causes of the disparities.

In the remainder of the paper, we begin with a description of the data, including when and where they were collected. In Section 3, we provide a more detailed discussion of the variables that we construct, and of the methods we employ to evaluate and test the spatial differences in our broadly defined notion of poverty. This is followed by a discussion of the results in Section 4. We conclude with some observations about the persistence of the rural/urban divide observed in the data.

2 Data

In this analysis we take advantage of the Demographic and Health Surveys (DHS)—a series of reliable household survey data sets that are comparable over time as well as across regions—to shed light on the urban-rural disparities in welfare indicators for up to 24 African countries.[4] As discussed in Sahn and Stifel (2001), the relatively small number of comparable integrated household surveys has limited our ability to understand changes in welfare over time, and make intercounty comparisons in Africa. In contrast, the demographic and health surveys have not only been designed to be nationally representative, but have employed a common survey instrument, with few differences found both across time and countries. Where these differences occur, they generally

[3] One consequence of this shifting emphasis, as Lipton (2001) estimates, is that 'the real level of aid to agriculture in the late 1990s was barely one-third (34.7 percent) of its level in the late 1980s (itself already well below the peak of the late 1970s).' Further, urban-oriented policies alone may not effectively reduce urban poverty given incentives for rural-urban migration (Harris and Todaro 1970, and IFAD 2001).

[4] Macro International, Inc implements the DHS program with funding from USAID. Additional information on the DHS data can be found at the following website: www.measuredhs.com.

involve the collection of additional information in more recent surveys (which does not impede intertemporal comparisons so long as they are limited to common modules),[5] or making small adjustments in how questions are formulated, for example, to capture the differences in the description of schooling levels in francophone and Anglophone Africa. However, these differences are not critical to our intertemporal or interregional comparisons in this paper, since we only use sections of the survey that have not changed and are strictly comparable.[6] In addition, training, measurement, and data collection procedures are overseen by Macro International, Inc., and as such are basically common across surveys.[7] Sampling procedures are also designed in each country to be representative based on the most recent census, and follow common enumeration procedures.

The DHS program has conducted over 70 nationally representative household surveys in more than 50 countries since 1984. In this study, we use 43 of the surveys for 24 sub-Saharan African countries that have cross-sectional surveys available. The DHS surveys are conducted in single rounds with two main survey instruments: a household schedule and an individual questionnaire for women of reproductive age (15-49). The household schedule collects a list of household members and basic household demographic information and is used primarily to select respondents eligible for the individual survey. The individual survey, inter alia, provides information on household assets, reproductive histories, health, and the nutritional status of young children. The quality of the data is generally regarded as good, and compares favorably with the most rigorous household surveys conducted in Africa.

The DHS program is designed for typical self-weighted national samples of 5,000 to 6,000 women between the ages of 15 and 49. In some cases the sample sizes are considerably larger, and some areas are over- or under-sampled. Household sampling weights are used to account for over- and under-sampling in various regions within surveys. Since all regions are sampled in the DHS surveys, with the exception of Uganda, we make the

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[5] Among the most significant change over the course of the DHS is that in the first wave of surveys (DHS I), co-resident husbands of women successfully interviewed in the individual survey were generally also interviewed in half of the clusters. This practice was changed in the later waves (DHS II and III) to have a nationally representative sample of men, by interviewing all men aged 15-49 living in every third or fourth household. In addition, more recent surveys have included an expanded module on AIDS related issues such as at-risk behavior and knowledge of preventative measures. In this paper, we do not utilize any of these additional questions, and limit ourselves to core questions whose formulation remained constant.

[6] By increasing the burden on respondents and enumerators, additions to questionnaires can admittedly have consequences for data quality, and consequently comparability. (We would like to thank an anonymous referee for raising this point.) While this is indeed a concern, we do not consider it a first order problem. This follows because many of the indicators—which have not changed over time—that are used in this analysis appear in early sections of the questionnaires before respondent fatigue generally sets in.

[7] Minor changes in training procedures since the first wave of DHS surveys in the mid-1980s (e.g. further probing in the birth history section), could affect comparability over time. Nonetheless, the authors' experiences with overlapping periods of the recall data (primarily birth histories) have been good with surprisingly close estimates of indicators in these periods over the differing surveys. Readers are welcome to contact David Stifel (stifled@lafayette.edu) for evidence to this effect.

surveys nationally representative through the use of sampling weights. Districts in northern Uganda were not included in the 1988 survey because of armed conflict.

3 Methods

In this section we describe the separate indicators and methods that we use to evaluate the relative progress of urban and rural areas in the African countries with DHS data. In light of the growing emphasis on multidimensional aspects of poverty (Sen 1987; UNDP 1997; Sahn, Stifel and Younger 1999; Appleton and Song 1999; World Bank 2000b), we analyze the levels and trends of seven non-money metric indicators of well-being in addition to a wealth index based on household assets. More specifically, we present the levels and the urban-rural differences in these indicators for each of the countries for which we have data. Then we examine the relative rates of change for urban and rural areas using an improvement index (Kakwani 1993) that adjusts for the base level of living standards.

3.1 The indicators

Indicator 1: asset poverty

Given the absence of expenditure data in the DHS, we construct a welfare index from households' asset information. While there are obvious concerns that our asset index will not provide the same precise portrait of intertemporal and interregional poverty differences as would income or consumption, we have shown elsewhere that the use of the asset index is appropriate for such analyses (Sahn and Stifel 2000). Further, our research suggests that as a measure of well-being, the asset index performs as well, if not better, in predicting other non-income measures of well-being (Sahn and Stifel 2003).

Since we want to compare the distributions of asset indices over survey years for each country, the datasets for each of the eleven countries for which we have at least two years of survey data and estimates of $1/day poverty rates, are pooled by country, and the factor analysis household asset indices are estimated for each pooled sample. To determine changes in poverty, we iteratively estimate poverty lines for each of the eleven countries in order to replicate the national $/day poverty rates found in World Bank (2001a). Because the DHS survey years and years for which $1/day poverty estimates coincide for only Ghana and Madagascar, the poverty lines must be estimated iteratively for all of the other countries by assuming a linear rate of change in poverty between the two survey years.[8] Once we have the poverty lines for each country, urban and rural poverty rates are estimated for each of the survey years.

[8] In the case of Ghana, Kenya, Senegal and Tanzania where we have three surveys, we iteratively estimate linear regression lines through the three poverty rates.

Indicator 2: primary school enrollment rates and educational attainment

For ten African countries, the household roster section of the DHS data records age of individuals and their educational status for at least two survey periods.[9] Using this information, we estimate the percentage of children between the ages of six and fourteen inclusive in urban and rural areas who were enrolled in school at the time of the survey. The household roster also includes information on the educational attainment of all household members. We use this information (years of education) for working-age adults (ages 15 to 40) for each of the 24 countries to analyze educational inequality.

Indicator 3: gender disparities in primary and secondary education

For the same ten countries for which we estimate changes in enrollments, we also estimate changes in the ratios of girls-to-boys enrolled in primary and secondary schools. This indicator of gender disparity in education is calculated by simply estimating in the samples of all individuals enrolled in primary and secondary schools, the ratio of girls to boys regardless of their age. These ratios (multiplied by 100) are estimated for urban and rural areas in each of the survey years.

Indicator 4: infant mortality rates

Infant mortality rates (IMRs) are constructed from the section of the individual survey instrument that includes birth histories of each of the women interviewed. This provides information on all live births, the ages of living children, and the dates of deaths of children who did not survive to the date of interview. Infant mortality ($_1q_0$) for a given cohort of children is defined as the simple probability of a child dying before his/her first birthday. We estimate infant mortality rates for cohorts of children born in each of the ten years prior to the date of the survey for the each of the 24 African countries with DHS data.[10]

The retrospective nature of the birth histories, however, gives rise to a censoring problem in the estimation of mortality rates. Since the birth histories are recorded for women of child-bearing age (15-49) at the time of the interview, observations on births 10 years prior to the interview do not account for children born to the cohort of women age 40-49 at that time. Sahn, Stifel and Younger (1999) find statistically significant parameters across-the-board for ten countries on the age and age squared of the mother in infant mortality regressions. Thus, uncorrected estimates of infant mortality rates become more biased as one goes back in time from the date of the survey, and are not comparable across surveys for a given time period. To avoid the censoring problem, we truncated the sample of children to only those born to mothers of age 15-39 at the date of birth, or roughly 90

9 This information was not available in the first round of the DHS.

10 Because of the retrospective nature of the data, we do not need more than one survey to estimate changes in infant mortality rates. Thus we have indicators of changes in infant mortality rates for all 24 countries in Sub-Saharan Africa for which DHS data are available.

percent of all children reported to have been born in each of the samples, and we extend our mortality estimates back only 10 years from the date of the survey. Note that we also exclude from our sample all children born within one year of the survey because these observations represent censored spells (i.e., the child may still have died before his/her first birthday though after the enumerators visited the household). For each survey, we then have ten point estimates of IMRs—one for each of the ten years prior to the survey. Consequently, for countries with two (three) surveys, we have 20 (30) IMR point estimates, with some years overlapping.[11] Regression lines are then run through these data points for each country to estimate linear annual rates of change in infant mortality rates. We allow these rates of change to differ across survey years for countries with more than one DHS survey and report them as such when they are statistically different.

Indicator 5: neonatal care

Because of the difficulty in measuring actual maternal deaths (i.e., deaths at childbirth), we employ a proxy for the prevention of such deaths. Given that a large number of maternal deaths follow from infections, blood loss and unsafe abortion, and are thus preventable, the proportion of births attended by skilled health personnel provides a means of tracking progress in preventing them. Further, since this form of health care is a primary policy mechanism that can be employed to address maternal mortality, tracking it allows us to also track the progress of public policy toward achieving the right of women to good health. Thus, while we are unable to measure the output (maternal deaths) we can and do measure changes in an input into reducing maternal mortality (births attended by skilled health personnel).

This indicator of the quality of neonatal care is recorded in the maternity section of the individual survey instrument in the DHS. In this section, each woman is asked about all births she had within the five years prior to the survey, including who was present at the birth. If a doctor, a nurse, a midwife and/or a 'trained health professional' was present at a birth, then the mother is recorded to have received neonatal health care from skilled health personnel for that particular birth. Since there are many mothers in the samples with more than one birth recorded in the five years prior to the surveys, it is possible (and observed) for some women to have births that were both attended and not attended by trained professionals. In a manner similar to that used for estimating IMRs, the percentage of births attended by skilled personnel is estimated for each cohort of children born in each of the five years prior to the date of the survey for each of the 24 countries with DHS data.[12] Regression lines are then run through these data points to estimate linear annual rates of change for each of these countries, and to predict the percentage of births attended by skilled health personnel in the survey years.

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[11] Sahn, Stifel and Younger (1999) find remarkably close infant mortality rate point estimates within countries where there exist more than one survey and where there is overlap among the yearly estimates. This suggests that the quality of these recall data is very good.

[12] As with the mortality data, only one survey is necessary to estimate changes in the quality of neonatal care because of the retrospective nature of the maternity data.

Indicator 6: use of reproductive health services

The DHS data have a wealth of information on knowledge and use of contraceptives. Each woman in the individual survey instrument is asked detailed questions about contraceptives as well as her current reproductive status. This permits us to estimate the share of women in need of reproductive health services who have knowledge of modern contraceptives and who use them. Two issues need clarification here. First, we define women who need access to modern contraceptives as those who are fecund and do not currently want to get pregnant. To do this, we drop from our sample of women those who are declared infecund or are menopausal, and those who report desiring to have children. This leaves non-menopausal women who either want no more children or report wanting a child but after two or more years (i.e., desiring to space the births). Second, modern contraceptives are defined as the pill, IUD, injections, diaphragm, foam, jelly, condom, sterilization (male or female), and Norplant^{TM} or other implants.

The percentages of women in need of access to reproductive health services who use modern contraceptive methods are estimated for urban and rural areas in the 13 African countries with at least two DHS surveys.

Indicator 7: child malnutrition

We use the standardized heights of pre-school age children, a measure of linear growth failure or chronic malnutrition. As discussed elsewhere, the percent of children who are 'stunted' is an excellent measure of nutritional deprivations and the health of the population (Pradhan, Sahn and Younger 2001; Beaton et al. 1990). We limit ourselves to estimating malnutrition as the percentage of the sample of children with height-for-age z-scores (HAZ) two standard deviations below the mean for the international reference population (i.e., stunting rates) in keeping with the recommendations of the World Health Organization (1983). Stunting rates are estimated in urban and rural areas in the 14 countries that have at least two DHS surveys with an anthropometry section.

Indicator 8: malnutrition of women

The indicator of nutritional status of adult women used in this paper (and available in a subset of the DHS) is the body mass index (BMI), also known as Quetelet's Index. The BMI for a particular individual is calculated as her weight (kg) divided by the square of her height (m^2). As recommended by the WHO (1995), our measure of malnutrition among women uses 18.49 as the cutoff to estimate the share of women in a population who are wasted. We refer to this as BMI malnutrition, and estimate it in urban and rural areas in the 7 countries for which BMI measures were made in at least two DHS surveys.

Table 1 shows the 24 African countries with DHS data and the years in which the data were collected. It also shows which indicators are available for each country. For example,

Table 1: Indicators of well-being in the Demographic and Health Surveys (DHS) in Africa

Indicator		Asset poverty	Enrollments	Ratio of girls-to-boys enrolled	Infant mortality rate	Neonatal care with skilled personnel	Contraceptive use	Child stunting	Adult malnutrition
Countries									
1	Benin (1996)				X	X			
2	Burkina Faso (1992,1999)	X	X	X	X	X	X	X	X
3	Burundi (1987)				X	X			
4	Cameroon (1991, 1998)		X	X	X	X	X	X	
5	Central African Republic (1994)				X	X			
6	Chad (1997)				X	X			
7	Comoros (1996)				X	X			
8	Cote d'Ivoire (1994)				X	X			
9	Ghana (1988, 1993, 1998)	X	X	X	X	X	X	X	X
10	Kenya (1988, 1993, 1998)	X	X	X	X	X	X	X	X
11	Madagascar (1992, 1997)	X	X	X	X	X	X	X	
12	Malawi (1992)				X	X			
13	Mali (1987, 1995)	X			X	X	X	X	
14	Mozambique (1997)				X	X			
15	Namibia (1992)				X	X			
16	Niger (1992, 1997)	X	X	X	X	X	X	X	X
17	Nigeria (1990, 1999)	X	X	X	X	X	X	X	
18	Rwanda (1992)				X	X			
19	Senegal (1986, 1992, 1997)	X			X	X	X	X	
20	Tanzania (1991, 1996, 1999)	X	X	X	X	X	X	X	X
21	Togo (1988,1998)				X	X		X	
22	Uganda (1988, 1995)	X			X	X	X	X	
23	Zambia (1992, 1996)	X	X	X	X	X	X	X	X
24	Zimbabwe (1988, 1994, 1999)	X	X	X	X	X	X	X	X

Note: 'X' denotes indicators that are available.

Source: See text.

all of the indicators are available for Burkina Faso, Ghana, Kenya, Madagascar, Niger, Nigeria, Tanzania, Zambia and Zimbabwe. Cameroon has all of the indicators except asset poverty because there are no estimates for $1/day poverty for this country available in World Bank (2001a), and as such an absolute percentage of the population living in extreme poverty cannot be estimated using the asset index. Further, Mali has all of the indicators except those concerned with enrollments. This follows because the 1987 data was collected in the first wave in which no information was recorded on the education of the household members.[13] For the nine countries with only one survey, indicators are only available for changes in infant mortality and neonatal care.

Finally, a note on testing differences in the levels and changes in the levels of these indicators: since asset poverty, enrollments, contraceptive use, child stunting and adult malnutrition are estimates of simple proportions, and since all of the surveys are sampled independently, standard z-tests are used to test the differences in urban and rural levels of these indicators, as well as the differences in changes in these levels for urban and rural areas. Similarly, differences in urban and rural infant mortality rates and rates of neonatal care are tested using standard z-statistics. The differences in the urban and rural rates of change in these two indicators, however, are determined by testing the differences in the parameter estimates from the regressions. For example, for IMR, the following regression is estimated

$$IMR = \beta_0 + \beta_1 Urban + \beta_2 Year + \beta_3 Year * Urban + \varepsilon ,$$

where, *IMR* is the infant mortality rate for the cohort of children born in a particular year (and measured by a particular survey),[14] *Urban* is an urban dummy variable, *Year* is the year of birth for the cohort of children, and *Year*Urban* is an interaction term which represents the difference in the temporal rate of change in infant mortality rates in rural areas (β_2) and in urban areas ($\beta_2 + \beta_3$). If β_3 is negative and significant, then we conclude that IMRs are falling at a faster rate (or are rising at a slower rate) in urban areas than in rural areas, and vice versa.

3.2 Measuring improvement

To assure that we capture the economic significance of changes in the various welfare indicators, we first, look at changes in percentage terms and compare urban and rural areas. Second, we adopt Kakwani's axiomatic approach to measuring performance in living standards by using achievement and improvement indices (Kakwani 1993). This approach accommodates the view that a further improvement of the living standard of a region

[13] Note that this also affects Ghana, Kenya and Zimbabwe. But since each of these countries has three surveys, two of which were in the second or third wave when information on educational status and attainment was included in the household roster, changes in enrollments can be estimated. Although Senegal has two later wave surveys, information on education is not available in the 1992 data.

[14] In the countries for which there are two or more DHS surveys, it is possible to have two or more estimates of *IMR* for a particular year. In the case of Tanzania, for instance, we have three estimates of the IMR for 1990—one from each of the three surveys (1991, 1996 and 1999).

where the standard is already at a high level signifies an achievement greater than that of another region with an equal increase, but starting at a lower base. An extreme cross-country example illustrates why this is important when we consider regional changes in poverty. According to the World Bank (1998), the infant mortality rate in Uganda dropped from 109 to 99 deaths per thousand live births between 1970 and 1996, respectively. Over the same period, the infant mortality rate in Japan fell from 13 to 4 deaths per thousand live births. In both cases, the mortality rates dropped by approximately 10 deaths per thousand live births. Nevertheless, one would be hard pressed to argue that Uganda's advances, while not negligible, are on par with Japan's (Sen 1981). To avoid reaching conclusions about performance based on changes without consideration of the initial levels, we appeal to Kakwani's improvement index.

Kakwani's improvement index can only be applied to measures of welfare that have upper and lower bounds, or for which such bounds can be reasonably defined. For many measures of living standards, there exist some well-defined limits. For example, if we define some measure of infant mortality that indicates improvement as it increases (e.g. $I(IMR)=1000-IMR$, where IMR is the infant mortality rate), then there are clear upper and lower bounds. We shall call the upper bound $\overline{M}$, and similarly $\underline{M}$ shall denote the lower bound. Kakwani (1993) shows that if we define an achievement index as follows,

$$f(x_t, \overline{M}, \underline{M}) = \frac{\ln(\overline{M} - \underline{M}) - \ln(\overline{M} - x_t)}{\ln(\overline{M} - \underline{M})},$$

where x_t is the increasing welfare measure at survey date t (we'll refer to time periods 1 and 2), then we can construct an improvement index as follows,

$$Q(x_1, x_2, \overline{M}, \underline{M}) = f(x_2, \overline{M}, \underline{M}) - f(x_1, \overline{M}, \underline{M})$$

$$= \frac{\ln(\overline{M} - x_1) - \ln(\overline{M} - x_2)}{\ln(\overline{M} - \underline{M})}.$$

This index ranges from –1 to 1, where –1 indicates the worst possible outcome (upper bound to lower bound), and 1 indicates the best possible outcome (lower bound to upper bound). It is also increasing in x_2 and decreasing in x_1. Further, it is additive and gives greater weight to improvements for a region that has a higher initial welfare level. We apply this improvement index to all of our welfare indicators at the national, urban and rural levels to compare changes over time.[15] For all of the indicators except IMRs and neonatal care, we test urban and rural differences in levels and in changes in levels by noting that the improvement index is the difference between two independent random

[15] The value of improvement index is that it captures the degree of difficulty in any achievements that are made. We note, however, that this is not consistent with equity-favoring national social welfare functions when comparing achievements between urban and rural areas. Such social welfare functions place greater weight on similar absolute achievement levels in the 'poorer' regions, rather than in the 'richer' regions (as the improvement index does).

variables (achievement indices), and that achievement index is a continuous function of a random variable, the variance of which we already know (see discussion in Section 3.1). As such, the variance of the improvement index is the sum of the variances of the achievement indices, which are themselves determined using the delta method.[16] Tests for differences in IMRs and neonatal care rates are analogous to those done for the levels, except that the dependent variables in the regressions are the achievement indices instead of the indicators themselves.

3.3 Inequality decompositions

In addition to examining levels and trends in urban-rural gaps, we also explore levels of national inequality, decomposing them into between and within urban and rural group inequality. Our inequality decompositions are limited to three of our indicators above: the asset index, child nutrition as captured by the normalized linear growth of pre-school age children, and the final year of schooling of the cohort of persons 15 to 40 years of age (i.e. potential members of the labor force). As we discuss in some greater detail below, each of these are continuous variables where we can determine and measure distributions of values in a given population. In contrast, for other discrete welfare measures in this paper, such as gender ratios or access to pre-natal care, it is simply not possible to measure inequality, let alone decompose it.

We use the Theil entropy measure (α = 1) as our measure of inequality for all three variables because it is decomposable by groups. The Theil index is defined by

$$I = \frac{1}{N}\sum_{i=1}^{N}\frac{x_i}{\mu}\ln\left(\frac{x_i}{\mu}\right)$$

where N is the sample size for the given country, x_i is the variable of interest (e.g., asset indices, educational attainment, or standardized heights) for individual or household i, and μ is the sample mean of the variable at the national level. The Theil entropy measure in turn can be decomposed into the sum of within and between region contributions. The within region contribution is defined as

$$\mathrm{W} = s_{urban} I_{urban} + s_{rural} I_{rural} \ ,$$

where s_i is the share of the sum of the variable in region i relative to the national sum, and I_i is the Theil inequality index of region i. And the between region contribution is defined as

$$\mathrm{B} = s_{urban}\ln\left(\frac{\mu_{urban}}{\mu}\right) + s_{rural}\ln\left(\frac{\mu_{rural}}{\mu}\right)$$

where μ_i is the sample mean of the variable for region i (i = urban, rural).

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[16] If $\mathrm{var}(x) = \sigma^2$, then $\mathrm{var}(f(x)) = \left(\frac{\sigma}{\ln(\overline{M} - \underline{M}) * (\overline{M} - x)}\right)^2$.

Asset index decompositions

An issue that arises with respect to this exercise in the case of the asset index, is that the mean and variance of the distribution of indices are arbitrarily defined by assumption to be zero and one. There are two consequences of this for our measurement and decomposition of inequality. The first is that any positive finite transformation of the values of the household indices does not change the information provided. For example, adding five to the value of the index for each household will maintain the rank ordering of households, giving us the same information as the untransformed set of asset indices. The only difference between the two is the identifying assumption (necessary for estimation) that the value of the mean of the distribution is now five instead of zero. The problem is that this shift in the distribution reduces inequality as measured by any Lorenz consistent measure (e.g., the Theil).[17] Nonetheless, we proceed with estimating levels of inequality for our asset index, not because we are inherently interested in them, but because we can decompose them to determine the share of inequality attributable to levels of inequality within urban and rural areas, and to levels of inequality between urban and rural areas. We ran sensitivity tests to get a sense of how much the decompositions change with the degree to which the distributions are shifted. We found them to be robust to within 5 percentage points of the shares of inequality attributable to between and within contributions for shifts up to 5 standard deviations.[18]

The second consequence is that the asset index takes on negative values. Since the Theil index is defined over positive real numbers, we cannot measure inequality using the unadjusted values of the asset index. To resolve this problem we simply shift the distribution by an amount sufficient to transform all the values to be positive—i.e., we add just more than the negative value of the smallest number to each household's index value. Again, although shifting the distribution in this manner reduces the level of inequality, our sensitivity tests mentioned previously suggest that the shares of inequality attributable to within- and between-group inequality are little affected.

Health and education decompositions

Before discussing our measurement and decomposition of education and health inequality, we emphasize that we examine pure inequalities in these measures—often referred to as univariate inequality—not socioeconomic inequalities in health and education, which measure inequality in these outcomes by a measure of income or some other indicator of socioeconomic status. Indeed, most of the literature on health and education inequality explores how health differs across various socioeconomic dimensions (e.g., Wagstaff et al.

[17] Note that any multiplicative change in the values of the household indices leaves inequality unchanged.

[18] These tests involved shifting the distributions of asset indices for each of the countries and decomposing inequality each of these shifted distributions. The results were that for all of the countries, the percentages of inequality attributable to between and within contributions changed by no more than 5 percentage points when the distributions where shifted by 5 standard deviations. The results of these tests are available upon request from the authors.

1991; Contoyannis and Forster 1999; van Doorslaer et al. 1997; Filmer et al. 2000). Another, albeit small, set of papers focus on univariate inequality in health and education (Pradhan, Sahn and Younger 2002; LeGrande 1987; Thomas, Wang and Fan 2000; Gakidou, Murray and Frenk 2000), not the correlations between health status and other socioeconomic indicators, or the 'gradient', as it is commonly termed. Perhaps the simplest way to distinguish what we do in this paper from the traditional approach is that our 'univariate' approach orders individual well-being by health status or education attainment, not income levels, and describes the inequality in health status across this health ordering.

In the case of education, we build upon the previous work of Thomas, Wang and Fan (2000) and Lopez, Thomas and Wang (1999:1,921-45) who develop the concept of an education Gini index based on attainment data (i.e., the ultimate year of schooling for the labor force population). They point out that education inequality is an important indicator for looking at the distribution dimension of human capital and welfare and is an important complement of measures of the average stock of education. They conduct an analysis of education inequality, both conducting an international comparison of education inequality, as well as examining how education inequality has changed over time.

Inequality in health is measured by the inequality in linear growth of children, in keeping with our use of child height as an indicator of well-being. Defining health inequality based on linear growth in children, however, presents a special challenge, since, as discussed at considerable length by Pradhan, Sahn and Younger (2002), we must deal with the fact that in a perfectly healthy population, there is genetic variation in the height potential of individuals (Carr 1988). This genetic variation in height potential is determined by measuring the heights, standardized for age and gender, of the same healthy population that the World Health Organization uses as the reference standard for defining malnutrition. As such, there will always be variations in children's heights, standardized for age and gender, even in a healthy population with complete health equality, as measured by the absence of any stunting or growth retardation. To respond to this concern, we use measurements from a healthy population to establish genetically determined variation in heights of children. We then assess the extent to which inequality of heights in our sample, conditional on gender and age, differs from the inequality observed in the healthy reference population to quantify health inequality. By implication, there will be no height inequality as we measure it if all children are well-nourished.[19]

[19] In this analysis, we take the National Center for Health Statistics reference population as representative of the healthy population. According to the World Health Organization, the NCHS population is globally representative of healthy, well-nourished children, regardless of ethnic or racial characteristics, thus providing the basis for our assumption that the distribution of standardized heights in that population represents only genetic variation (WHO 1983).

4 Results

4.1 Urban-rural gaps in living standards

Table 2 presents the urban-rural differences in our various welfare indicators, as well as the relevant statistical tests, for the last survey year in each of the countries for which we have data, as well as the pooled results and the relevant test results. A quick perusal of the country specific and pooled numbers—most of which are large, positive and statistically significant—illustrates that standards of living in rural areas almost universally lag far behind urban areas. For example, in 6 of 12 countries the asset index poverty headcount is more than 50 percentage points greater in rural areas than in urban areas. Moreover, the smallest urban-rural difference is 30 percentage points—the case of Kenya. Enrollment rates in urban areas are dramatically higher than in rural areas. This is especially so in Burkina Faso and Niger. In the former, the urban enrollment rate was 69 percent, whereas it was only 18 percent in rural areas. The comparable numbers for Niger are 55.5 and 14.6. Kenya, once again, shows the smallest urban-rural disparity, with Zimbabwe not far behind. The pooled differences are similarly large, at 47.4 percent for asset poverty and 18.4 percent for enrollments.

Like enrollments in general, the ratio of girl-to-boy enrollments is far higher in urban than rural areas in most countries. This is particularly so in countries where enrollment rates are generally low, such as Burkina Faso and Niger. We also note that in rural Madagascar, the girl-to-boy enrollment ratio is 96, better than the 85 recorded in the urban areas. This situation is a reversal of what was observed in the earlier Madagascar survey data, a point we will come back to later when we look at changes over time.

In 5 of the 24 countries, infant mortality rates are higher in urban areas: Benin, Burundi, Chad, Rwanda and Zambia. This finding is not consistent with all of the other indicators for these countries. We are hard pressed to explain this finding, other than to note that in the particular cases of Burundi and Rwanda, part of the story may be attributable to the influx of rural refugees from continued ethnic conflicts. The spatial differences in access to neonatal care are also very large. In Burundi, for example, skilled health personnel attend 83 percent of births in urban areas. Contrast this with the 16 percent estimated for rural areas. The smallest difference is in Nigeria, where the urban and rural figures are 59 and 36 percent, respectively. Nutritional status of children and adults is also considerably better in urban than in rural areas. In Zimbabwe, for example, more than twice the share of children are malnourished in rural (34 percent) than urban areas (15 percent). And pooling the data, we find that the difference is a statistically significant 10.5 percent. Similarly, adult undernutrition among women as measured by the body mass index shows far greater rates of wasting in rural than in urban areas.

Table 2: Differences between urban and rural indicators

Indicator		Asset poverty	Enrollments	Ratio of girls-to-boys enrolled	Infant mortality rate	Neonatal care with skilled personnel	Contraceptive use	Child stunting	Adult malnutrition
Positive (negative) values indicate higher levels of well-being in urban (rural) areas[a]									
Countries									
1	Benin (1996)				-14.7	24.4 **			
2	Burkina Faso (1999)	68.6 **	50.5 **	37.3 **	10.7 **	69.4 **	26.5 **	16.3 **	4.0 **
3	Burundi (1987)				-66.2 **	65.7 **			
4	Cameroon (1998)		17.7 **	7.8 *	30.3 *	37.5 **	11.7 **	9.9 **	
5	Central African Republic (1994)				41.4 **	52.3 **			
6	Chad (1997)				-20.5 *	35.2 **			
7	Comoros (1996)				6.6 +	30.1 **			
8	Cote d'Ivoire (1994)				19.7 **	48.1 **			
9	Ghana (1998)	48.0 **	13.9 **	4.8	22.8 *	46.4 **	4.7 **	15.3 **	7.3 **
10	Kenya (1998)	30.3 **	0.7	-1.0	11.8	35.9 **	12.9 **	9.6 **	4.9 **
11	Madagascar (1997)	45.3 **	24.3 **	-11.5 *	26.4 *	28.1 **	10.8 **	4.4 *	
12	Malawi (1992)				2.0	38.9 **			
13	Mali (1995)	62.0 **			44.7 **	54.1 **	15.8 **	11.4 **	
14	Mozambique (1997)				7.7 **	57.6 **			
15	Namibia (1992)				11.2 +	26.4 **			
16	Niger (1997)	59.1 **	40.9 **	38.9 **	67.8 **	61.7 **	23.1 **	11.7 **	7.5 **
17	Nigeria (1999)	45.9 **	18.4 **	4.8	4.8 +	21.5 **	12.0 **	5.5 +	
18	Rwanda (1992)				-30.8 **	39.4 **			
19	Senegal (1997)	42.3 **			56.6 **	50.1 **	22.1 **	15.5 **	

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20	Tanzania (1999)	51.0 **	21.4 **	8.4	23.5 **	49.1 **	23.9	**	21.9 **	1.6 +
21	Togo (1998)				8.8 **	49.1 **	9.7	**	9.2 **	
22	Uganda (1995)	34.7 **			11.9 +	46.8 **	21.5	**	18.3 **	
23	Zambia (1996)	77.3 **	20.5 **	7.3 *	-6.3	50.9 **	16.3	**	16.1 **	2.1 **
24	Zimbabwe (1999)	56.2 **	5.3 **	7.6 +	14.0 +	28.5 **	16.7	**	8.3 **	0.8
Pooled		*47.4 **	*18.4 **	*7.4 **	*23.6 **	*35.4 **		*14.9 **	*10.5 **	*3.9 **

Note: [a]These are simply the arithematic differences of the indicators. For enrollments, ratio of boys-to-girls, neonatal care and contraceptive use this is $D_i = U_i - R_i$, where U_i is the level of the indicator in urban areas and R_i is the level of the indicator in rural areas. For the remaining indicators, this is $D_i = R_i - U_i$. The implication is that positive values that appear in the table indicate higher levels of welfare in urban areas, while negative values indicate higher levels of welfare in rural areas. ** indicates signficance at 99% level of confidence; * at 95% level of confidence; and + at 90% level of confidence.

Source: see text.

Table 3: Has welfare improved more in urban areas?
Welfare indicators

Indicator		Asset poverty	Enrollments	Ratio of girls-to-boys enrolled	Infant mortality rate	Neonatal care with skilled personnel	Contraceptive use	Child stunting	Adult malnutrition	Total
Countries										
1	Benin (1996)				no *	(yes)				1/2
2	Burkina Faso (1992,1999)	yes	yes **	yes *	no **	yes **	yes **	(yes)	no	5/8
3	Burundi (1987)				no **	(no)				0/2
4	Cameroon (1991, 1998)		yes **	no	no	yes	yes +	(no) +		4/6
5	Central African Republic (1994)				no	(no)				0/2
6	Chad (1997)				no *	(no) +				0/2
7	Comoros (1996)				no	no +				0/2
8	Cote d'Ivoire (1994)				no	(yes) *				1/2
9	Ghana (1988, 1993, 1998)	no **	no	no	no	yes	no *	yes	yes *	5/8
10	Kenya (1988, 1993, 1998)	no *	no	(no)	(no)	(yes)	no	no	(no)	2/8

11	Madagascar (1992, 1997)	no	**		no	*		no	*		no			(no)			no	**		no	*				1/7
12	Malawi (1992)										no			yes	*										1/2
13	Mali (1987, 1995)	yes									no			no			yes	**		(yes)					5/5
14	Mozambique (1997)										no	*		yes	**										1/2
15	Namibia (1992)										yes			no											2/2
16	Niger (1992, 1997)	yes			yes	**		yes			no			no	*		yes	**		(no)			(yes)		6/8
17	Nigeria (1990, 1999)	no	**		no	**		no	*		no	+		no			yes			(no)					1/7
18	Rwanda (1992)										no	+		no	*										0/2
19	Senegal (1986, 1992, 1997)	yes	**								yes	**		no	**		yes	**		yes	+				5/5
20	Tanzania (1991, 1996, 1999)	yes			yes	**		yes			yes			(yes)	*		yes	+		yes	**		no	+	6/8
21	Togo (1988,1998)										no			yes	+		yes			no					3/4
22	Uganda (1988, 1995)	no									yes			(equal)			yes			no					2/5
23	Zambia (1992, 1996)	(no)			(no)	*		no			no	**		(no)			no			(yes)			no		1/8
24	Zimbabwe (1988, 1994, 1999)	(yes)	**		(no)			yes			no			no			no	+		no			(no)	*	2/8
No. with significant convergence		4			3			2			8			5			3			2			2		
No. with significant divergence		2			4			1			1			6			6			2			1		
Pooled		*conv*	**		*conv*	**					*conv*	**		*conv*	**										
Pooled w/out Nigeria		*conv*	**		*div*	**																			
Number of countries		12			10			10			24			24			14			14			7		

Note: 'yes' indicates that welfare improved more in urban areas, or that it improved in urban areas and worsened in rural areas; 'no' indicates that welfare did not improve more in urban areas, or that it improved in rural areas and worsened in urban areas; 'equal' indicates that welfare increased in both urban and rural areas at the same rate; '(yes)' indicates that welfare decreased in both urban and rural areas and the rate of decrease was smaller in urban areas; '(no)' indicates that welfare decreased in both urban and rural areas and the rate of decrease was greater in urban areas; '(equal)' indicates that welfare decreased in both urban and rural areas at the same rate. ** indicates signficance at 99% level of confidence; * at 95% level of confidence; and + at 90% level of confidence.
Source: see text.

Table 4: Have achievement indices improved more in urban areas?
Kakwani Indices

	Indicator	asset poverty		enrollments		ratio of girls-to-boys enrolled		infant mortality rate		neonatal care with skilled personnel		contraceptive use		child stunting		adult malnutrition		Total
	Countries																	
1	Benin (1996)							no	*	(yes)								1/2
2	Burkina Faso (1992,1999)	yes		yes	**	yes	**	no		yes	**	yes	**	(no)		no		5/8
3	Burundi (1987)							no	**	(no)	*							0/2
4	Cameroon (1991, 1998)			yes	**	no		yes		yes		yes	+	(no)	*			4/6
5	Central African Republic (1994)							no	**	(no)	*							0/2
6	Chad (1997)							no	*	(no)	*							0/2
7	Comoros (1996)							no		no	+							0/2
8	Cote d'Ivoire (1994)							no		(yes)								1/2
9	Ghana (1988, 1993, 1998)	yes	**	no		no		yes		yes		no	*	yes		yes	**	5/8
10	Kenya (1988, 1993, 1998)	yes		no		(no)		(no)		(no)		yes		no		(no)		2/8
11	Madagascar (1992, 1997)	no	**	no	*	no	+	yes		(no)	*	no	**	no	*			1/7
12	Malawi (1992)							no		yes	**							1/2
13	Mali (1987, 1995)	yes	**					yes		yes	*	yes	**	(yes)				5/5
14	Mozambique (1997)							no	*	yes	**							1/2
15	Namibia (1992)							yes		yes								2/2
16	Niger (1992, 1997)	yes	**	yes	**	yes		yes		no	*	yes	**	(no)	+	(yes)		6/8
17	Nigeria (1990, 1999)	no	+	no	**	no	*	no		no		yes		(no)	+			1/7
18	Rwanda (1992)							no		no	*							0/2
19	Senegal (1986, 1992, 1997)	yes	*					yes		yes		yes	**	yes				5/5
20	Tanzania (1991, 1996, 1999)	yes	**	yes	**	yes		yes		(no)		yes	*	yes	**	no	+	6/8
21	Togo (1988,1998)							no		yes	**	yes		yes				3/4
22	Uganda (1988, 1995)	no						yes		(no)		yes		no				2/5
23	Zambia (1992, 1996)	(no)	**	(no)	**	no		no	**	(no)		no		(yes)		no		1/8
24	Zimbabwe (1988, 1994, 1999)	(no)	**	(no)		yes		no		yes		no	+	no		(no)	*	2/8

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No. with significant convergence	4		3		2		6		7		3		4	2
No. with significant divergence	5		4		1		0		5		6		1	1
Pooled			conv	**									conv +	
Pooled w/out Nigeria	div	**	div	**										
Number of countries	12		10		10		24		24		14		14	7

Note: ‘yes’ indicates that welfare improved more in urban areas, or that it improved in urban areas and worsened in rural areas; ‘no’ indicates that welfare did not improve more in urban areas, or that it improved in rural areas and worsened in urban areas; ‘equal’ indicates that welfare increased in both urban and rural areas at the same rate; ‘(yes)’ indicates that welfare decreased in both urban and rural areas and the rate of decrease was smaller in urban areas; ’(no)’ indicates that welfare decreased in both urban and rural areas and the rate of decrease was greater in urban areas; ‘(equal)’ indicates that welfare decreased in both urban and rural areas at the same rate. ** indicates signficance at 99% level of confidence, * at 95% level of confidence, and + at 90% level of confidence.

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Clearly, the living standards of those living in rural areas lag far behind those living in urban areas. The logical question then is if this is just a transitory stage in which the rural sectors are catching up to the urban sectors. We attempt to shed light on this question of convergence by presenting in Tables 3 and 4, the relative improvements in achievements. In particular, we indicate with a 'yes' if the achievements of urban areas for each of the indicators exceed those of the rural areas as measured by the actual percentage change in Table 3, and by the Kakwani achievement index in Table 4. We also indicate whether these differences in changes are statistically significant at standard levels.[20] For example, in Mali the actual urban poverty headcount ratio fell by over 7.4 percentage points and the rural by 6 percent; and the Kakwani improvement indices for urban areas was 5.04, and 1.39 in rural areas.[21] Since the urban decline is larger, both in absolute terms and using the index, a 'yes' is recorded in the first column of both Table 3 and 4 for Mali, indicating that the gains made in urban areas exceeded those of rural areas. However, only in the case of the Achievement Index is the difference statistically significant, as indicated by the ** in the appropriate column. Another example is Ghana where urban poverty fell by 8.8 percentage points while rural poverty fell by a much larger 18 percentage points over the decade between 1988 and 1998. But because urban poverty in Ghana as measured by our asset index was initially considerably lower in urban areas (15.6 percent) than in rural areas (72.9 percent), the gains from declining urban poverty were more of an achievement than those from declining rural poverty despite that the former was half the size of the latter. As such, the urban achievement index for Ghana was 17.9 compared to the rural achievement index of 6.2, so that in Table 4, we show a 'yes', but in Table 3, a 'no'. In both these cases, the values are statistically significant at the five percent level.

We also summarize the results in the rows below the country specific results by tallying the number of countries where there is statistically significant convergence and divergence in any given indicator—where convergence is defined as improvements in rural areas outpacing improvements in urban areas, and where divergence is characterized by the already lower levels of living standards in rural areas getting worse (better) at a faster (slower) rate than urban areas. The results in Tables 3 and 4 suggest that there is no strong pattern of living standards in rural areas improving at rates greater than in urban areas, or conversely, that living standards in urban areas are declining at faster rates, as suggested in Haddad et al. (1999). First, examining the summary rows at the bottom of Table 3, we find that there is evidence of convergence for only one indicator—infant mortality—where this occurs in 8 of the 24 countries for which we have data, while there is only divergence in 1 of the 24 countries. In the remaining 15 countries, no statistical difference is observed in terms of whether urban or rural areas are witnesses a more rapid drop in infant mortality. When we look at the same indicator based on the achievement index reported in Table 4, however, we find statistical convergence in 6 of the countries and divergence in none.

[20] These test statistics are described in Section 3.2.

[21] These and the remaining figures are available upon request from the authors.

In the case of contraceptive use, in contrast, we find that among 6 of 9 countries for which there are statistically significant differences in the changes, that the improvement in urban areas is more rapid that rural areas. In the case of changes in asset poverty, when we use the absolute level of changes, there is convergence in 4 of 12 countries and divergence in 2 of 12 countries. But when we employ the achievement index, there is statistically significant divergence in 5 countries, while convergence is only observed in only 4 countries. In the case of our statistical comparison of changes in school enrollments, in both Tables 3 and 4 we observe convergence in 3, and divergence in 4 countries. Overall, the results do not give any indication of a clear pattern or indication of rural living standards converging to those of urban dwellers.

The final set of results we report in Tables 3 and 4 are the statistical tests of convergence/divergence when we pool the data across all countries in Africa.[22] The results in Table 3 indicate that living standards for urban dwellers have not improved more quickly than rural areas in the case of asset poverty, enrollments, infant mortality and neonatal mortality. However, if we remove Nigeria from the sample, with its large influence on the pooled results owing to the size of its population, we find that there is only convergence in the case of asset poverty and there is divergence in the case of enrollments. When we turn to the pooled results of the achievement indexes in Table 4, we see that there is only convergence in the cases of enrollments and stunting; and when we exclude Nigeria, there are no cases of convergence, while there is statistically significant divergence in the cases of asset poverty and enrollments.

4.2 Decomposing inequality

We next turn to the results of our inequality decompositions using the asset index (Table 5). In the first two columns are the Gini and Theil measures for the 12 countries in our sample. Both inequality parameters show the same general pattern, with inequality being highest in Niger and Burkina Faso and lowest in Ghana and Tanzania.

Looking at the third and forth columns that present the Theil measures for urban and rural populations separately, we immediately see that inequality tends to be worse in rural areas than urban areas. The difference is particularly large in the cases of Kenya, Zambia and Zimbabwe. In all these countries, urban inequality is exceptionally low. For example, the Theil index in urban Zimbabwe is only 0.052. In contrast, Madagascar and Tanzania are the only two countries where the relative levels of urban asset inequality exceed rural asset inequality. The fifth and sixth columns show the decomposition of total inequality into within- and between-group (urban and rural) inequality, with the last two columns presenting their respective percentage shares. The evidence here is mixed. In Ghana, Madagascar and Nigeria, within urban and rural region inequality comprises over 70 percent of total inequality. In contrast, the within shares are far smaller in Zimbabwe (only 34 percent) and Zambia (40 percent). Thus, while we observe that rural asset inequality

[22] Population weights are used in estimating the pooled indicators so that the measures are people averages, not country averages. The population estimates are taken from World Bank (2001).

tends to be higher than urban asset inequality, there is no generalizable picture from our decompositions that examine the relative contributions to total asset inequality of (a) inequality within urban and rural areas, and (b) inequality between urban and rural areas.

We now turn to an examination of the spatial dimensions of education inequality for our sample of 15 to 40 year olds (Table 6). Before presenting the results, we should point out that migration presents a particular problem here, since education is a stock acquired before the survey date in most cases. Since urban jobs by their nature require more education, you may be seeing the result of ex ante sorting rather than urban/rural inequality in the opportunity for schooling. Education inequality has a large range of values. Coincidentally, it is lowest in Kenya, Zambia and Zimbabwe, the same countries where asset inequality is quite low.[23] Education inequality is also highest in the Sahelian region, the same region where levels of schooling attainment are lowest. Similar to the story of the asset inequality, the Theil indices in rural areas are larger than in urban areas in all 23 countries for which we have data. Thus, there is significantly greater inequality in the distributions of education in rural than urban areas. For example, the Theil for rural Benin is 1.40, while it is only 0.63 for urban areas. The comparable numbers for Nigeria are 0.49 and 0.22, respectively.

We next decompose total inequality into the within and between shares. The vast majority of total inequality is due to within region inequality in education (Table 6). The highest share of between-region inequality is in the same Sahelian countries of Burkina Faso (33 percent), Mali (19.4 percent) and Niger (21.3 percent). Note that in each of these countries, more than 74 percent of the adults in our samples have no education. Having said this, the between share is also relatively high in some countries in other regions, where higher levels of school attainment can be found (e.g., Central African Republic and Mozambique, with 37 and 34 percent of the samples with no education, respectively). Regardless of the country, however, we find that the within region share of total inequality in education is predominant, despite the fact that the ratio of rural to urban inequality often exceeds two. This finding reinforces the important distinction between average levels and dispersions in education attainment (and other welfare indicators). While the problem of the urban-rural gap in levels of education attainment is large, and presumably requires some attention by policymakers to raise overall living standards, those more concerned with an aversion to inequality will not see their objective effectively realized through reducing urban rural disparities.

Turning to the decomposition of inequality in health, we find the overwhelming share of inequality in the population is represented by within region differences (Table 7). The greatest between shares are in the cases of Tanzania (6.6 percent) and Senegal (5.9 percent). Like other indicators, we find that rural inequality in health tends to be greater than urban inequality in most cases. For example, the Theil for rural Togo is 1.18, while it is only 0.60 in urban areas. However, there are exceptions such as Benin, Burundi and Rwanda, where there is greater intra-urban inequality than intra-rural inequality.

[23] While the education of the household head is included in the asset index, its weight is not large enough to drive these common results.

Table 5: Asset poverty inequality: levels and urban-rural decomposition
Household asset index

Country	Gini	Theil measure	Rural inequality (Theil)	Urban inequality (Theil)	Within-group inequality	Between-group inequality	Within share	Between share
Burkina Faso, 99	0.592	0.638	0.403	0.199	0.293	0.345	46.0%	54.0%
Ghana, 98	0.453	0.345	0.301	0.201	0.244	0.101	70.8%	29.2%
Kenya, 98	0.468	0.362	0.295	0.105	0.204	0.158	56.4%	43.6%
Madagascar, 97	0.503	0.468	0.314	0.370	0.341	0.127	72.9%	27.1%
Mali, 95	0.586	0.609	0.449	0.281	0.338	0.271	55.5%	44.5%
Nigeria, 99	0.496	0.410	0.421	0.202	0.305	0.105	74.4%	25.6%
Niger, 97	0.754	1.185	0.735	0.416	0.508	0.677	42.9%	57.1%
Senegal, 92	0.511	0.441	0.416	0.198	0.260	0.181	58.9%	41.1%
Tanzania, 99	0.434	0.357	0.215	0.246	0.231	0.126	64.6%	35.4%
Uganda, 88	0.570	0.681	0.356	0.332	0.347	0.335	50.9%	49.1%
Uganda, 95	0.494	0.484	0.285	0.252	0.272	0.211	56.3%	43.7%
Zambia, 96	0.475	0.370	0.287	0.089	0.149	0.221	40.2%	59.8%
Zimbabwe, 99	0.494	0.413	0.327	0.052	0.141	0.272	34.1%	65.9%

Source: see text.

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Table 6: Education inequality: levels and urban-rural decomposition
Years of education of working-age adults (age 15-40)

	Percent Without Any School				Theil Inequality Measure						
Country	National	Rural	Urban	Gini	National	Rural	Urban	Within-group	Between-group	Within share	Between share
Benin, 96	56.4	70.1	37.1	0.710	1.017	1.398	0.629	0.881	0.136	86.6%	13.4%
Burkina Faso, 99	79.2	89.0	38.3	0.853	1.721	2.374	0.582	1.153	0.568	67.0%	33.0%
Cameroon, 98	20.9	26.8	11.0	0.409	0.340	0.422	0.196	0.309	0.031	91.0%	9.0%
CAR, 94	36.9	49.5	21.6	0.574	0.634	0.864	0.380	0.546	0.088	86.1%	13.9%
Chad, 97	65.4	72.8	44.7	0.784	1.291	1.524	0.758	1.090	0.201	84.4%	15.6%
Comoros, 96	39.6	45.0	28.4	0.571	0.643	0.745	0.441	0.608	0.035	94.6%	5.4%
Cote d'Ivoire, 94	48.0	57.3	36.0	0.622	0.777	0.978	0.553	0.724	0.053	93.2%	6.8%
Ghana, 98	21.1	26.9	11.1	0.378	0.318	0.397	0.185	0.299	0.019	94.0%	6.0%
Kenya, 98	6.3	7.0	4.3	0.253	0.135	0.142	0.096	0.128	0.007	94.9%	5.1%
Madagascar, 97	22.5	26.4	12.2	0.494	0.451	0.487	0.279	0.399	0.053	88.3%	11.7%
Malawi, 92	33.2	36.6	14.3	0.522	0.537	0.587	0.245	0.498	0.039	92.8%	7.2%
Mali, 95	74.5	85.7	52.7	0.820	1.524	2.132	0.863	1.228	0.296	80.6%	19.4%
Mozambique, 97	33.5	40.8	13.5	0.547	0.582	0.686	0.264	0.493	0.089	84.7%	15.3%
Namibia, 92	13.0	15.9	8.2	0.346	0.243	0.284	0.153	0.220	0.023	90.6%	9.4%
Niger, 97	77.2	85.9	45.7	0.833	1.619	2.120	0.707	1.273	0.345	78.7%	21.3%
Nigeria, 99	26.8	32.5	14.5	0.428	0.400	0.494	0.218	0.379	0.021	94.7%	5.3%
Rwanda, 92	29.7	30.9	14.3	0.500	0.491	0.503	0.277	0.476	0.015	97.0%	3.0%
Senegal, 92	64.3	83.9	38.4	0.796	1.551	2.654	0.871	1.394	0.157	89.9%	10.1%
Tanzania, 99	18.2	21.8	8.7	0.305	0.265	0.303	0.163	0.255	0.010	96.3%	3.7%
Togo, 98	34.1	43.4	18.9	0.525	0.555	0.694	0.336	0.500	0.054	90.2%	9.8%
Uganda, 95	22.2	24.8	8.1	0.431	0.370	0.399	0.168	0.342	0.028	92.4%	7.6%
Zambia, 96	9.7	15.2	3.1	0.305	0.193	0.259	0.097	0.167	0.026	86.5%	13.5%
Zimbabwe, 99	3.7	5.3	1.3	0.202	0.091	0.116	0.042	0.080	0.010	88.8%	11.2%

Source: see text.

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Table 7: Health inequality: levels and decomposition

Country	Gini	Theil measure (NCHS adjusted)	Rural Theil measure (NCHS adjusted)	Urban Theil measure (NCHS adjusted)	Within-group inequality (NCHS adjusted)	Between-group inequality (NCHS adjusted)	Within share	Between share
Burkina Faso, 99	0.0393	1.9880	2.0241	1.3855	1.9518	0.0361	98.2%	1.8%
Benin, 96	0.0342	1.2410	1.2169	1.2530	1.2289	0.0120	99.0%	1.0%
Burundi, 87	0.0343	1.3133	1.2771	1.5783	1.2892	0.0241	98.2%	1.8%
CAR, 94	0.0371	1.6386	1.7349	1.4217	1.6024	0.0361	97.8%	2.2%
Cote d'Ivoire, 94	0.0340	1.2410	1.4337	0.7108	1.1928	0.0482	96.1%	3.9%
Cameroon, 98	0.0372	1.6506	1.7590	1.3012	1.6386	0.0120	99.3%	0.7%
Ghana, 98	0.0331	1.0964	1.1325	0.8554	1.0602	0.0361	96.7%	3.3%
Kenya, 98	0.0379	1.7590	1.7229	1.6867	1.7229	0.0361	97.9%	2.1%
Comoros, 96	0.0359	1.4940	1.5422	1.3494	1.4940	0.0000	100.0%	0.0%
Morocco, 92	0.0351	1.3855	1.5060	0.8675	1.2892	0.0964	93.0%	7.0%
Madagascar, 97	0.0357	1.4458	1.4337	1.4578	1.4337	0.0120	99.2%	0.8%
Mali, 95	0.0403	2.0843	2.2048	1.6145	2.0482	0.0361	98.3%	1.7%
Malawi, 92	0.0356	1.4337	1.4096	1.2048	1.3976	0.0361	97.5%	2.5%
Mozambique, 97	0.0383	1.8072	1.9036	1.4096	1.7711	0.0361	98.0%	2.0%
Nigeria, 99	0.0495	3.6145	3.6024	3.6024	3.6024	0.0120	99.7%	0.3%
Niger, 97	0.0386	1.8193	1.8675	1.3735	1.7831	0.0361	98.0%	2.0%
Namibia, 92	0.0337	1.2289	1.1807	1.0964	1.1566	0.0723	94.1%	5.9%
Rwanda, 92	0.0339	1.2892	1.2530	1.3494	1.2651	0.0241	98.1%	1.9%
Senegal, 92	0.0339	1.2169	1.3373	0.8193	1.1446	0.0723	94.1%	5.9%
Chad, 97	0.0432	2.5181	2.6145	2.0602	2.4940	0.0241	99.0%	1.0%
Togo, 98	0.0327	1.0602	1.1807	0.6024	1.0361	0.0241	97.7%	2.3%
Tunisia, 88	0.0330	1.1325	1.1687	0.9398	1.0482	0.0843	92.6%	7.4%
Tanzania, 99	0.0320	0.9639	1.0120	0.4578	0.9036	0.0602	93.8%	6.3%
Uganda, 95	0.0346	1.3735	1.3976	1.0000	1.3494	0.0241	98.2%	1.8%
Zambia, 96	0.0355	1.4217	1.5904	1.0000	1.3614	0.0602	95.8%	4.2%
Zimbabwe, 99	0.0388	1.8916	2.0241	1.5904	1.8795	0.0120	99.4%	0.6%

Source: see text.

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5 Concluding remarks

In this paper we initially address the question of the magnitude of spatial differences in living standards between urban and rural households in Africa. Our major finding is that living standards in rural areas lag far behind those in urban areas. While we expected to observe gaps, we did not anticipate such dramatic spatial differences. Furthermore, we find no overall evidence of declining differences in urban and rural living standards despite the (at least) rhetorical emphasis of rural development as the central pillar in the strategies of international organizations, development agencies and non-governmental organizations, to generate sustainable growth and poverty reduction.

While our objective is to paint with a broad brush, doing so inevitably obscures the differences across a vast continent. There is substantial variation in the extent of the urban-rural divide among the countries in our sample. At one extreme we have Burkina Faso, where in 1999, the poverty rate was 69 percentage points higher in rural areas than in urban areas, and the enrollment rate was over 50 percentage points lower in rural areas. At the other extreme we have Kenya, where in 1998, these gaps were considerably lower at 30 percentage points and virtually nil, respectively. Nevertheless, except for the handful of cases in which IMR rates are higher in urban areas than in rural areas, the overwhelming evidence indicates the persistence of urban-rural inequalities in 'poverty', and that efforts to alleviate these inequalities have not been successful to date.

We further note that while our paper is about urban-rural spatial differences in well-being, standards of living within and among urban and rural areas are far from homogenous. The indicators examined in this paper differ markedly between rural regions of almost every country.[24] Likewise, when we observe changes in well-being over time in rural areas, the changes are often highly regionalized.[25] However, it also is all too remarkable that despite over three decades of recognizing the urban bias, rural areas continue to be left behind from many of the benefits of economic and social progress.

In terms of our inequality analysis and decomposition, we are limited to three indicators: the asset index, education and health. We find that in the case of education and health, the vast majority of the total inequality is attributable to the within region effects. This is particularly true for health where in most cases less than five percent of total inequality is represented by the between region share. The results in terms of the asset index are more mixed. Nonetheless, in all cases, there are indications that rural inequality exceeds urban inequality. These findings on the levels of inequality for the three indicators are indeed interesting. But equally worthy of note are the comparisons of the results of the

[24] We examined interrural differences, and indeed they are large. However, due to space constraints, we have not reported these results in this paper.

[25] See, for example, Sahn and Stifel (2000) where we present urban-rural decompositions of changes in poverty and find that the rural changes differ dramatically across rural areas.

(a) inequality decompositions, and (b) living standards decompositions. While the former include the entire distributions of the indicators, the latter focus on the lower ends. Our findings also suggest that although policies to reduce the gap in urban-rural living standards will effectively improve well-being measured at the national level, they will not effectively reduce the overall level of inequality in health and education, and to a lesser extent asset wealth. The reason for this is that both the urban and rural distributions of education and health are extremely disbursed relative to the difference in their central tendencies.

One important limitation of our paper is that we look at urban and rural populations in a static setting. We thus recognize that levels and inequalities of living standards measured here are endogenous to such household decisions as migration.[26] Nonetheless, a fundamental re-examination of development strategy, and in particular a questioning of why we have been unable to alleviate the constraints to greater economic and social progress in rural areas needs further attention.

Finally, in our examination of the urban-rural divide, we limit ourselves to relatively objective measures of poverty and deprivation. There are a battery of other indicators—or to be more precise and to use Sen's terminology, capabilities and functionings—that we are unable to capture with our data. Notions of hope, freedom of association, and various characterizations of security and opportunity, are indeed of great importance in characterizing and measuring poverty. We ignore these indicators, not by choice, but because of the limitations of the data that we have available. The results of our urban-rural analysis could very well look different if we had data on such indicators. This would suggest an interesting research challenge—to gather and analyze such data in order to both better understand the relative difference in poverty, and to provide insights into how to more effectively combat Africa's intractable challenge of rural poverty.

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[26] We must confess surprise that despite the rapid rates of rural to urban migration in Africa, this has yet to occur. However, there are myriad possible explanations, including that the better off and more educated continue to move to the city in search of opportunity. (We thank an anonymous referee for making this point.)

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