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Living Standards in Africa

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Poverty

LIVING STANDARDS IN AFRICA

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Introduction

Sub-Saharan Africa is one of the poorest regions in the world. Whether it is *the* poorest region is difficult to establish, for all of the conceptual and practical problems in inter-country poverty comparisons laid out in other chapters of this volume. We can avoid some of those problems, though certainly not all, when we make intertemporal poverty comparisons in one country. Here, too, Africa's performance is disappointing. Poverty reduction has been halting and irregular in Africa, in contrast to other regions of the world that have grown more rapidly and made greater progress on poverty reduction. The first task of this paper is to substantiate these two claims – that Africa is poor compared to the rest of the world and that poverty in Africa is not declining consistently or significantly – while fully recognizing the problems inherent in using income and expenditure data in Africa and elsewhere.

However, given the reservations about income poverty comparisons, a second important feature of the paper is that we consider not only income (or expenditure) poverty, but also other dimensions of well-being, especially education and health. There are many reasons for this, both theoretical and practical. On the theory side, Amartya Sen has argued convincingly that we should understand that well-being is multidimensional, comprising capabilities such as good health, adequate nutrition, literacy, and political freedoms. More traditional money metrics of poverty, particularly as measured by income (or consumption expenditure) are *instrumentally*

important to these capabilities, but it is the capabilities themselves that are *intrinsically* important, and merit recognition and measurement in their own right (Sen 1985, 1987). Even though Sen's argument is widely accepted in theory, in practice it is usually ignored. Most empirical poverty research still focuses on measuring material living standards.

Beyond the compelling theoretical argument, there are many reasons to measure poverty (and inequality as well) in non-income dimensions of well-being. First, and most importantly in the context of this volume, measurement error is much less a problem for the non-income variables that we use than it is for standard economic measures of deprivation. We discuss measurement problems in Section 3. Here we simply note that collecting income and expenditure data is a complex process involving dozens, sometimes hundreds, of questions, not all of which respondents want to answer truthfully and not all of which they find easy to answer. Data on non-income measures of well-being, especially anthropometry and years of schooling, are easy to collect and straightforward to answer. Further, respondents cannot misreport anthropometry data, and reasons to misreport educational attainment are less than those for incomes and some expenditures. Of course, measurement error is still possible for these variables, but it is more likely to be random – uncorrelated with other variables of interest in the survey.

A second reason for considering poverty in dimensions such as health and education is that public policy has an important role in providing for the basic needs of the population in these areas. While publicly funded income transfers also have a compelling logic, they remain rare in developing countries, and it is often far easier to mobilize public support for targeted programs to improve non-income living standards, as manifested in outcomes such as improved nutrition and

better education. This both reflects a commonly held welfarist conception of the state and, in developing countries, non-governmental organizations as well. But an additional argument for focusing on deprivation in health and education is that improvements in these areas have tangible externalities, including benefits for the non-poor, that are not as manifest for income transfers.

Third, we can measure outcomes such as nutrition, health, and education at the individual rather than household level. Income and expenditures, in contrast, are measured for households, necessitating arbitrary assumptions about how resources are allocated among household members. Assuming that household income is equally shared among members, the most common approach is potentially misleading in ways that the study of intra-household allocation is only beginning to understand (Kanbur and Haddad 1992, Sahn and Younger 2007). A related challenge in employing income measures is the need to make arbitrary and unidentifiable assumptions about economies of scale and equivalence units (Deaton and Muellbauer 1980). Such problems do not arise when measuring individual outcomes.

Finally, we note that many non-income measures of well-being, especially those that concern health, are not highly correlated with incomes, either within a given country or across countries (Haddad et al. 2003; Behrman and Deolalikar 1988, 1990; Appleton and Song 1999). This is important because it indicates that these variables contain additional information about well-being not captured by income or expenditures alone.

With these considerations in mind, this paper analyzes evidence on levels and trends of poverty in Africa during the late 1980s through the early part of the present decade. We augment the

available evidence on expenditures with measures of health and education because these are two fundamental dimensions of well-being whose importance almost everyone can agree upon. The particular variables that we use are per capita expenditures for income poverty; children's height-for-age and women's body mass for health poverty; and women's years of school completed for education. Throughout, we are particularly interested in whether and the extent to which there is consistency between poverty changes measured in these four dimensions.

In the remainder of the paper, Section 2 presents some aggregate figures on the three dimensions of poverty in Africa, comparing the continent's performance to other regions in the developing world. Section 3 follows with a presentation of changes in poverty. We begin with a discussion of the data used, distinguishing between the reliance on expenditure data, and the health and education indicators employed. As noted above, the most important results of this section are that Africa is generally poorer than other regions of the world, the one exception being in terms of stunting rates of pre-school age children, and that poverty is not declining consistently on the continent for any of our measures, with the possible exception of women's years of schooling.

Given the on-going debate over the relative importance of growth versus distribution in affecting poverty levels, Section 4 decomposes the share of the population that falls below the poverty line into two components: one due to changes in the mean of the distribution and another due to changes in its dispersion (Datt and Ravallion 1992; Kakwani 1997).

The discussion in the first few sections deals with the poverty indicators distinctly, each examined as an independent outcome. But it is possible to make multivariate poverty

comparisons that account for the correlation of deprivations in different dimensions of well-being (Duclos, Sahn, and Younger, 2006a, b). Section 5 presents an example of a robust multidimensional poverty comparison over time in Uganda. We summarize and discuss the overall findings in Section 6 with some concluding comments and insights.

Africa in the Global Context

We begin our discussion with continent-level data that examine progress in alleviating poverty in Africa and elsewhere since 1960 (when the data permit). We use six indicators of well-being that are readily available and frequently used in cross-country research: dollar-a-day income poverty, gross primary enrolment rates, average years of schooling for adults, the share of children under five who are underweight, infant mortality rates (IMR), and life expectancy at birth. While the limitations of these continental aggregations are manifest, not least because they are often based on extrapolations and interpolations that compensate for missing and poor quality data, as a first order approximation, the results here set the context for our more detailed analysis of household survey data.

Table 14.1. Estimates of the Share of Persons Falling below the Poverty Line of $1 per Day

Region	1981	1990	1999	2004
Sub-Sahara Africa	42.24	46.77	45.94	41.09
Middle East/North Africa	5.08	2.33	2.08	1.47
Latin America and the Caribbean	10.77	10.19	9.62	8.64
South Asia	49.57	43.05	35.04	30.84
East Asia	57.73	29.84	15.4	9.05
East Europe/Central Asia	0.7	0.47	3.6	0.95

Source: World Bank. "PovcalNet." TTUUhttp://iresearch.worldbank.org/PovcalNet/jsp/index.jsp.

Table 14.1 reports the share of people living on less than $1 per day. The data from the most recent year, 2004, indicate that the headcount is markedly higher in Africa than any other region of the world. In South Asia, the next poorest region, less than one-third of the population is living below the $1 per day poverty line. In East Asia, just over 1 in 10 people live under this threshold, and an even smaller share does so in Latin America and the Caribbean. Going back to the beginning of the 1980s, Africa's share of poor people was markedly less than East Asia and South Asia. However, all this changed by 1990, by which time Africa's poverty headcount actually increased, while steep declines were reported in other regions. The pattern of continued improvement in the poverty numbers occurred throughout the rest of the world in the 1990s, while Africa stagnated and the share of the poor remained relatively constant.

For schooling, we examine two indicators of access: primary school gross enrollment rates and average years of schooling. Gross enrolment is defined as the number of children in primary school divided by the number of children in the age groups associated with primary school.[2] The data for the most recent year, 2000, reveal that sub-Saharan Africa lags markedly behind other regions. For example, the average gross enrollment rate in sub-Saharan Africa is 77, versus the next lowest value of 97 in the Middle East/North Africa region (Table 14.2). And in terms of average years of school among adults, the 3.4 years in sub-Saharan Africa is substantially lower than the 4.6 years in South Asia and 6.2 years in East Asia (Table 14.3). But perhaps of greater interest is that in 1960 the average years of school among adults was somewhat higher in sub-Saharan Africa than South Asia and the Middle East/North Africa. However, by 1980 this was no longer the case.

Table 14.2. Primary School Gross Enrollment Rates (percent of students of primary school age)

Region	1960	1970	1980	1990	2000	2005
Sub-Saharan Africa	40	51	80	73	114	95
Middle East/North Africa	59	79	89	97	120	104
Latin America and the Caribbean	91	107	105	105	120	118
South Asia	41	71	77	95	95	113
East Asia	87	90	111	119	114	111
East Europe/Former Soviet Union (FSU)	103	104	100	98	100	103

Sources:; Data for 1960 to 1980 from Kremmer and Glewwe (forthcoming); data for 1990 to 2005 from http://devdata.worldbank.org/edstats/query/defaultGrp.htm

Table 14.3. Average Years of School of Adults, Age 15+

Region	1960	1970	1980	1990	2000
Sub-Saharan Africa	1.7	2.0	2.3	3.0	3.4
Middle East/North Africa	1.4	2.2	2.9	4.1	5.4
Latin America and the Caribbean	3.2	3.7	4.4	5.3	6.0
South Asia	1.5	2.0	3.0	3.8	4.6
East Asia	2.5[b]	3.4[b]	4.6	5.6	6.2
East Europe/Former Soviet Union (FSU)	6.5[b]	7.6[b]	8.5[b]	9.0[b]	9.7[b]

Source: Barro and Lee (2001)

Underweight is the most widely used indicator for assessing the general health and nutritional status of children. Falling below standardized norms is considered an excellent indicator of deprivation from both inadequate dietary intake relative to needs, and disease and infection that impede normal growth and weight gain (Beaton et al. 1990; WHO 1983). We observe that in the most recent year, 2005, nearly 30 percent of the children were underweight in Sub-Saharan Africa (Table 14.4). However, the share of underweight children is actually higher in South Asia. What is of greater concern, however, is that the share of underweight children in Africa has virtually remained constant over the past three decades, despite a temporary decline in the 1980s. In contrast, the share of underweight children in South Asia, like all other regions, shows

a marked and steady decline from more than two in three children being underweight in 1975, to 40 percent of the children being underweight in 2005.

Table 14.4. Percent Prevalence of Underweight Preschool Children (0 – 60 Mo) in Developing Countries, 1975-2005

Region	1975	1980	1985	1990	1995	2000	2005
Sub-Saharan Africa	31.4	26.2	26.7	27.3	27.9	28.5	29.1
Middle East/North Africa	19.8	17.5	16.4	15.6	14.8	14.0	13.2
Latin America and the Caribbean	19.3	14.2	12.2	10.2	8.3	6.3	4.3
South Asia	67.7	58.1	54.5	50.9	47.3	43.6	40.0
East Asia	43.6	43.5	39.9	36.2	32.6	28.9	25.3

Source: The Fourth Nutrition Situation Report, SCN (http://www.unsystem.org/SCN/archives/rwns04/index.htm)
The 1975 data is from the First Nutrition Situation Report, SCN

The results on the evolution of changes in infant mortality paint a similarly sobering picture for sub-Saharan Africa. During the 1960s, Africa's 154 deaths per 1,000 live births was similar to the figures from the Middle East and South Asia. East Asia too had a high IMR of 133 (Table 14.5). Over the next couple of decades the rate of improvement in Africa and South Asia was markedly slower than other regions, especially East Asia where dramatic drops in IMR were noted. While the 1980s witnessed continued and rapid reductions in IMR in the rest of the world, by 1990 sub-Saharan Africa had distinguished itself by the slow level of improvement in infant mortality. This trend of modest gains in Africa continued through 2005.

Table 14.5. Infant Mortality Rate in Developing Countries, deaths before age one per 1,000 live births, 1960-2005

Region	1960	1970	1980	1990	2001	2005
Sub-Saharan Africa	154	145	120	112	107	101
Middle East/North Africa	154	128	91	59	47	43
Latin America and the Caribbean	105	86	61	43	28	26

South Asia	146	130	115	89	70	63
East Asia	133	84	55	43	33	26
East Europe/FSU	76	68	55	44	30	29

Source: UNICEF (2007) http://www.childinfo.org/areas/childmortality/infantdata.php

At the same time, initial low levels of life expectancy (Table 14.6), which were in the 40- to 50-year range in Africa, Asia and the Middle East, showed steady improvements through the 1960s and 1970s; progress was especially rapid in Asia. Progress in Africa, however, was considerable slower. The creeping improvements in life expectancy in Africa continued through 1990, reaching 50 years, in contrast to 58 years in South Asia, the second worst region. Over the next 15 years, however, life expectancy in Africa has fallen to 46, the recent decline largely due to the rise in AIDS-related deaths. However, with the exception of Eastern Europe, life expectancy has continue to rise in all other regions of the world, reaching 64 in South Asia, the next lowest number compared to 46 in sub-Saharan Africa.

Table 14.6. Life Expectancy of Developing Countries, 1960-2005

Region	1960[2]	1965[2]	1970	1975[2]	1980[2]	1985[2]	1990	1995[2]	2001	2005
Sub-Saharan Africa	40	42	44	46	48	49	50	50	48	46
Middle East/North Africa	46	48	52	54	57	57	63	64	67	69
Latin America and the Caribbean	54	57	60	60	62	64	68	70	70	72
South Asia	46	49	48	58	60	60	58	65	62	64
East Asia	46	49	58	58	60	60	66	65	69	71
East Europe/FSU			66				68		69	67

Source: Unicef (State of World Children Reports from 1998 to 2007)

[2] http://earthtrends.wri.org/text/population-health/variable-379.html (Their source is UNICEF and WHO – Data tallies with 90, 00, 05 0)

Despite reservations about data quality, these results provide a sobering perspective on the evolution of poverty in Africa since 1960. Of course, the types of aggregates presented do not tell the story of the complexity and variations within Africa (and the other regions). We next turn to a more careful treatment of the changes in poverty in Africa that relies on good-quality household survey data to estimate various measures of well-being.

Survey-Based estimates of Changes in Poverty

Income/Expenditure Surveys

We begin by looking at changes in economic measures of deprivation. While the standard approach to measuring deprivation in material living standards in developed countries is to use income or assets, household consumption expenditures have been widely accepted as the more appropriate approach to measuring economic deprivation in developing countries. The conceptual basis for relying on consumption is that it is the goods and services that people consume that capture their economic well-being, and income and assets only serve to enable that consumption. In addition, however, there are practical reasons for using consumption data rather than income to measure economic deprivation that revolve around the relative ease of measuring the former. These include: that income is far more volatile, varying greatly by season and even across years due to weather and other shocks; that there are formidable challenges in calculating net revenues from agriculture and other own-account enterprises in which most people are engaged in developing countries; that income derived from assets is difficult to estimate; and that there is often a reluctance to divulge information on earnings (and assets), especially in Africa where tax avoidance is widespread and tax authorities are viewed with great suspicion.

The primary sources of data used in Africa to assess economic deprivation are Living Standard Measurement Surveys (LSMS) conducted by, or with the support of, the World Bank. In addition, there are several countries where statistical agencies have conducted income/expenditure surveys that can be used to create expenditure aggregates and derive poverty lines. Both sources of data have been catalogued and collated by the World Bank, and subsequently used to derive poverty measures. We rely on the poverty headcount calculations made by the World Bank in order to examine spells of change for countries in sub-Saharan Africa. We do so, first, because of the difficulty in getting access to many of the relevant surveys. Governments and statistical agencies are notoriously reluctant to allow individuals access to data they collect. We therefore could not get access to many surveys which the World Bank has permission to use. Furthermore, the analytical requirements to create consumption aggregates are formidable (Deaton and Zaidi 2002). Repeating the enormous effort that the World Bank has put into this enterprise would not only be prohibitively time consuming and expensive, but a fool's errand.

Given our interest in making comparisons of poverty changes that are roughly comparable across countries, we also rely on the dollar per day poverty headcount ratios that were calculated by the World Bank.[3] All the figures that we report are based on household surveys that were designed to be nationally representative. There are a total of 23 countries in sub-Saharan Africa that have one or more relatively recent spells of money metric poverty changes over time. Of those, only 15 have a spell that includes the current decade.

While considerable care went into the Bank's attempt to ensuring some degree of comparability across surveys, concerns remain about the appropriateness of using them to measure changes in living standards over time. The first set of concerns revolves around the ability of the surveys themselves to collect comparable consumption data. There are many challenges in this regard. First and foremost is that in developing countries we are almost exclusively reliant on the recall of respondents. The accuracy of the recall is conditioned by the limitations of the memories of respondents. However, the nature of the survey design is also a critical element in determining the quality of recall data; and so, too, is the training and technical competence of enumerators that are charged with overcoming the challenges of memory loss.

To amplify, it is now well understood that the design of the survey instrument is important in eliciting accurate information. Among the major design parameters that are critical to overcoming memory problems are issues of the number of items that consumption data are collected on, the recall period, and the nature of choices available to respondents in terms of units of consumption. In the case of the list of consumption goods, there is solid evidence that a shorter list reduces the overall estimate of the value of consumption (Joliffe and Scott 1995; Steele 1998; Pradhan 2001). Regarding recall period, which is related to the design issues of the number of visits to the household, the tradeoffs between accuracy and representativity have been well documented in the literature. However, there is also evidence that longer recall periods, which may in fact capture the more typical pattern of consumption (e.g., food vs non-food consumption), will also tend to under-estimate total consumption (Silberstein and Scott 1991; Scott and Amenuvegbe 1990). As for the choice of consumption units, some surveys allow considerable latitude in responses, including bottle caps of oil, gourds of rice, and so forth, while

others do not. The direction of bias introduced by these choices is less clear, although there is little doubt that they affect how well consumption is measured.

There are also a number of related issues that will affect the consumption estimates, such as how often the enumerator visits the household, whether and how the respondents are prompted about consumption of specific items, and whether questions are posed in terms of consumption since the last visit, or alternatively, as usual consumption in a similar time period. Another factor that can affect the reliability and comparability of consumption data concerns the issue of who is interviewed in the household and the gender of the enumerators. In some societies there may be cultural taboos against women working as enumerators, and/or women responding to questionnaires. Likewise, in some cases both the head and the spouse respond, while in others it is one or the other. These types of variability in survey protocols will all affect the reliability and accuracy of recall.

A second set of concerns revolves around deflators and purchasing power parity conversion factors. Price data that are required to construct a price index are notoriously deficient in developing countries. The lack of capacity of statistical agencies is compounded by the fact that spatial price variability tends to be far greater in poorly integrated markets where transaction costs are high. Thus, even if good price deflators are available for the capital city, they are likely of little relevance in remote rural areas. Another critical challenge is that unlike in developed countries where patterns of consumption tend to be quite similar across regions, in developing countries this is not the case. So, even if it were possible to collect prices at different locations with some degree of accuracy, the lack of a common consumption basket will make creating

appropriate deflators difficult (and likewise for the formulation of a consumption-based poverty line). Furthermore, unlike in developed countries where prices are easily determined at the grocery store or at the local market, this is often not the case in developing countries where prices are not posted and are an outcome of a bargaining process.

In response to these types of problems, some (but not all) surveys rely on prices derived from questions administered to the household, rather than community questionnaires or routine government price reconnaissance. This can involve explicitly asking households about the price per standardized unit, or alternatively, from the calculation of unit values from quantity and expenditure data. Of course, unit values are not prices, but only a first approximation. They are affected by a range of household choices, such as quality choices, size of the purchase, choice of market, and so forth. One way of addressing this variability is to use a measure of central tendency of prices within a sampling cluster as the local price. But again, considerable judgment (and skill) is involved in this process.

In creating a comparable data set across countries, the additional challenge of generating purchasing power parities (PPP) to derive headcounts is extensively discussed in the literature. Various options exist in this regard, most noteworthy being the Penn World Tables (PWT) which generally serves as the standard for such calculations. However, there are a variety of criticisms of using PWT PPP for poverty comparisons, including their reliance on average prices and expenditures. These concerns have contributed to attempts to create alternative (food-based) PPP. While we are not going to engage the technicality of the arguments for and against various

alternatives, again, the subjective nature of this choice will potentially have important effects of inter-temporal and spatial comparisons.

Other issues, unrelated to sample design and price deflators plague the calculation of economic deprivation using consumption data. For example, economic measures of well-being are collected at the household level. Equal sharing relative to need is generally assumed. Clearly this is not correct as there may be individuals who capture a relatively larger share of consumption in the household. Likewise, the use of household size as the divisor for total consumption represents an unidentifiable assumption. Indeed, there are undoubtedly economies of scale, even in poor households, and these certainly differ by location, household composition, household size, household income, and so forth. But as it is difficult, perhaps impossible, to estimate these scale economies (Deaton 1997) in the absence of an identification strategy for deriving equivalence scales, the use of per capita expenditure seems as defensible as any other assumption, but certainly is arbitrary.

An examination of the details on the surveys used by the World Bank and referenced below indicates a great deal of variability along all the dimensions cited above, both across time in specific countries, and across countries. While some analysts have made heroic efforts to deal with changes in survey design (for example, Appleton (2001a, b) for Uganda; Canagarajah, Ngwafon, and Okunmadewa (2000) for Nigeria; and Coulombe and McKay (2001) for Ghana), there is little doubt that these variations in methods contribute in an important way to the poverty headcounts. We therefore admonish considerable caution in interpreting these results.

A casual examination of the results suggests that our skepticism about using these data for making country-specific inter-temporal comparisons is warranted. For example, the extremely high poverty figures from Uganda seem somewhat implausible, at least compared to other countries in the region (Table 14.7). Similarly, the numbers indicate that poverty in Kenya fell by more than half between 1994 and 1997. A decline in poverty of a similar magnitude is reported for Mali between 1994 and 2001 and Gambia between 1992 and 1998. Similarly, Cameroon, Mauritania, Senegal, and South Africa reported poverty reductions in short intervals that seem quite implausible. The reduction of poverty reported for Senegal during the 1990s is extraordinary, 45.4 to 16.8, and seems completely inconsistent with developments in that economy. Despite such questionable findings, we summarize the results from the Bank data as a point of departure for examining alternative metrics of poverty that are based on more comparable and reliable survey data.

Table 14.7. Headcount of Economic Poverty

Country	Survey Year(s)	1st Survey	2nd Survey	3rd Survey	4th Survey	5th Survey	6th Survey	7th Survey
Benin	2003	30.79						
Botswana	1985, 1993	33.3	28.53					
Burkina Faso	1994, 1998, 2003	51.38	44.85	28.65				
Burundi	1992, 1998	44.07	54.56					
Cameroon	1996, 2001	35.77	20.15					
Cape Verde	2001	1.91						
Central African Republic	1993	66.58						
Côte d'Ivoire	1985, 1987, 1988, 1993, 1995, 1998, 2002	4.71	3.28	7.46	9.88	12.29	15.53	15.72
Ethiopia	1981, 1995, 2000	32.73	31.25	21.6				
Gambia	1992, 1998	53.69	27.91					
Ghana	1987, 1988, 1991, 1998	46.51	45.45	47.24	36.17			
Kenya	1992, 1994, 1997	33.51	26.54	12.41				
Lesotho	1986, 1993, 1995	30.34	43.14	36.4				
Madagascar	1980, 1993, 1997, 1999, 2001	49.18	46.31	49.76	66.03	61.04		

Malawi	2004	20.76				
Mali	1994, 2001	72.29	36.35			
Mauritania	1987, 1993, 1995, 2000	46.67	49.37	28.6	25.94	
Mozambique	1996, 2002	39.84	36.18			
Namibia	1993	34.93				
Niger	1992, 1994	41.73	54.76			
Nigeria	1985, 1992, 1996, 2003	65.72	59.19	78.21	71.18	
Rwanda	1994, 2000	35.01	60.29			
Senegal	1991, 1994, 2001	45.38	24.04	16.82		
Sierra Leone	1989	57.03				
South Africa	1993, 1995, 2000	10.02	6.3	12.37		
Swaziland	1994, 2000	68.21	47.58			
Uganda	1989, 1992, 1996, 1999, 2002	87.67	90.26	87.94	84.92	82.28
United Republic of Tanzania	1991	32.74				
Zambia	1991, 1993, 1996, 1998, 2004	65.65	73.57	72.22	65.65	60.04
Zimbabwe	1990, 1995	54.39	56.12			

Source: World Bank (2007). "PovcalNet." http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp

Among the 49 spells of poverty changes, quite a few are of a small magnitude – often two or three percentage points. Given that there are no standard errors on the point estimates, and the inevitable measurement errors, for the sake of distinguishing whether poverty increased/decreased/remained the same across spells, we arbitrarily define "no change," as a difference in the headcount of less than three percentage points. Out of the 49 spells, 23 indicate a decline in poverty, 11 indicate a worsening of poverty, and 15 indicate no change. A more encouraging result is found when looking at spells with the most recent year being between 2000 and 2004. Among the 15 spells that end during the present decade, 10 indicate a decline in the poverty headcount, two suggest an increase, and three show no change. Again, it should be kept in mind that there are many cases where even a casual examination of reported magnitudes of the declines in the share of the population falling below the $1 per day poverty line look suspect, suggesting a healthy degree of skepticism be accorded to these findings.

Health and Education

We next turn to a discussion of changes in non-income dimensions of well-being, focusing on health and nutrition, which in addition to income are the other two pillars of the Human Development Index. To begin we discuss briefly the data employed, and then turn to the results. But before doing so, we want to emphasize that we believe these metrics of deprivation have far fewer problems than the standard income and expenditure variables. First and foremost, measuring deprivation in terms of health is done at the individual level. We need not concern ourselves with making assumptions about allocations within the household, or issues of unidentifiable economies of scale parameters. Second, price deflators and PPP calculations are not an issue here: centimeters are centimeters and kilos are kilos the world over. Measurement error is also small, and to the extent that it exists, it is random. Putting a child on a scale and recording a correct weight is simpler, less costly, less time consuming, and less subject to personal judgment than collection of consumption data. Nor are any complex calculations required to get from the field data to our measure of well-being.

Demographic and Health Survey (DHS) questionnaires are nearly identical across time and across countries, and the training of enumerators and field staff follow a standard set of procedures. This again, contrasts dramatically with the LSMS and consumption/expenditure surveys discussed above. And likewise, the questions on health do not rely on memory, and to the extent that the education question does, recall of the highest grade completed is likely not as affected by memory lapses and the types of measurement errors that affect consumption recall.

Despite these dramatic advantages in the measurement of deprivation, there is one common concern with the LSMS and DHS type surveys: the potential of changes in sampling frames which can compromise the comparability of results over time. While in principle the analysis of repeated large, nationally representative surveys that follow the same design is the most appropriate way to understand change in the well-being of the population, the potential pitfall of changes in the sampled populations may lead to spurious estimates of poverty changes. This issue has been examined in some detail in two recent papers using DHS surveys where we compare the sample means of individual or household characteristics that should not change over time in the two data sets (Glick, Sahn and Younger 2006; Glick and Sahn 2007).[4] Among the relatively small number of surveys compared, the authors do find several instances where there is evidence that the DHS samples are not identical. While statistical differences in certain characteristics are frequently uncovered, they are generally of a very small magnitude. While this problem undoubtedly plagues most, if not all the surveys that are the basis of the income-determined poverty figures, it does suggest the need for some caution in interpreting changes for individual spells, especially when differences are small in magnitude. Nonetheless, we would argue that the bigger picture we present based on 64 surveys is not affected by this potential problem.

Data

We analyze data from 64 Demographic and Health Surveys (DHS) conducted in 23 African countries that have at least two such surveys. Overall, we have 40 proximal spells of change in health and education poverty in our analysis, usually around five years long. A large share of the

most recent surveys are from the current decade, making the comparisons current, although for most countries they do not extend back into the 1980s.

The DHS are nationally representative surveys with large sample sizes and questionnaires that are virtually identical across time and countries. In most surveys, households are selected based on a standard stratified and clustered design, and, within the household, one woman, aged 15-49, is selected at random as the focus of the interview. In addition, all living children up to a given age (usually 60 months, but sometimes 36 months) born to that woman are weighed and measured. The data that we use pertain to these women and children.

There are many potential health and education variables, and related "poverty" lines that can be used to measure deprivation in these dimensions. Since we are interested in *distributions* of well-being, any useful measure must apply to individuals (as opposed to populations), and must also be continuous, (which rules out indicators such as the infant mortality rate or Human Development Index). Likewise, we cannot rely on predicted variables, because the prediction equation will compress the distribution.

For a variety of reasons which we discuss elsewhere (Sahn and Younger 2005, 2006), the first health indicator that we employ is the standardized height of pre-school age children. There is a large body of evidence to argue that a child's growth is an excellent objective indicator of his/her general health status (Cole and Parkin 1977; Mata 1978; Tanner 1981; Mosley and Chen 1984; WHO 1995; Martorell et al. 1975, Beaton et al. 1990; Strauss and Thomas 1995; Behrman and Deololikar 1988, 1991). As summarized by Beaton et al. (1990), growth failure is "…the best

general proxy for constraints to human welfare of the poorest, including dietary inadequacy, infectious diseases and other environmental health risks." They go on to point out that the usefulness of stature is that it captures the "…multiple dimensions of individual health and development and their socio-economic and environmental determinants (p. 2)."

Most analyses of children's heights (or weights) measure them in z-scores: the distance the child's height is from the median of a reference population of healthy children, measured in standard deviations and standardized by age and gender (WHO 1983). But z-scores can be negative (and usually are for poor populations), while most standard distributional statistics require that the underlying measure of well-being be positive. We thus work with "standardized heights," instead of z-scores. This variable is calculated by, given a child's z-score (whatever the age and gender), assigning that child the height corresponding to the same z-score in the 24-month-old girls' distribution. Thus, the height derived is that which the child would have if s/he were a 24-month old girl. The standardization allows us to compare children of different ages and genders while maintaining a positive value for each child. The poverty line that we assign for this variable is the standardized height that is two standard deviations below the median of the distribution of the reference population of healthy children, a practice that is standard in the literature.

A second health indicator we employ to assess the health of the adult population is the Body Mass Index (BMI) for women aged 15-49, calculated as (weight in kilograms)/(height in meters squared). Like with children's heights, we use a conventional cut-off point of 18.5 as a poverty line for this variable. It is important to note that, unlike height, education, or income, welfare does not necessarily increase monotonically with body mass, which violates one of the standard

axioms of most distributional measures (the monotonicity axiom, or "more is better"). Yet in Africa, the share of women who are obese is sufficiently small that we can interpret our results for this variable as if "more is better" applies over the observed range of weights.

For education, we use the number of years of schooling for women aged 22 to 30 as our indicator of well-being, defining education poverty as not completing six years of primary schooling. We limit our analysis to women above 22 because we want to avoid censoring for women who have not yet reached the age at which they should have completed post-secondary school. Likewise, since we want to focus our attention on those who have finished their schooling in the not-too-distant past, we use an upper age limit of 30 years of age. [5] A potential weakness of using years of schooling as a measure of well-being is that it does not control for differences in school quality and is thus an imperfect measure of the well-being that comes from education. However, given that our comparisons are within countries and over relatively short time periods (usually five years), the implicit assumption that school quality is constant may not be too restrictive. We define the education poverty line at completing six years of schooling. Since this is somewhat arbitrary, we have tested the sensitivity of our results to this assumption by varying the education poverty line three years in each direction, and find little difference in our results.

Since the DHS surveys follow the same structure and format, and the indicators are strictly comparable and do not involve challenges such as employing deflators, we are quite confident in making inter-temporal comparisons using these data. Likewise, we expect that most measurement error will be random – unlike measurement error in income. The fact that we estimated the headcounts ourselves also allows us to not only ensure the same analytical procedures were employed in calculating poverty indexes, but we can also make statistical comparisons over time employing the standard errors we estimate.[6]

Results

Headcount Indexes

We next examine the headcounts for the three measures of well-being. Table 14.8 presents the changes in the share of stunted children between proximal spells. Among the 39 spells for which we have data, there were 13 cases where the headcount worsened (e.g., more stunting), 13 where the headcount declined, and 13 where it remained the same.[7] Of course, this summary of the changes in spells obscures important inter-country differences, as well as differences within a country where we have more than one spell. For example, there was a substantial decline in the share of children who were in poor health in Namibia between 1992 and 2000, but just the opposite is the case in Niger. But perhaps of greater interest is that in those countries with two or more spells, it is usually the case that the changes over time do not tend to work in the same direction. For example, Zimbabwe witnessed a large decline in stunted children between 1988 and 1994, only to witness a substantial worsening between 1994 and 1999. In a similar vein, the deterioration in the health of Nigeria's children that occurred between 1986 and 1990, and again between 1990 and 1999, reversed itself by 2003 where there was a substantial decline in the stunted share. Thus, whether we look at all the spells across the continent or sequences of spells in individual countries, there is no clear evidence of steady improvement (or deterioration) in children's health.

Table 14.8. Poverty Headcounts for Children's Heights

			Tests for Equality*		
	Survey	Headcount	vs. first	vs. second	vs. third
Burkina Faso	1992	0.353			
	1999	0.383	1.96		

	2003	0.406	4.09	1.76	
Benin	1996	0.294			
	2001	0.320	1.82		
Cote d'Ivoire	1994	0.289			
	1998	0.245	-2.61		
Cameroon	1991	0.272			
	1998	0.355	4.65		
	2004	0.348	4.42	-0.42	
Chad	1997	0.431			
	2004	0.437	0.41		
Ethiopia	2000	0.511			
	2005	0.475	-2.62		
Ghana	1988	0.320			
	1993	0.307	-0.78		
	1998	0.236	-5.20	-4.33	
	2003	0.304	-1.00	-0.20	4.24
Guinea	1999	0.284			
	2005	0.371	5.00		
Kenya	1993	0.355			
	1998	0.355	0.00		
	2003	0.347	-0.60	-0.59	
Madagascar	1992	0.567			
	1997	0.564	-0.25		
	2003	0.502	-4.32	-4.17	
Mali	1987	0.272			
	1995	0.368	5.45		
	2001	0.408	7.87	3.75	
Malawi	1992	0.496			
	2000	0.506	0.71		
Mozambique	1997	0.440			
	2003	0.425	-1.09		

continued

Table 14.8. Poverty Headcounts for Children's Heights *continued*

			Tests for Equality		
	Survey	**Headcount**	**vs. first**	**vs. second**	**vs. third**
Nigeria	1986	0.302			
	1990	0.425	8.11		

	1999	0.504	10.80	4.65	
	2003	0.422	7.57	-0.19	-4.63
Niger	1992	0.439			
	1998	0.497	4.18		
Namibia	1992	0.330			
	2000	0.238	-5.60		
Rwanda	1992	0.489			
	2000	0.427	-4.47		
	2005	0.479	-0.66	3.62	
Senegal	1986	0.230			
	1992	0.262	1.66		
	2005	0.164	-3.38	-7.16	
Togo	1988	0.341			
	1998	0.262	-4.86		
Tanzania	1992	0.451			
	1996	0.466	1.19		
	1999	0.442	-0.58	-1.47	
	2004	0.385	-5.75	-6.67	-3.62
Uganda	1988	0.472			
	1995	0.412	-4.25		
	2000	0.407	-4.53	-0.38	
Zambia	1992	0.428			
	1996	0.448	1.58		
	2001	0.512	6.40	4.95	
Zimbabwe	1988	0.321			
	1994	0.254	-4.04		
	1999	0.312	-0.52	3.51	

Author's calculations

*These are t-test statistics of the equality of the poverty statistic between the two surveys indicated.

We have information for fewer spells in the case of the share of underweight women. This is because women's anthropometry was not a standard part of the health module of the DHS in the earlier surveys. The results, however, differ somewhat from the information on child health. In the majority of cases there was no change in the share of women who are wasted; only in four of

25 spells did the share of underweight women increase, while it declined in six cases. (Table 14.9).

Table 14.9. Poverty Headcounts for Women's BMI

	Survey	Headcount	Tests for Equality* vs. first	vs. second	vs. third
Burkina Faso	1992	0.137			
	1999	0.125	-1.50		
	2003	0.197	9.12	11.07	
Benin	1996	0.140			
	2001	0.101	-5.02		
Cote d'Ivoire	1994	0.079			
	1998	0.082	0.53		
Cameroon	1998	0.070			
	2004	0.064	-0.89		
Chad	1997	0.194			
	2004	0.202	0.93		
Ethiopia	2000	0.281			
	2005	0.246	-5.38		
Ghana	1993	0.113			
	1998	0.107	-0.68		
	2003	0.091	-2.77	-2.15	
Guinea	1999	0.113			
	2005	0.121	1.09		
Kenya	1993	0.094			
	1998	0.109	2.19		
	2003	0.118	4.05	1.43	
Madagascar	1997	0.190			
	2003	0.184	-0.74		
Mali	1995	0.146			
	2001	0.114	-5.43		
Malawi	1992	0.086			
	2000	0.080	-0.97		
Mozambique	1997	0.109			
	2003	0.081	-4.45		

continued

Table 14.9. Poverty Headcounts for Women's BMI *continued*

	Survey	Headcount	Tests for Equality vs. first	vs. second	vs. third
Nigeria	1999	0.156			
	2003	0.141	-1.75		
Niger	1992	0.177			
	1998	0.190	1.49		
Namibia	1992	0.128			
Rwanda	2000	0.082			
	2005	0.092	2.07		
Senegal	1992	0.137			
	2005	0.174	4.48		
Togo	1998	0.105			
Tanzania	1992	0.089			
	1996	0.088	-0.16		
	2004	0.095	1.25	1.35	
Uganda	1995	0.089			
	2000	0.094	0.78		
Zambia	1992	0.097			
	1996	0.083	-2.25		
	2001	0.141	7.08	10.14	
Zimbabwe	1994	0.047			
	1999	0.054	1.45		

Authors' calculations

*These are t-test statistics of the equality of the poverty statistic between the two surveys indicated.

Our final indicator of deprivation is years of schooling for women aged 22-30. We select this group because first, the women in this cohort are old enough that schooling is likely not censored. In addition, these young women represent a cohort that has recently passed through the years in which they would have been in school and are also recent entrants into the labor market. We use a cut-off point of six years of schooling for our poverty line (Table 14.10).[8]

Table 14.10. Poverty Headcounts for Women's Years of Learning

	Survey	Headcount	Tests for Equality*		
			vs. first	vs. second	vs. third
Burkina Faso	1992	0.940			
	1999	0.947	0.95		
	2003	0.905	-4.64	-5.71	
Benin	1996	0.893			
	2001	0.898	0.54		
Cote d'Ivoire	1994	0.862			
	1998	0.835	-1.80		
Cameroon	1991	0.718			
	1998	0.543	-9.37		
	2004	0.523	-11.83	-1.29	
Chad	1997	0.966			
	2004	0.947	-2.88		
Ethiopia	2000	0.878			
	2005	0.870	-1.17		
Ghana	1988	0.507			
	1993	0.530	1.23		
	1998	0.492	-0.83	-2.04	
	2003	0.494	-0.73	-1.98	0.12
Guinea	1999	0.927			
	2005	0.931	0.52		
Kenya	1988	0.482			
	1993	0.386	-6.41		
	1998	0.276	-14.38	-7.75	
	2003	0.261	-15.76	-9.01	-1.14
Madagascar	1992	0.726			
	1997	0.748	1.51		
	2003	0.741	1.01	-0.56	
Mali	1987	0.943			
	1995	0.933	-1.12		
	2001	0.929	-1.64	-0.65	
Malawi	1992	0.809			
	2000	0.739	-5.52		
Mozambique	1997	0.924			
	2003	0.893	-3.93		

continued

Table 14.10. Poverty Headcounts for Women's Years of Learning *continued*

	Survey	Headcount	Tests for Equality vs. first	vs. second	vs. third
Nigeria	1986	0.661			
	1990	0.809	8.87		
	1999	0.625	-2.04	-15.34	
	2003	0.599	-3.41	-16.49	-1.84
Niger	1992	0.972			
	1998	0.947	-4.08		
Namibia	1992	0.408			
	2000	0.228	-11.13		
Rwanda	1992	0.762			
	2000	0.640	-8.81		
	2005	0.804	3.39	13.72	
Senegal	1986	0.910			
	1992	0.903	-0.68		
	1997	0.871	-3.70	-3.16	
	2005	0.848	-6.32	-5.92	-2.54
Togo	1988	0.836			
	1998	0.881	3.38		
Tanzania	1992	0.433			
	1996	0.320	-8.29		
	1999	0.328	-6.36	0.44	
	2004	0.346	-6.68	1.98	1.14
Uganda	1988	0.795			
	1995	0.758	-2.59		
	2000	0.699	-6.62	-4.41	
Zambia	1992	0.453			
	1996	0.465	0.79		
	2001	0.476	1.44	0.67	
Zimbabwe	1988	0.532			
	1994	0.286	-13.15		
	1999	0.157	-21.61	-8.89	

Authors' calculations.

*These are t-test statistics of the equality of the poverty statistic between the two surveys indicated.

Overall we observe a more positive story than the health indicators: out of the 39 spells, schooling poverty declined in 20 cases, worsened in two cases, and remained constant in 17 cases. Kenya and Zimbabwe are notable for their quite dramatic improvements across multiple spells. In contrast, there are a number of countries with extremely high shares of women who have not completed six years of schooling. These are concentrated in Francophone West Africa, and the sobering statistics capture both low starting values, and the fact that there has been little improvement over the years. In fact, the progress reported for Cameroon between 1991 and 1998 is the only case where a substantial and statistically significant improvement in the share of women who have competed six years of schooling is found in Francophone West Africa.

Decompositions of changes in health and education

In considering the changes in poverty headcounts along various dimensions, an interesting question that arises is the extent to which the relatively limited progress observed is attributable to adverse distributional changes. That is, we ask the question: to what extent are changes in inequality contributing to, or impairing, progress in terms of the overall reduction in poverty. To address that question, we build upon the earlier work of Datt and Ravallion (1992) who show that the change in the share of the population that falls below the poverty line can be decomposed into two components: one due to changes in the mean of the distribution and another due to changes in its dispersion. More precisely, any distribution can be characterized by its mean and its Lorenz curve. As a result, the share of a population that is poor can be expressed as a function of its mean, μ, its Lorenz curve, L, and the poverty line, z. We then decompose the change in poverty between period t and $t+n$ into a growth component, defined as the change in

poverty due to a change in the mean of the distribution while holding the Lorenz curve constant at that of the reference sample, and the redistribution component, defined as the change in the Lorenz curve while keeping the mean of the distribution constant at that of the reference sample (Datt and Ravallion 1992).

The Datt and Ravallion decomposition is not robust to the choice of the reference sample. To avoid this problem we rely on Kakwani's (1997) approach to the decomposition problem and average the Datt and Ravallion decompositions calculated with each sample as the reference. We have previously adopted this practice (Sahn and Younger 2005), as have others (McCulloch, Cherel-Robson, and Baluch 2000; Dhongde 2002; Shorrocks and Kolenikov 2001). Besides having the advantage of being consistent with the axiomatic properties proposed by Kakwani, it eliminates the residual in the methodology developed by Datt and Ravallion, which is difficult to interpret.

Before presenting the results of our decomposition analysis for the two health indicators and education, we note that there are many examples from Africa of similar decomposition exercises for income poverty. The results of such efforts are summarized by Christiaensen, Demery, and Paternostro (2002), who conclude that the mean shifts are far more important in determining changes in poverty than the contribution of the distribution component. We are therefore interested in the whether the same holds true for well-being measured in terms of health and education. The results of such an analysis are found in Tables 14.11, 14.12, and 14.13. For children's heights, in 29 spells the absolute value of the share of the mean component of the decomposition is larger than the dispersion share, while the opposite is true in only nine spells.

For one spell they are the same. It is also the case that whenever there are relatively large changes in the share of stunted children, this is driven by changes in the mean component. A good example of this if found in the three spells from Ghana; in each case the share of the overall change contributed to by the mean shift is more than twice the magnitude of the change in the dispersion.

Table 14.11. Datt-Ravallion-Kakwani Decompositions for Children's Heights

Country	Period	First	Second	Difference	t-value	Mean	Dispersion
Burkina Faso	1992-1999	0.351	0.380	0.030	-1.940	0.053	-0.023
	1999-2003	0.380	0.402	0.021	-1.584	0.003	0.018
Benin	1996-2001	0.290	0.318	0.028	-1.920	0.024	0.004
Cote d'Ivoire	1994-1998	0.286	0.240	-0.046	2.697	-0.052	0.006
Cameroon	1991-1998	0.271	0.349	0.078	-4.405	0.035	0.043
	1998-2004	0.349	0.346	-0.003	0.154	-0.011	0.008
Chad	1997-2004	0.426	0.434	0.009	-0.604	0.011	-0.002
Ethiopia	2000-2005	0.509	0.471	-0.037	2.705	-0.071	0.034
Ghana	1988-1993	0.320	0.303	-0.016	0.984	-0.026	0.009
	1993-1998	0.303	0.232	-0.071	4.333	-0.057	-0.014
	1998-2003	0.232	0.301	0.068	-4.268	0.050	0.018
Guinea	1999-2005	0.282	0.368	0.086	-4.952	0.063	0.023
Kenya	1993-1998	0.352	0.352	0.000	0.003	-0.031	0.031
	1998-2003	0.345	-0.007	0.004	0.000	-0.011	0.000
Madagascar	1992-1997	0.567	0.562	-0.005	0.339	-0.011	0.006
	1997-2003	0.562	0.502	-0.060	4.089	-0.084	0.024
Mali	1987-1995	0.271	0.366	0.095	-5.412	0.069	0.025
	1995-	0.366	0.406	0.040	-3.771	0.025	0.015

	2001						
	1992-						
Malawi	2000	0.491	0.505	0.014	-0.963	-0.009	0.022
Mozambiq	1997-						
ue	2003	0.438	0.423	-0.015	1.128	0.017	-0.032
	1986-						
Nigeria	1990	0.301	0.421	0.119	-7.902	0.073	0.046
	1990-						
	1999	0.421	0.502	0.081	-4.783	0.035	0.047
	1999-						
	2003	0.502	0.420	-0.082	4.639	-0.045	-0.037
	1992-						
Niger	1998	0.437	0.495	0.058	-4.177	0.068	-0.010
	1992-						
Namibia	2000	0.329	0.235	-0.094	5.686	-0.080	-0.014
	1992-						
Rwanda	2000	0.486	0.424	-0.062	4.487	-0.093	0.030
	2000-						
	2005	0.424	0.474	0.050	-3.512	0.066	-0.016
	1986-						
Senegal	1992	0.230	0.258	0.028	-1.434	0.000	0.028
	1986-						
	2005	0.230	0.162	-0.067	3.460	-0.073	0.005
	1992-						
	2005	0.258	0.162	-0.095	6.980	-0.078	-0.017
	1988-						
Togo	1998	0.340	0.259	-0.082	4.969	-0.083	0.001
	1992-						
Tanzania	1996	0.448	0.463	0.015	-1.178	0.006	0.009
	1996-						
	1999	0.463	0.441	-0.022	1.357	0.001	-0.024
	1999-						
	2004	0.441	0.382	-0.059	3.730	-0.059	0.001
	1988-						
Uganda	1995	0.470	0.408	-0.062	4.376	-0.052	-0.010
	1988-						
	2000	0.470	0.404	-0.066	4.619	-0.051	-0.015
	1995-						
	2000	0.408	0.404	-0.004	0.341	-0.002	-0.003
	1992-						
Zambia	1996	0.426	0.446	0.020	-1.539	0.018	0.002
	1996-						
	2001	0.446	0.508	0.062	-4.790	0.054	0.008
	1988-						
Zimbabwe	1994	0.319	0.252	-0.066	4.033	-0.082	0.016
	1994-						
	1999	0.252	0.306	0.054	-3.311	0.004	0.050

Author's calculations.

Table 14.12. Datt-Ravallion-Kakwani Decompositions for Women's BMI

Country	Period	First	Second	Difference	t-value	Mean	Dispersion
Burkina Faso	1992-1999	0.137	0.125	-0.011	1.501	0.011	-0.022
	1999-2003	0.125	0.197	0.071	-11.069	0.006	0.065
Benin	1996-2001	0.140	0.101	-0.039	5.016	-0.090	0.051
Cote d'Ivoire	1994-1998	0.079	0.082	0.004	-0.534	-0.023	0.027
Cameroon	1998-2004	0.070	0.064	-0.006	0.888	-0.038	0.032
Chad	1997-2004	0.194	0.202	0.008	-0.931	-0.023	0.031
Ethiopia	2000-2005	0.281	0.246	-0.035	5.379	-0.045	0.011
Ghana	1993-1998	0.113	0.107	-0.007	0.677	-0.029	0.022
	1998-2003	0.107	0.091	-0.016	2.155	-0.066	0.050
Guinea	1999-2005	0.113	0.121	0.008	-1.092	-0.004	0.012
Kenya	1993-1998	0.094	0.109	0.015	-2.188	0.001	0.014
	1998-2003	0.109	0.118	0.009	-1.429	-0.044	0.053
Madagascar	1997-2003	0.190	0.184	-0.006	0.736	-0.047	0.041
Mali	1995-2001	0.146	0.114	-0.031	5.429	-0.066	0.035
Malawi	1992-2000	0.086	0.080	-0.006	0.972	-0.016	0.011
Mozambique	1997-2003	0.109	0.081	-0.027	4.445	-0.056	0.028
Nigeria	1999-2003	0.156	0.141	-0.015	1.747	0.030	-0.044
Niger	1992-1998	0.177	0.190	0.013	-1.487	0.011	0.002
Rwanda	2000-2005	0.082	0.092	0.010	-2.074	0.009	0.000
Senegal	1992-2005	0.137	0.174	0.036	-4.483	-0.036	0.072
Tanzania	1992-1996	0.089	0.088	-0.001	0.163	-0.012	0.011
	1996-2004	0.088	0.095	0.007	-1.355	-0.018	0.025
Uganda	1995-2000	0.089	0.094	0.005	-0.776	-0.030	0.034

Zambia	1992-1996	0.097	0.083	-0.014	2.253	-0.010	-0.004
	1996-2001	0.083	0.141	0.058	-10.144	0.035	0.023
Zimbabwe	1994-1999	0.047	0.054	0.008	-1.446	-0.014	0.022

Authors' calculations.

Table 14.13. Datt-Ravallion-Kakwani Decompositions for Women's Years of Schooling

Country	Period	First	Second	Difference	t-value	Mean	Dispersion
Burkina Faso	1992-1999	0.940	0.947	0.007	-0.950	0.016	-0.009
	1999-2003	0.947	0.905	-0.043	5.710	-0.052	0.009
Benin	1996-2001	0.893	0.898	0.006	-0.536	-0.012	0.018
Cote d'Ivoire	1994-1998	0.862	0.835	-0.026	1.802	-0.095	0.068
Cameroon	1991-1998	0.718	0.543	-0.175	9.367	-0.189	0.014
	1998-2004	0.543	0.523	-0.020	1.288	-0.038	0.018
Chad	1997-2004	0.966	0.947	-0.019	2.880	-0.021	0.002
Ethiopia	2000-2005	0.878	0.870	-0.008	1.175	-0.011	0.002
Ghana	1988-1993	0.507	0.530	0.023	-1.227	-0.026	0.049
	1993-1998	0.530	0.492	-0.039	2.044	-0.029	-0.009
	1998-2003	0.492	0.494	0.002	-0.121	0.032	-0.030
Guinea	1999-2005	0.927	0.931	0.004	-0.520	0.006	-0.001
Kenya	1988-1993	0.482	0.386	-0.095	6.411	-0.039	-0.057
	1993-1998	0.386	0.276	-0.110	7.753	-0.122	0.012
	1998-2003	0.276	0.261	-0.015	1.138	0.036	-0.051
Madagascar	1992-1997	0.726	0.748	0.022	-1.508	0.017	0.005
	1992-2003	0.726	0.741	0.014	-1.014	-0.017	0.031
	1997-2003	0.748	0.741	-0.008	0.559	-0.017	0.010

Mali	1987-1995	0.943	0.933	-0.010	1.117	-0.014	0.004
	1995-2001	0.933	0.929	-0.004	0.647	-0.010	0.006
Malawi	1992-2000	0.809	0.739	-0.070	5.518	-0.136	0.066
Mozambique	1997-2003	0.924	0.893	-0.030	3.930	-0.022	-0.008
Nigeria	1986-1990	0.661	0.809	0.148	-8.869	0.136	0.011
	1990-1999	0.809	0.625	-0.184	15.337	-0.147	-0.038
	1999-2003	0.625	0.599	-0.026	1.837	-0.092	0.066
Niger	1992-1998	0.972	0.947	-0.025	4.076	-0.049	0.024
Namibia	1992-2000	0.408	0.228	-0.180	11.126	-0.127	-0.054
Rwanda	1992-2000	0.762	0.640	-0.121	8.811	-0.126	0.005
	2000-2005	0.640	0.804	0.163	-13.722	0.078	0.085
Senegal	1986-1992	0.910	0.903	-0.007	0.676	0.044	-0.052
	1992-1997	0.903	0.871	-0.032	3.163	-0.059	0.028
	1997-2005	0.871	0.848	-0.023	2.537	-0.072	0.049
Togo	1988-1998	0.836	0.881	0.045	-3.378	0.026	0.019
Tanzania	1992-1996	0.433	0.320	-0.113	8.290	-0.014	-0.099
	1996-1999	0.320	0.328	0.007	-0.441	-0.007	0.014
	1999-2004	0.328	0.346	0.018	-1.144	-0.014	0.033
Uganda	1988-1995	0.795	0.758	-0.036	2.589	-0.036	0.000
	1995-2000	0.758	0.699	-0.059	4.409	-0.145	0.086
Zambia	1992-1996	0.453	0.465	0.012	-0.794	-0.042	0.055
	1996-2001	0.465	0.476	0.010	-0.671	-0.039	0.049
Zimbabwe	1988-1994	0.532	0.286	-0.246	13.151	-0.199	-0.046
	1994-1999	0.286	0.157	-0.129	8.890	-0.027	-0.102

Authors' calculations.

The fact that the predominance of the changes in the mean in driving changes in stunting, however, is not to say that the dispersion component is trivial or unimportant. Take the case of Nigeria between 1986 and 1990. There was a large increase in the share of stunted children, from 30 to 42 percent. Over one-third of this was attributable to the worsening distribution of standardized heights in the population. Similarly, more than half of the increase in stunting over the spell from 1991 to 1998 was accounted for by the worsening inequality in children's health. We similarly note cases where the distribution and mean components move in opposite directions, and occasionally cancel each other out. This was the case in Kenya between 1993 and 1998. There are also interesting cases such as Rwanda between 1992 and 2000 where the decline in the share of stunted children would have been substantially greater if not for worsening inequality in the population. Overall, in fact, the mean and dispersion components for children's heights move in the same direction in only 15 out of 39 spells. This is somewhat contrary to our expectation that we would find these moving in the same direction, given that there is an obvious upper bound to children's heights and we might expect that any improvements would be concentrated in the left part of the distribution.[9] But it also reinforces the fact that distributions matter, albeit not as much as mean components.

When we examine the BMI decompositions, somewhat in contrast, we find that only in half of the cases are the mean shifts of a greater magnitude than the dispersion effects. Once again, an example of the importance of the dispersion effect is the case of the most recent spell in Burkina Faso. Between 1999 and 2003, the share of severely wasted women increased from 12.5 percent to 19.7 percent. Ninety percent of this increase was due to worsening inequality, with the mean component remaining nearly constant. Another interesting case of the mean shift and dispersion

effects working in opposite direction is the case of Mozambique. In the absence of worsening inequality, the decline in the share of women who are severely wasted would have been nearly 50 percent. However, the worsening distribution of weights contributed to a far smaller decline in the share of wasted women, falling from 14.6 percent to 11.4 percent between 1997 and 2003.

One final finding of note with regard to the BMI results that is that, unlike the case for the share of stunted children, the overwhelming share of spells involve an increase in inequality. That is consistent with a story of women at the upper end of the standardized weight distribution seeing larger gains in weight than those thinner and wasted women we are primarily concerned about.

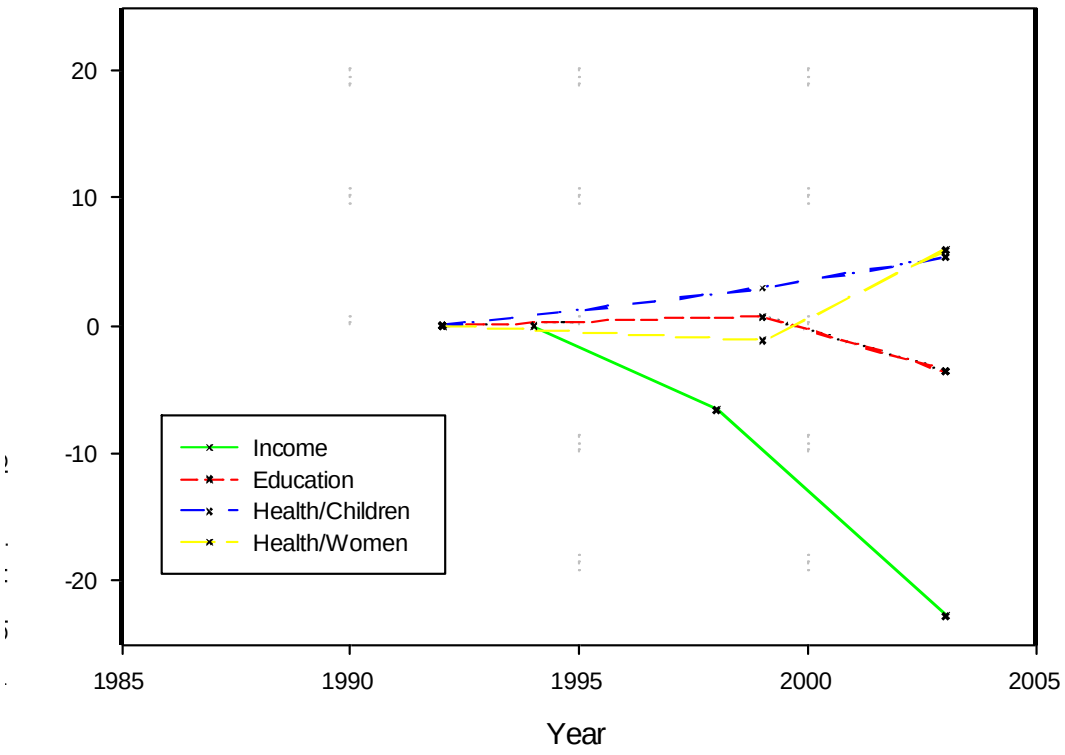
Our final indicator of deprivation is years of schooling for women aged 22-30. As noted above, we use a poverty line of six years of schooling. As we observed with the child health indicator, the mean shift is of a greater magnitude than the impact of the changes in dispersion in terms of explaining overall differences in the headcount. This is the case in 28 out of 40 spells. Overall, the average dispersion effect is also smaller than the mean shift effect, indicating it is the latter which is driving improvements in the education poverty headcount. Nonetheless, once again the dispersion effects are sometimes quite important in explaining the overall level of improvement, or lack thereof. In a case such as Uganda between 1995 and 2000, the education headcount fell by six percentage points from 76 to 70 percent. However, if it were not for the increased inequality in education, the decline in the share of women not completing primary school would have been much greater, to 61 percent. Similarly, the improvement in the share of women completing six years of schooling in Nigeria between 1999 and 2003 would have been 10 percentage points, rather than three, if inequality was not worsening during the period.

We also note that like BMIs, but unlike children's heights, the mean and dispersion effects tend to move in opposite directions. And likewise, the dispersion effect is more often in the direction of increasing education poverty, that is, increasing inequality in this outcome.

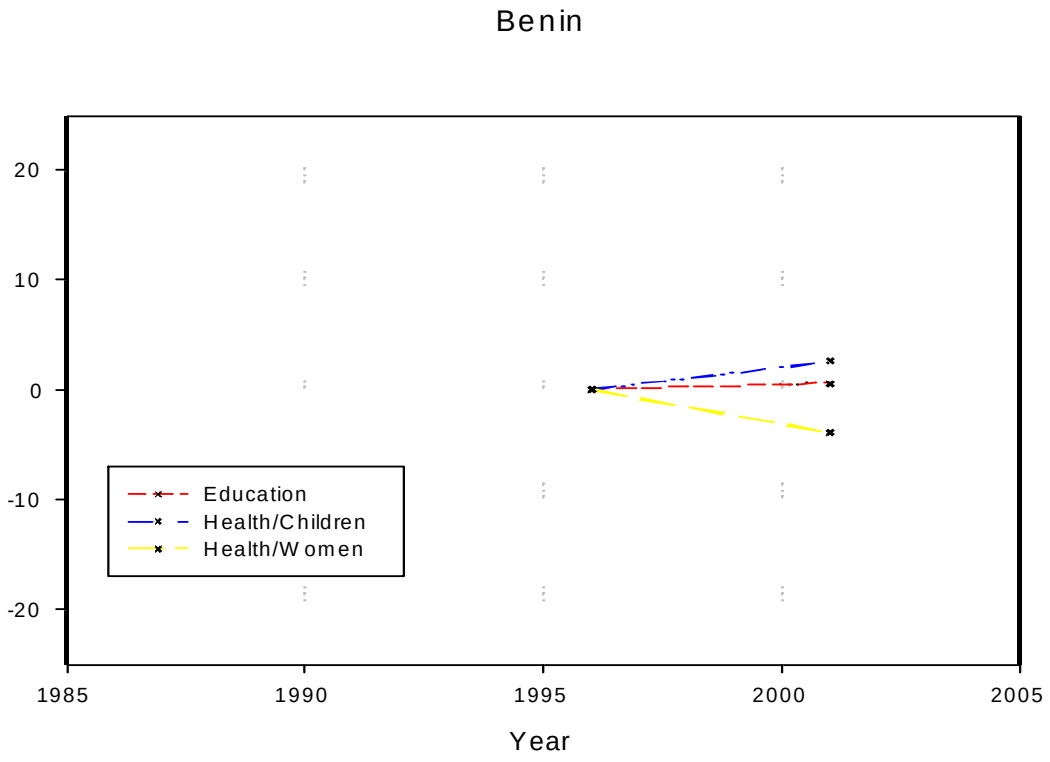
Given these findings, we next present a series of figures that put them all together: they plot the results of survey data across the four dimensions we have examined – household expenditures per capita, children's heights, women's BMI, and women's years of schooling (Figure 14.1). The graphs are all plotted on the same axes so as to be comparable across countries. The poverty value in the first survey in the series is assigned zero, so that the subsequent data points capture absolute changes, either positive (more poverty) or negative (less poverty), in the headcount measures. So, a change in the share of the poor from 50 percent to 58 percent will be plotted exactly the same as a change in the headcount from 4 to 12 percent.

Figure 14.1. Comparisons of Changes in the Poverty Headcounts by

Burkina Faso



Country


Benin
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1985
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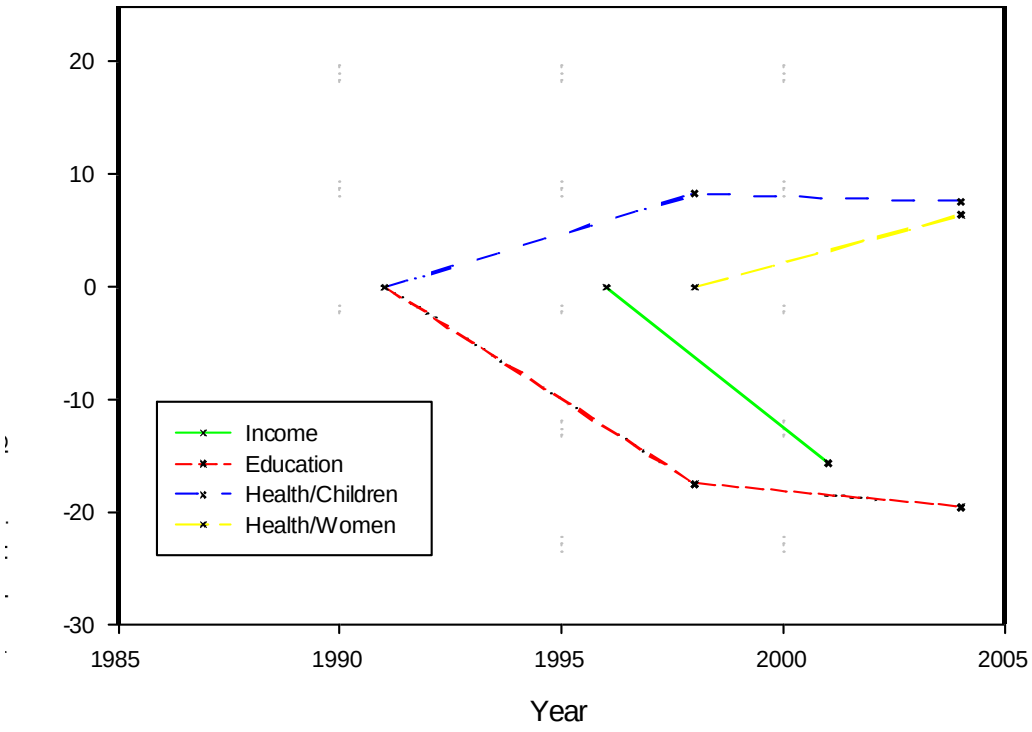
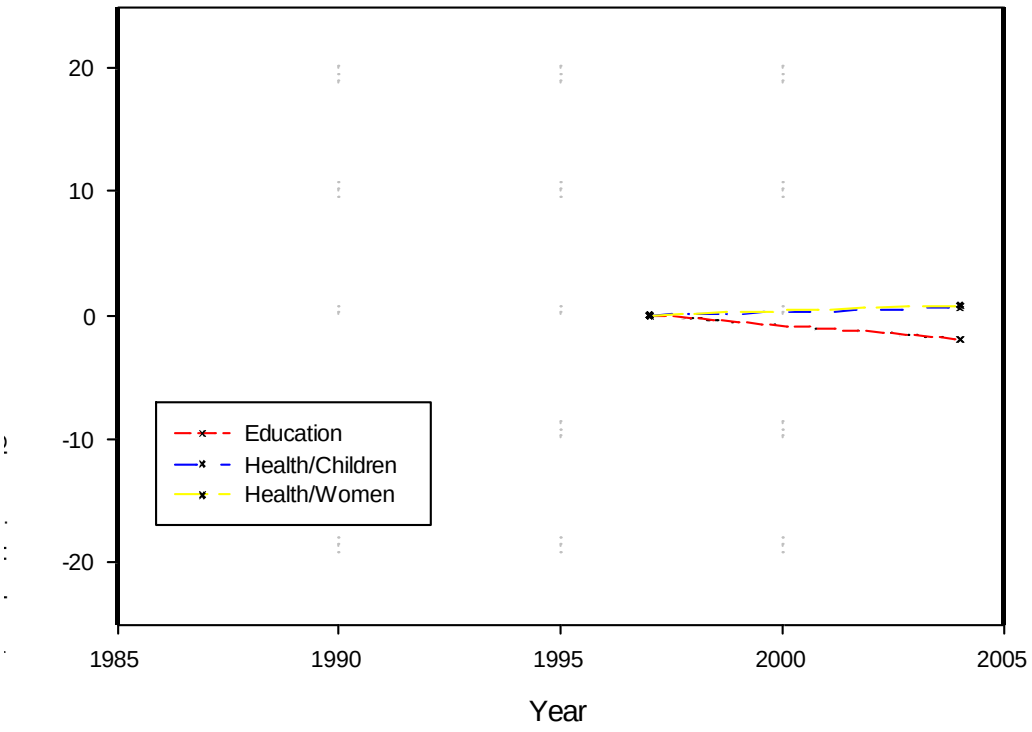
Year
Education
Health/Children
Health/Women

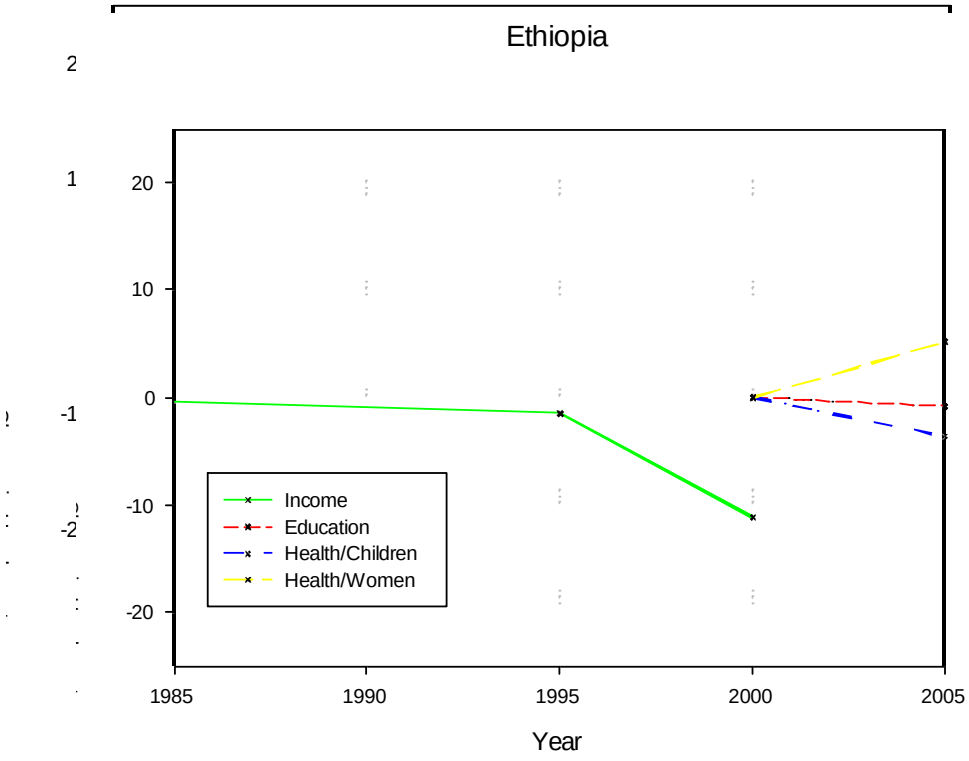
Cameroon



Chad



Cote d'Ivore


Ethiopia
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Income
Education
Health/Children
Health/Women
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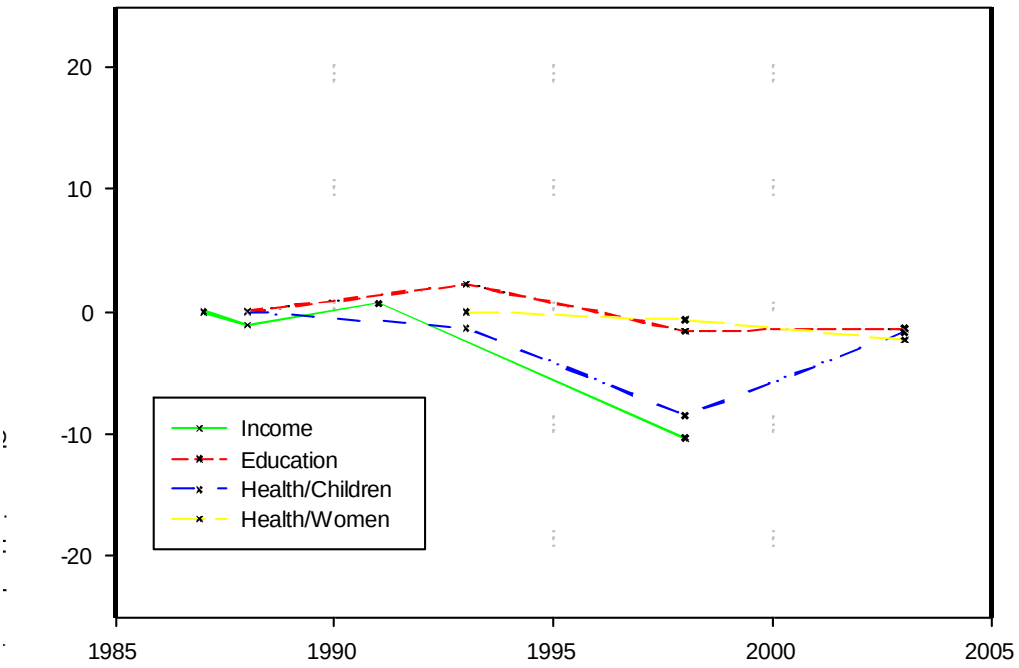
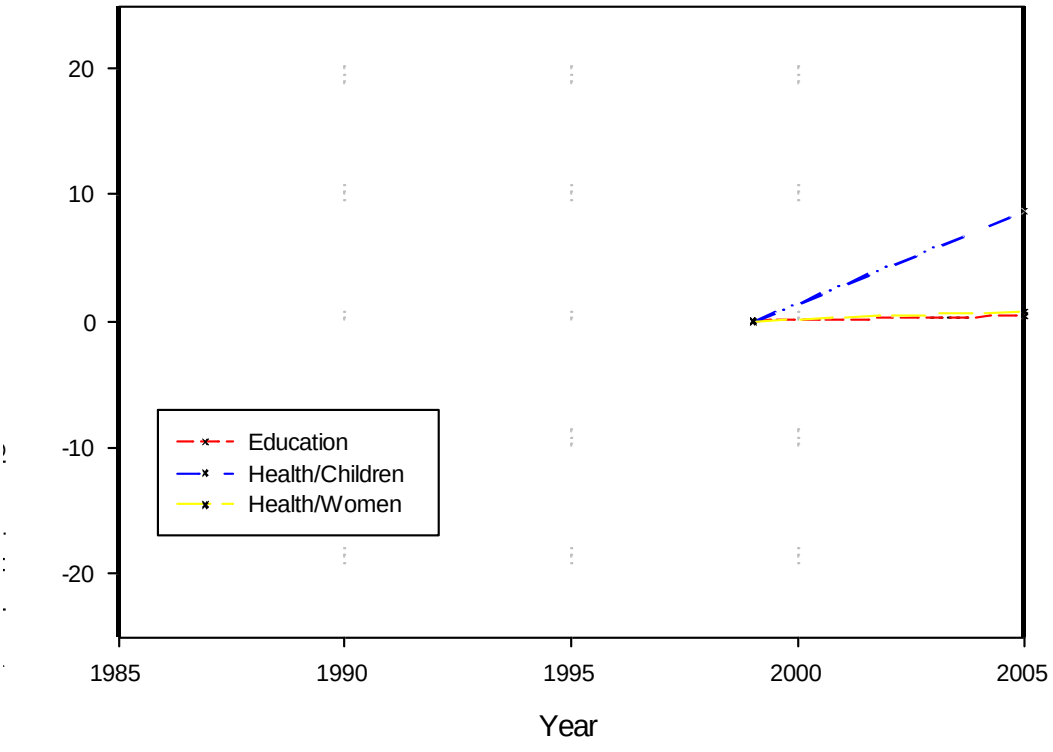
2005
Year

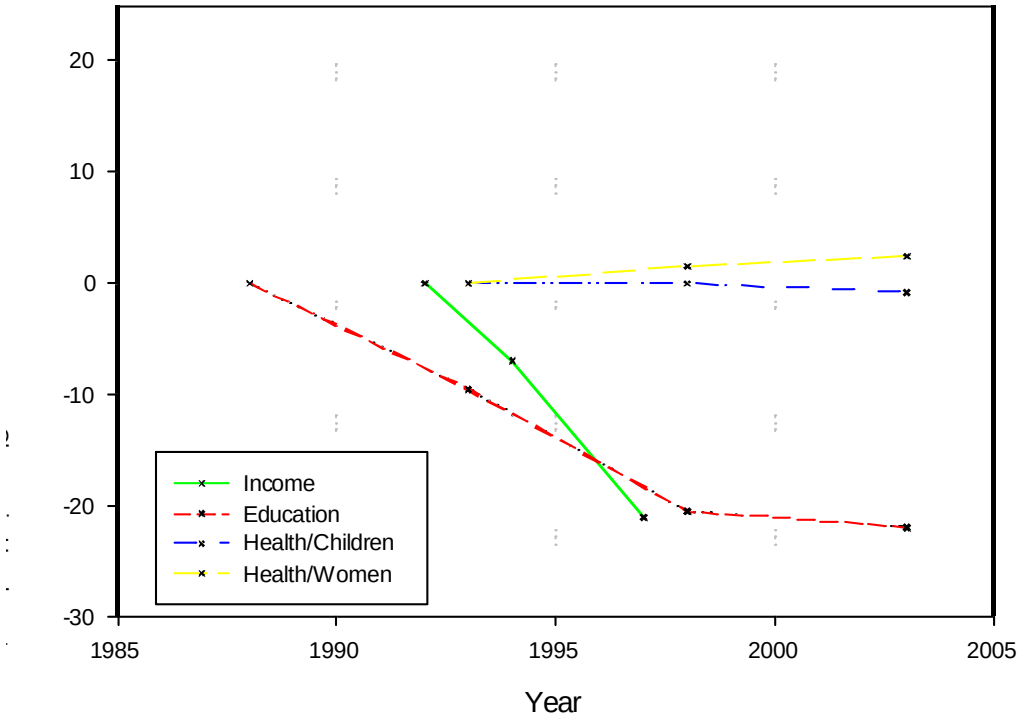
Ghana



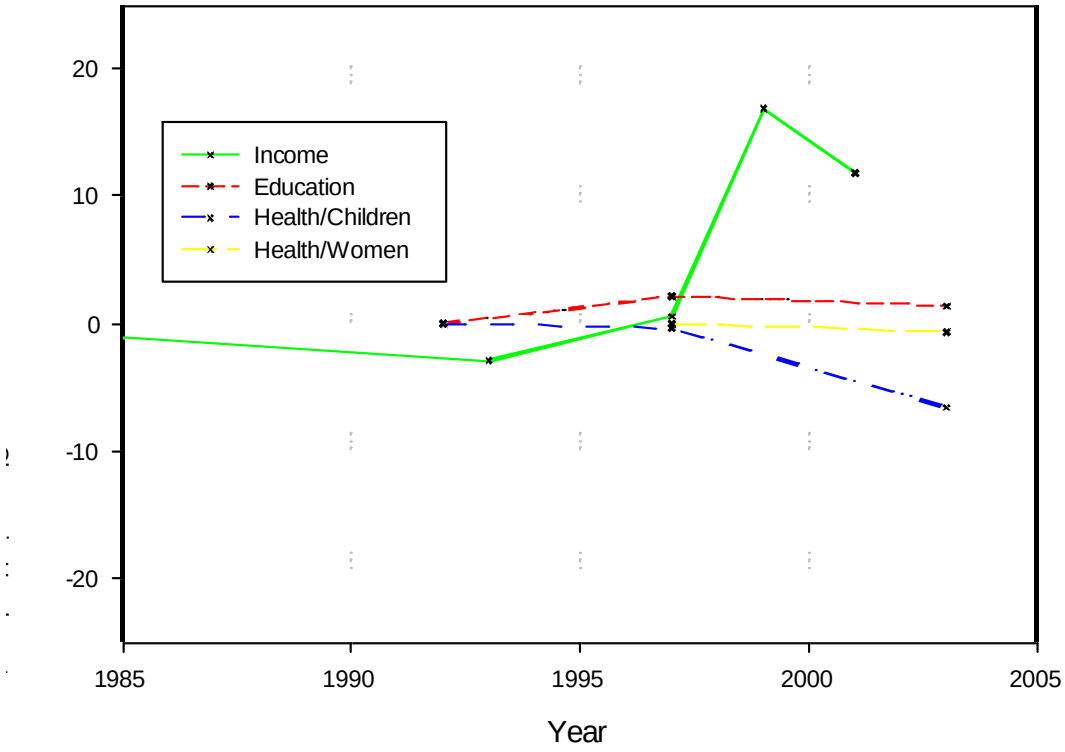
Guinea



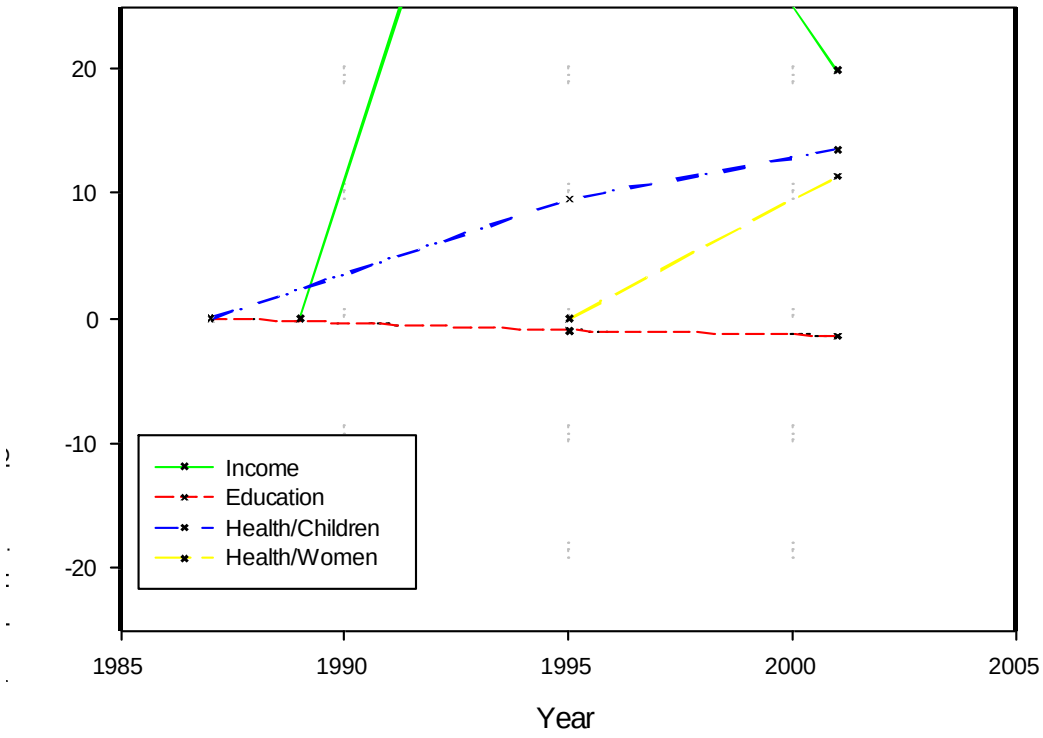
Kenya



Madagascar



Mali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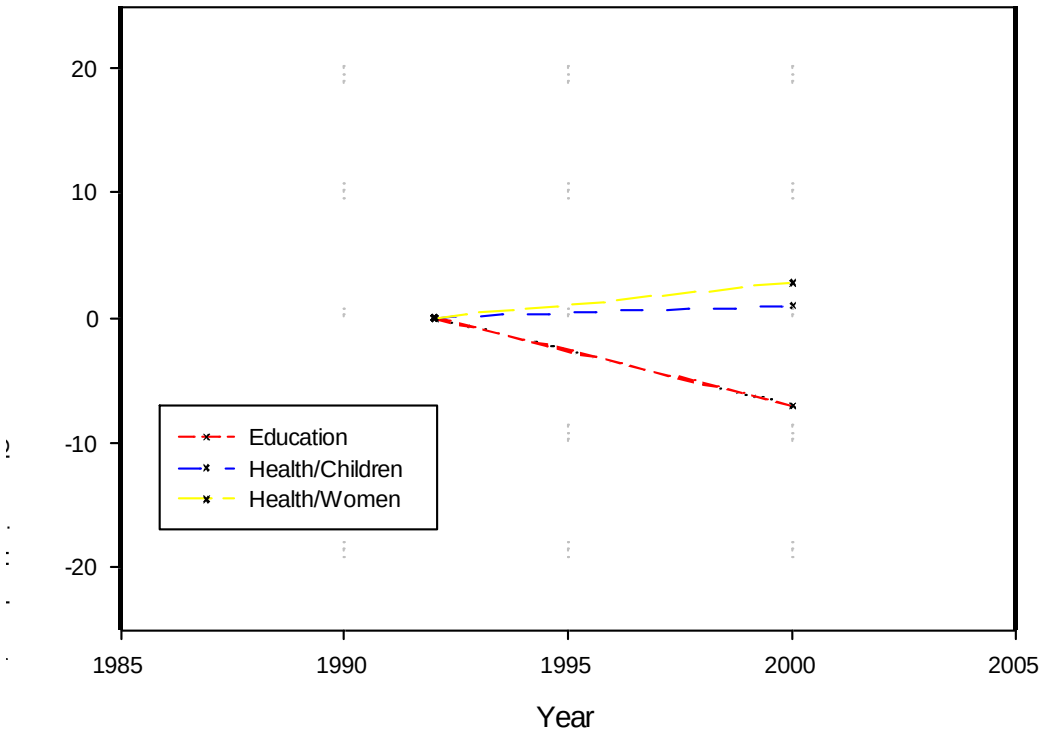
Year
Income
Education
Health/Children
Health/Women

Malawi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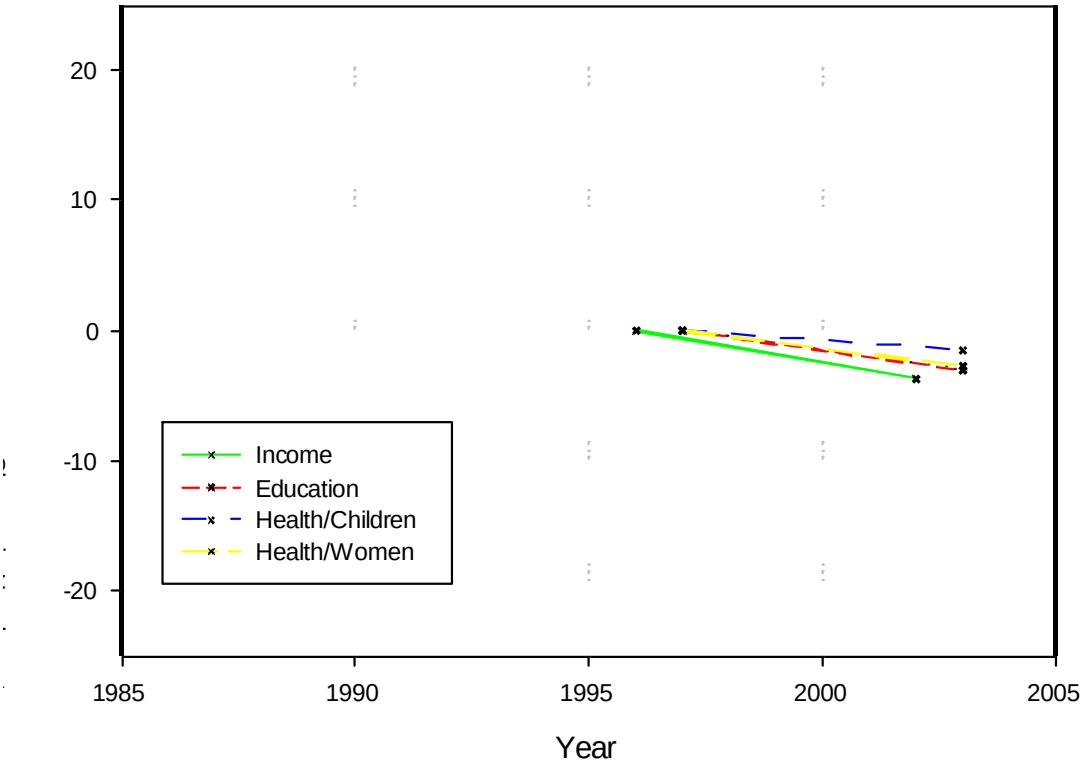
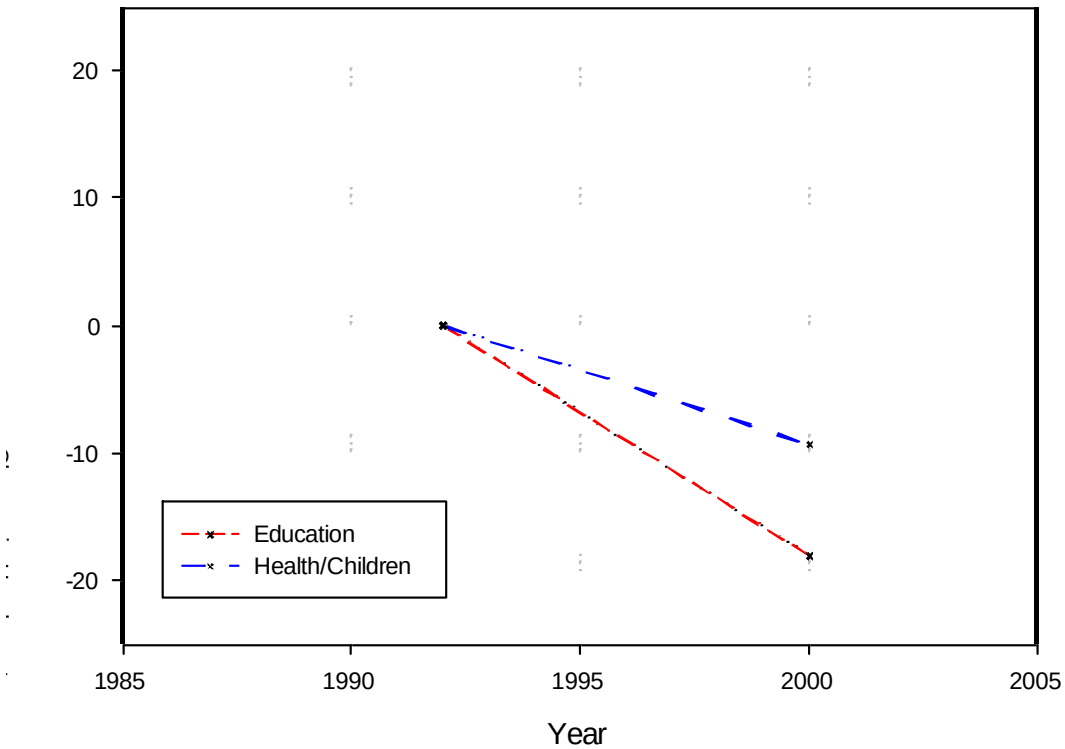
Education
Health/Children
Health/Women

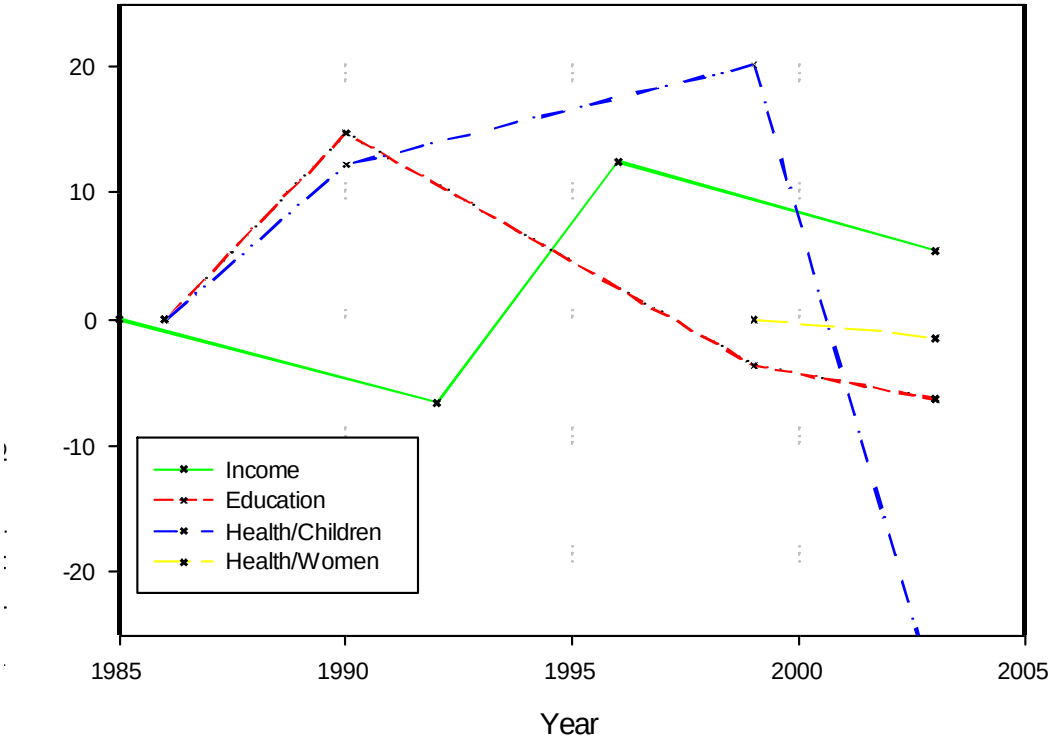
Mozambique



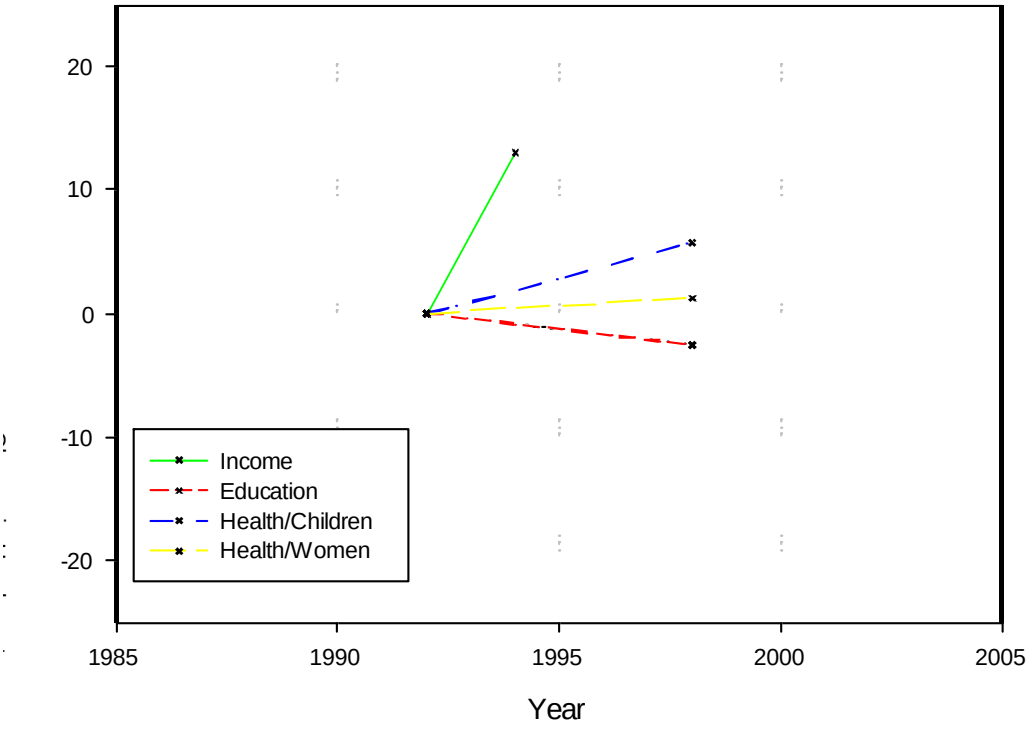
Namibia



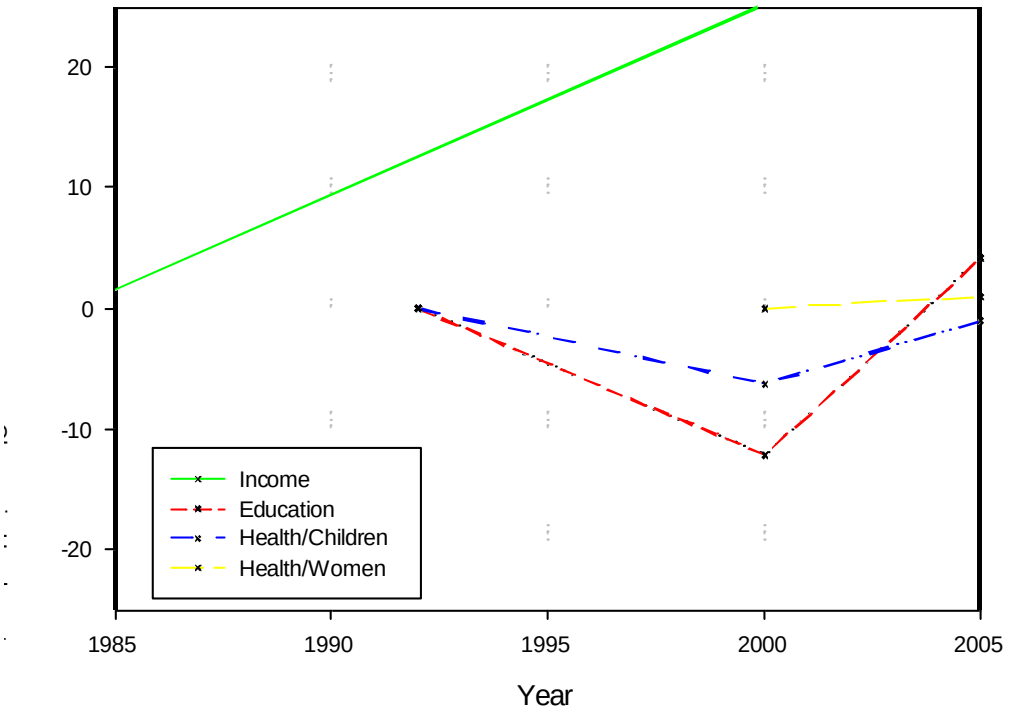
Nigeria



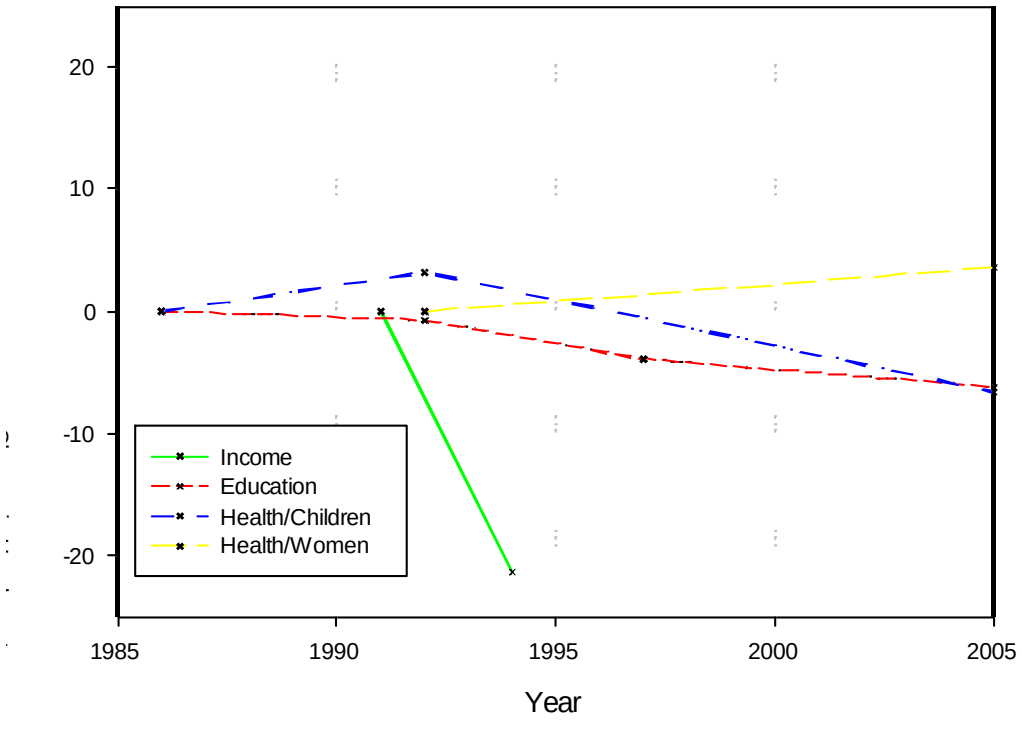
Niger



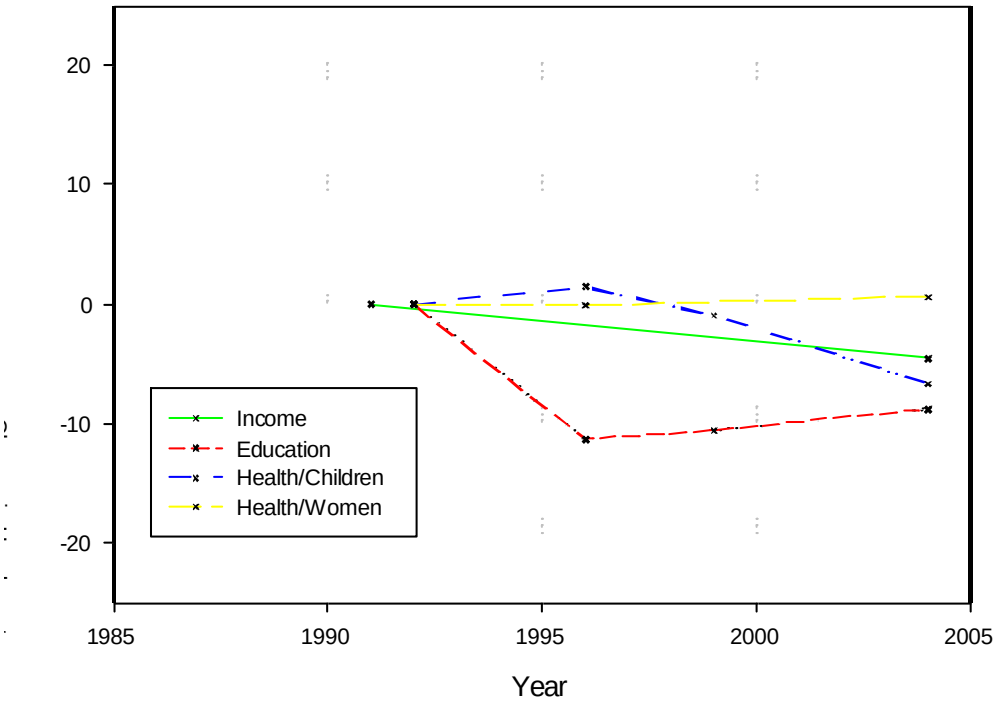
Rwanda



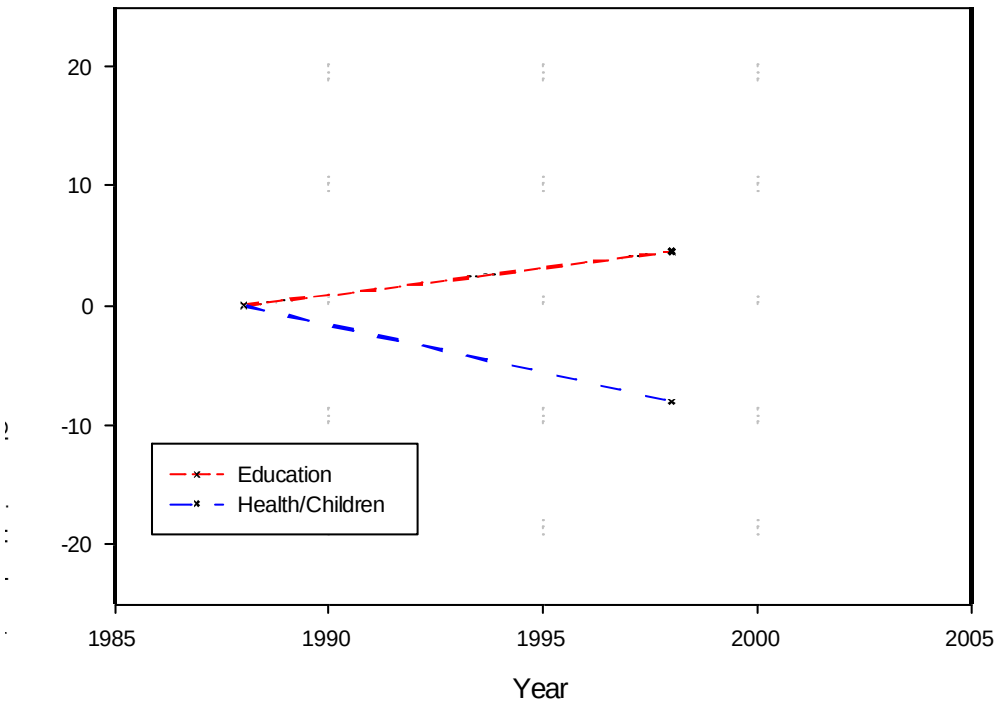
Senegal



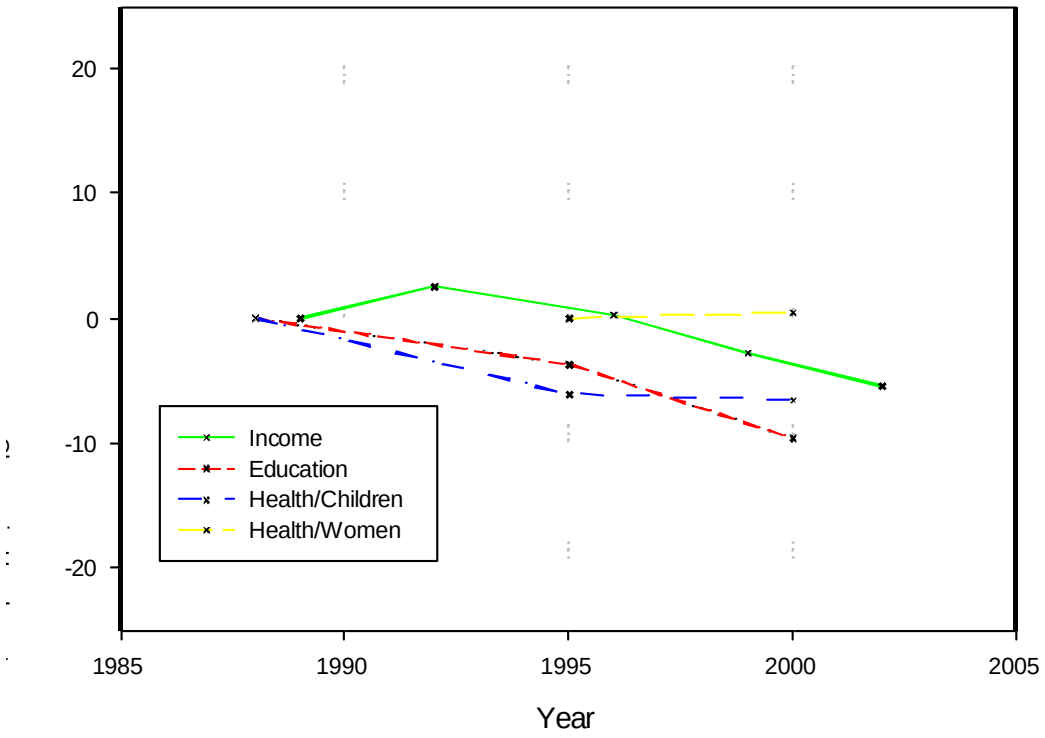
Tanzania



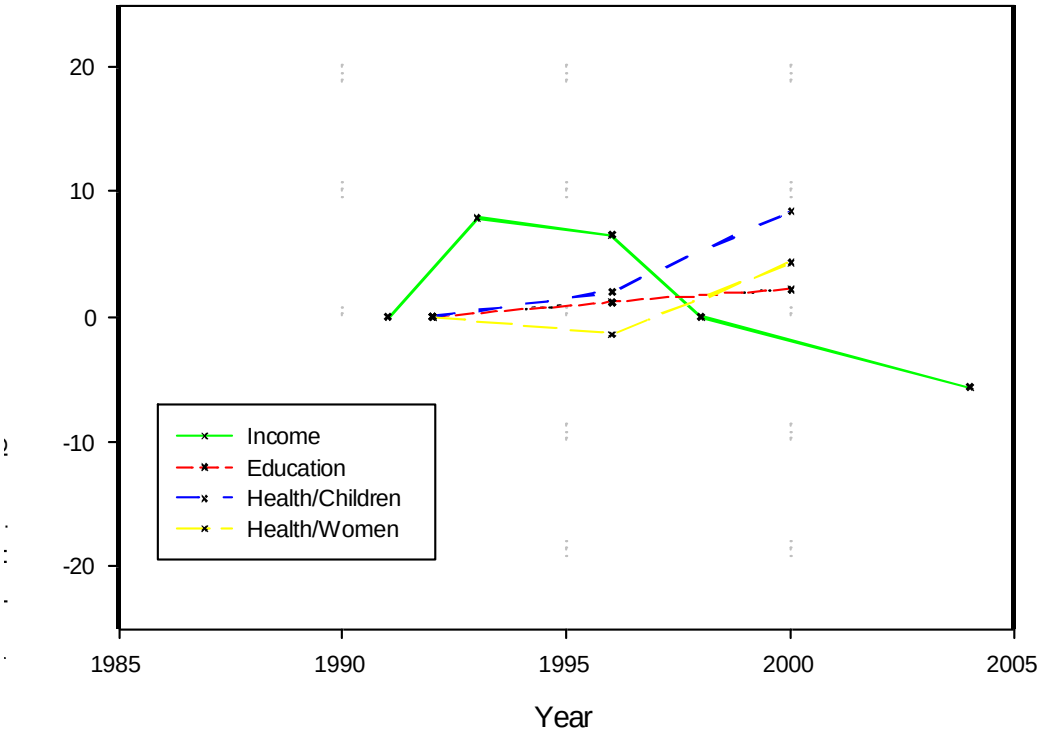
Togo

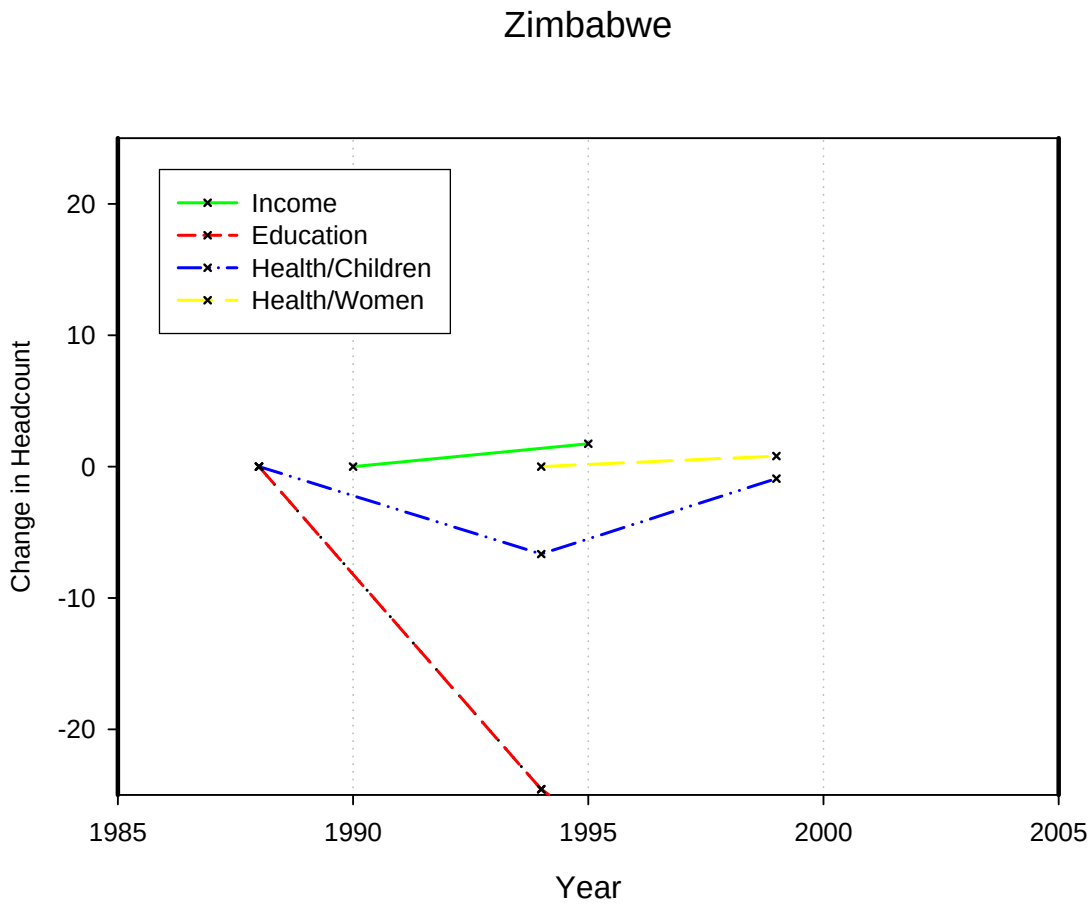


Uganda



Zambia





Among the most important generalizations that emerge from these graphs is that money metric poverty tends to show more volatility and more dramatic changes over time than other indicators, as indicated by the steeper slopes of the lines connecting the spells between surveys. The fact that the changes in headcounts across spells are greater for money metric poverty might in part be attributable to the role of genuine income fluctuations that households cannot smooth, but many of the measurement error issues that we discussed above may also contribute significantly to this volatility.

The second big story is that indicators often move in opposite directions. Indeed, the education poverty headcounts almost always declines, as discussed above. But there is no sense that the size or direction of change is related to changes in money metric poverty. Likewise, there seems to be little correspondence between the direction of changes in money metric poverty and the measures of health poverty.

Multidimensional Poverty Comparisons

Throughout this chapter, we have found it useful to evaluate changes in non-income dimensions of well-being as we try to understand poverty changes in Africa. But we have done this for each measure of well-being individually, and independently of any evaluation of changes in income poverty. It is possible, however, to evaluate poverty reduction in multiple dimensions jointly. Duclos, Sahn, and Younger (2006a, 2006b) develop multidimensional methods that are consistent with the stochastic dominance approach to poverty comparisons (Atkinson (1987) and Foster and Shorrocks (1988a, b, c). These methods are useful in cases when one dimension of well-being is improving while another is not. As we have seen, this is a common occurrence in Africa. As Duclos, Sahn, and Younger (2006a) show, it is possible for certain types of multidimensional poverty measures to be declining over time even if one of the elements of well-being is not improving.[10]

In this section, we examine the particular case of Uganda in the 1990s. In that period, economic growth was quite rapid (by African standards) and consumption poverty declined significantly (Appleton 2001a, b). Yet there is concern in Uganda that living standards are not improving by

anything like the quantitative analysis of household expenditures suggests. In particular, policy makers and public health professionals have noted that that non-income measures of well-being such as infant mortality and children's nutritional status are not improving over time despite the substantial increases in income (Ministry of Finance, Planning, and Economic Development 2002; Task Force on Infant and Maternal Mortality 2003; Uganda Bureau of Statistics 2001).

Methods

The stochastic dominance approach to *uni*variate poverty comparisons compares the cumulative density function[11] of a measure of well-being like expenditures or income per capita. If one such poverty incidence curve is everywhere below the other, then it must be the case that poverty is lower in the first population for any poverty line and for any poverty measure that has these four properties: they must be additively separable, non-decreasing, anonymous, and continuous at the poverty line. By "additively separable," we mean that the poverty measure can be expressed as a weighted sum of the poverty status of individuals. By "non-decreasing," we mean that if any one person's income increases, then the poverty measure cannot increase as well. By "anonymous," we mean that it doesn't matter which person occupies which position or rank in the income distribution. "Continuous at the poverty line" means that the poverty measure cannot change dramatically when someone crosses the poverty line. It is helpful to call all the poverty measures that have these characteristics the "class" Π^1. Π^1 includes virtually every standard poverty measure except the headcount, but in the particular comparison in the example that follows, the headcount is also covered because it is the poverty incidence curve's y-coordinate. Clearly, such comparisons are very robust.

Figure 14.2. Poverty Incidence Curves, Uganda, 1992 and 1999

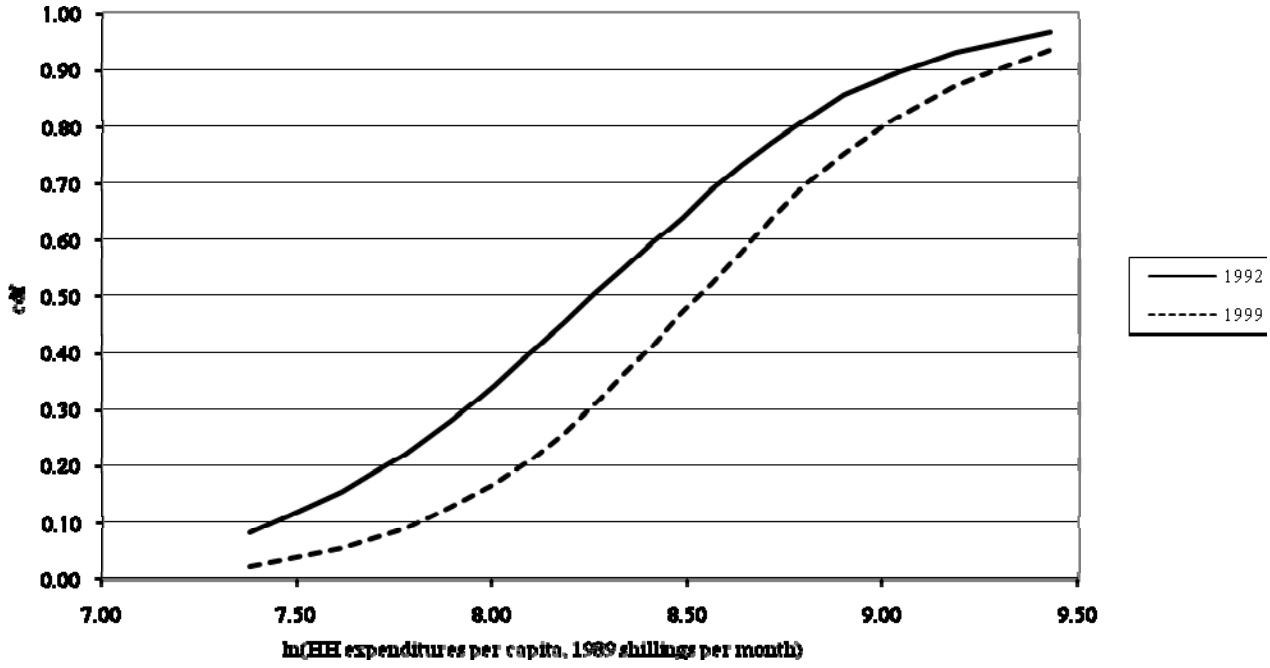
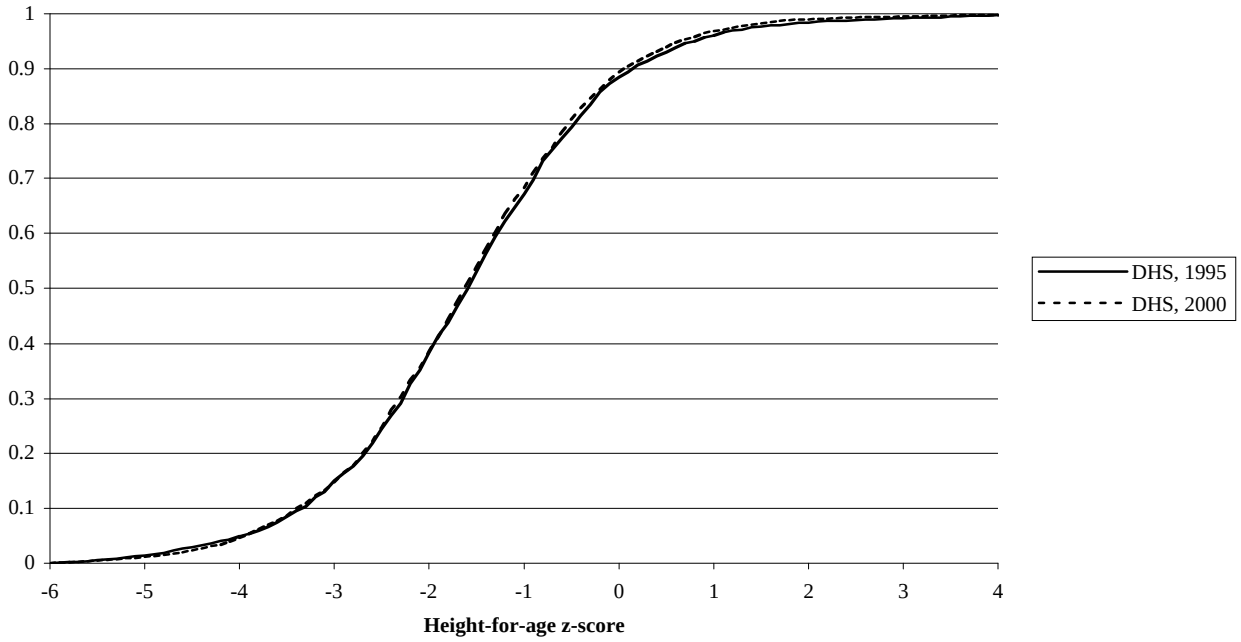


Figure 14.2 gives an example for Uganda, comparing expenditures per capita in 1992 and 1999. Because the poverty incidence curve for 1999 is everywhere below that for 1992, we know that for any poverty line and for the very large class of poverty measures Π^1, poverty was lower in 1999 than it was in 1992. For reasons that will become clear shortly, this is called "first-order poverty dominance." The generality of this conclusion makes poverty dominance methods attractive. However, such generality comes at a cost. If the cumulative density functions cross one or more times, then we do not have a clear ordering – we cannot say whether poverty is lower in one year or the other. This is the case in Figure 14.3, which graphs the cumulative density functions (cdf) for children's height-for-age z-score in 1995 and 2000 in Uganda. These curves are quite close together, and they cross at several points, including some that are well below a "reasonable" poverty line. In such cases, we cannot conclude that poverty was unambiguously lower in one year or the other.

Figure 14.3. Poverty Incidence Curves for Children's Heights, Uganda, 1995 and 2000



There are two ways to deal with this problem, both which are still considerably more general than the traditional method of a fixed poverty line and a single poverty measure. First, it is possible to conclude that poverty in one sample is lower than in another for the same large class of poverty measures, but only for poverty lines up to the first point where the cdf's cross (Duclos and Makdissi 2005). If reasonable people agree that this crossing point is at a level of well-being safely beyond any sensible poverty line, then this conclusion may be sufficient.[12] Second, it is possible to make comparisons for a smaller class of poverty measures. For example, if we add the condition that the poverty measure respect the Dalton transfer principle, then it turns out that we can compare the areas under the cdf's shown in Figure 14.3. If it is the case that the area under one curve is less than the area under another for all reasonable poverty lines, then poverty will be lower for the first sample for all poverty measures that are additively separable, non-

decreasing, anonymous, continuous at the poverty line, and that respect the Dalton transfer principle. This is called "second-order poverty dominance," and we can call the associated class of poverty measures Π^2. While not as general as first order dominance, it is still quite a general conclusion. Note that we can make this comparison by integrating the two curves in Figure 14.3, yielding "poverty depth curves," and comparing them to see if one is everywhere above the other.

If the poverty depth curves also cross, then we can proceed to a more restricted set of poverty measures, those that are additively separable, non-decreasing, anonymous, continuous at the poverty line, that respect the Dalton transfer principle, and that respect the principle of transfer sensitivity.[13] To make dominance comparisons for this class of poverty measures, called Π^3, we compare the area under the poverty depth curves by integrating them again and checking to see if one is entirely below the other. If so, then we have "third-order poverty dominance." It is possible to continue integrating the curves in this manner until one dominates the other, but intuition for the class of poverty measures generally ends at third-order comparisons.

Bivariate Poverty Dominance Methods

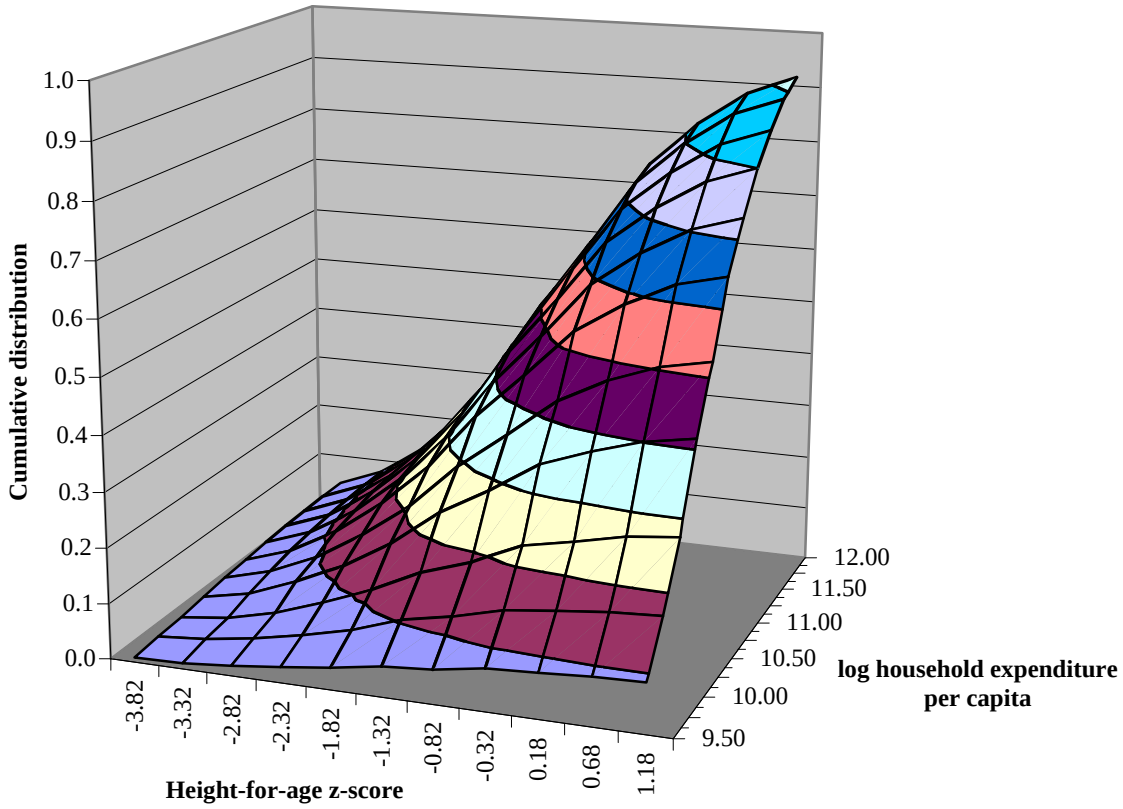
Bivariate poverty dominance comparisons extend the univariate methods discussed above. If we have two measures of well-being rather than one, then Figure 14.2 becomes a three-dimensional graph, with one measure of well-being on the x-axis, a second on the y-axis, and the cdf on the z-axis (vertical), as in 4. Note that the cdf is now a surface rather than a line, and we compare one cdf surface to another, just as in Figure 14.1. If one such surface is everywhere below another,

then poverty in the first sample is lower than poverty in the second for a broad class of poverty measures, just as in the univariate case.

That class, which we call $\Pi^{1,1}$ to indicate that it is first-order in both dimensions of well-being, has the same characteristics as the univariate case – additively separable, non-decreasing in each dimension, anonymous, and continuous at the poverty lines – and one more: that the two dimensions of well-being be substitutes (or more precisely, not be complements) in the poverty measure. This means, roughly, that a transfer of well-being in one dimension from a person who is richer to one who is poorer in that dimension should have a greater effect on poverty if these two people are poorer in the other dimension of well-being.[14]

Practically, it is not easy to plot two surfaces such as the one in Figure 14.4 on the same graph and see the differences between them, but we can plot the differences directly. If this difference is always positive or always negative, then we know that one or the other of the samples has lower poverty for all poverty lines and for a large class of poverty measures $\Pi^{1,1}$.

Figure 14.4. Bi-dimensional Poverty Dominance Surface



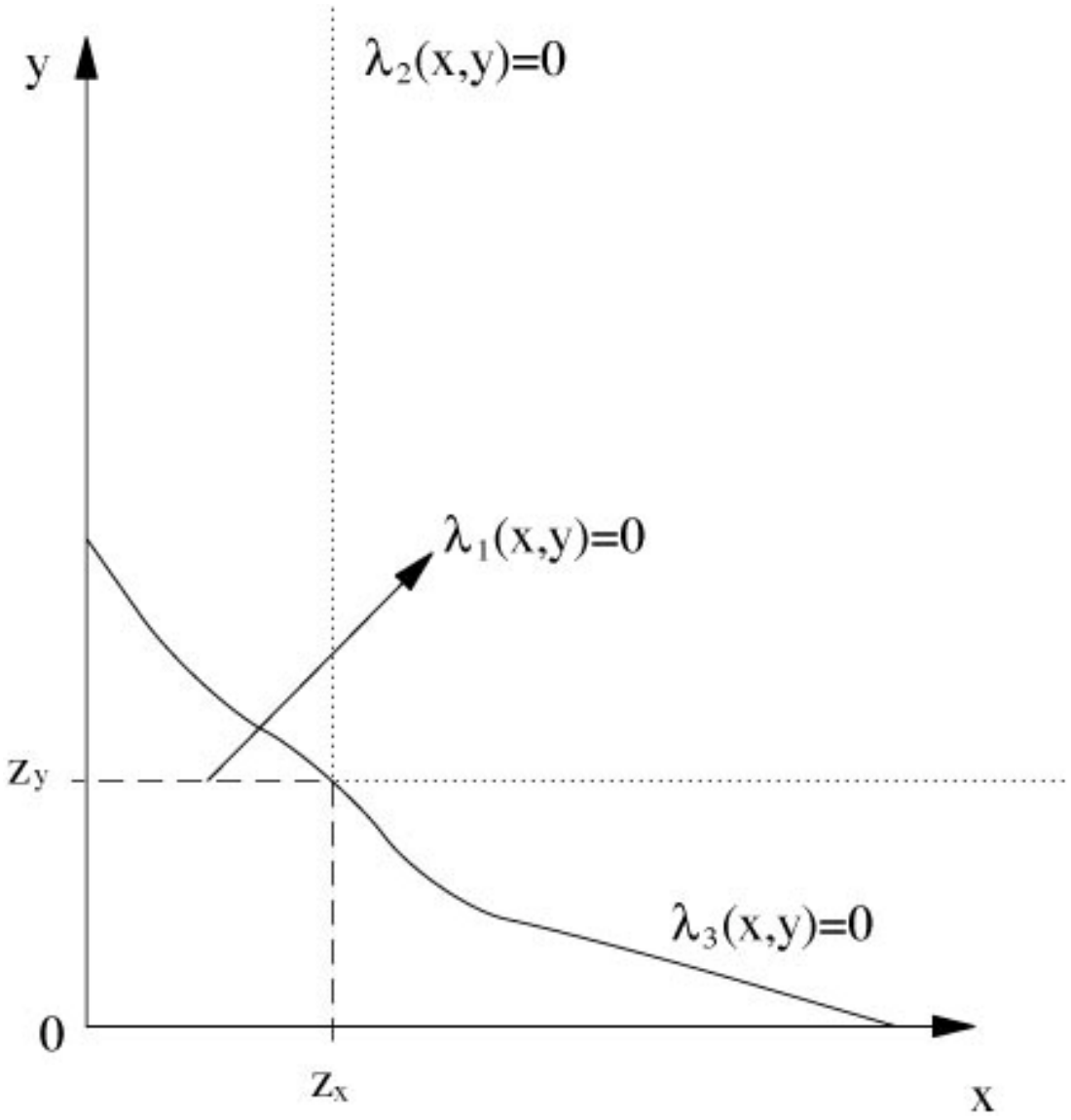
If the surfaces cross, we can compare higher orders of dominance, just as we did in the univariate case. This can be done in one or both dimensions of well-being, and the restrictions on the applicable class of poverty measures are similar to the univariate case.

Intersection, Union, and "Intermediate" Poverty Definitions

In addition to the extra condition on the class of poverty indices, multivariate dominance comparisons require us to distinguish between union, intersection, and intermediate poverty measures. We can do this with the help of Figure 14.5, which shows the domain of dominance surfaces – the (x,y) plane. The function $\lambda PP_1(x,y)$ defines an "intersection" poverty index: it

considers someone to be in poverty only if she is poor in both of the dimensions *x* and *y*, and therefore if she lies within the dashed rectangle of Figure 14.5. The function $\lambda_2(x,y)$ (the L-shaped, dotted line) defines a union poverty index: it considers someone to be in poverty if she is poor in *either* of the two dimensions, and therefore if she lies below or to the right of the dotted line. Finally, $\lambda_3(x,y)$ provides an intermediate approach. Someone can be poor even if her *y* value is greater than the poverty line in the *y* dimension if her *x* value is sufficiently low to lie to the left of $\lambda_3(x,y)$.

Figure 14.5. Intersection, Union, and Intermediate Dominance Test Domains



For one sample to have less intersection poverty than another, its dominance surface must be below the second sample's everywhere within an area like the one defined by $\lambda_1(x,y)$. To have less union poverty, its surface must be below the second sample's everywhere within an area like the one defined by $\lambda_2(x,y)$, and similarly for intermediate definitions and $\lambda_3(x,y)$. These are the sorts of comparisons that we will make in the applications that follow.

Results

Table 14.14 gives descriptive statistics for poverty rates, based on the household asset index, and children's stunting rates for the three DHS surveys in Uganda. All areas/regions of the country show declines in poverty as determined by household assets, a result that is comparable to the household expenditure results from income/expenditure data in Uganda (Appleton 2001a, b). In fact, these declines, and even the levels of poverty, are similar to poverty rates as determined by household expenditures per capita. This supports the use of the asset index as a proxy for more standard measures of well-being.

Table 14.14. Uganda: Descriptive Statistics for Income Poverty and Stunting, 1988, 1995, and 2000 DHS Surveys

	Poverty[1/]			Stunting[2/]			N[3/]			corr(asi,haz) [4/]		
	1988	*1995*	*2000*	*1988*	*1995*	*2000*	*1988*	*1995*	*2000*	*1988*	*1995*	*2000*
National	0.63	0.47	0.35	0.44	0.39	0.39	3,701	4,503	4,939	0.16	0.15	0.18
Rural	0.69	0.52	0.38	0.46	0.41	0.40	3,098	3,249	3,868	0.10	0.07	0.14
Urban	0.08	0.07	0.04	0.26	0.23	0.26	603	1,254	1,071	0.21	0.20	0.24
Central	0.41	0.24	0.19	0.33	0.34	0.35	1,378	1,306	1,377	0.16	0.26	0.22
Eastern	0.65	0.46	0.33	0.45	0.36	0.36	676	1,294	1,350	0.05	0.12	0.12
Western	0.75	0.55	0.39	0.53	0.43	0.48	1,520	1,196	1,437	0.15	0.07	0.17
Northern	0.93	0.65	0.56	0.45	0.42	0.37	127	707	775	0.09	0.12	0.18

Sources: 1988, 1995, and 2000 DHS Surveys

Notes:

1/ Poverty is the headcount, or the share of the sample below the poverty line, based on an index of household assets. I chose the poverty line such that the national headcount is equal to Appleton's (2001a) for the 2000 survey.

2/ Stunting is the share of the sample below –2 z-scores.

3/ N is the sample size.

4/ The correlation is between the household asset index and the height-for-age z-score.

5/ The 1988 DHS collected no data in urban areas in the Northern region.

The stunting data, however, are less positive. We find only modest declines in stunting rates over time, mostly between 1988 and 1995. In fact, in urban areas, the stunting rate rises from 1995 to

2000, back to its 1988 level, so the national improvement over the entire period is due only to reductions in rural areas. In addition, the only region with steady improvement in children's heights is Northern region. Western region actually has a significant increase in stunting from 1995 to 2000. Note also that in all cases, assets and children's heights are only modestly positively correlated, a result now common in the literature (Haddad et al. 2003).

Table 14.15 – [1,1] Dominance Test Results for 1995 and 2000 DHS

	4.89	0.37	0.80	1.71	0.75	1.60	1.44	2.08	2.58	2.47	0.22
	0.63	0.27	0.79	1.32	0.39	1.06	1.06	1.35	1.53	0.68	-1.64
					-	-	-	-	-		
	0.07	0.31	0.20	0.22	1.22	0.61	0.88	0.75	1.05	-2.34	-4.92
	-		-	-	-	-	-	-	-		
	0.12	0.24	0.27	0.87	2.66	2.40	3.31	2.98	3.33	-4.60	-7.21
	-	-	-	-	-	-	-	-	-		
	0.22	0.54	0.92	1.46	3.73	3.72	5.12	4.64	5.22	-6.60	-8.89
asset	**-**	-	-	-	-	-	-	-	-		-
index	**0.30**	0.96	2.01	2.62	4.80	4.94	6.45	5.77	6.54	-8.16	10.47
	-	-	-	-	-	-	-	-	-		-
	0.37	1.68	3.09	3.36	5.55	6.25	7.76	7.43	8.31	-9.75	12.00
	-	-	-	-	-	-	-	-	-	-	-
	0.43	2.69	3.61	3.84	5.89	6.42	7.94	7.89	8.95	10.24	12.36
	-	-	-	-	-	-	-	-	-	-	-
	0.51	3.80	5.50	6.32	8.02	8.25	9.17	9.03	9.76	10.85	12.51
	-	-	-	-	-	-	-	-	-		
	0.60	3.95	5.50	6.09	7.11	6.82	6.91	6.88	7.45	-8.47	-9.84

	-	-	-	-	-	-	-	-		
0.00	3.37	2.69	2.29	1.95	1.61	1.30	0.92	0.51	0.10	5.71
haz										

Table 14.15 gives the dominance test results for all of Uganda comparing the 1995 and 2000 DHS data. Each cell reports a t-statistic for the difference in the dominance surfaces at the asset index and HAZ values shown on the axes. Note that the origin, with the poorest people, is in the lower left-hand corner. To establish dominance, the dominance surfaces should be signficantly different in regions similar to those described in Figure 14.5, and of the same sign. Here, there is no dominance for any union poverty measure, and dominance only for a limited range of intersection poverty measures, up to the third decile of the asset distribution. If we examine the top and right edges of the test domain, we see that there is clear univariate dominance for the asset index (the right edge), i.e., poverty measured by assets declined significantly over the period. However, there is no statistically significant improvement in the dimension of children's heights (the top edge), and, in fact, the 2000 surface is above that for 1995. Results for $\Pi^{2,2}$ (not shown here) are somewhat more positive, yielding dominance for intersection poverty lines up to the sixth decile for the asset index and for all poverty lines in the HAZ dimension. Higher order tests, up to $\Pi^{1,3}$ and $\Pi^{3,3}$, yield results that are qualitatively similar to those in Table 14.15, never showing univariate dominance for heights, and thus never showing any bivariate dominance for union poverty measures. For intersection measures, no comparisons show bivariate dominance for intersection poverty measures at greater than the sixth decile of the asset distribution. Thus, we cannot make a robust conclusion that bivariate poverty declined between these two sample periods unless we are willing to claim that no reasonable poverty line in the asset dimension would be higher than the sixth decile and even then, only for intersection poverty measures.

Table 14.16 - ^{1,1} Dominance Test Results for 1988 and 2000 DHS

	4.89	-4.43	-6.32	-5.75	-5.08	-5.48	-4.15	-4.07	-2.76	-0.02	1.19
	0.58	-4.55	-6.50	-6.24	-5.92	-6.60	-5.44	-5.62	-5.03	-4.24	-6.35
	0.03	-4.56	-6.96	-7.31	-7.20	-7.89	-7.20	-7.56	-6.81	-6.84	-8.60
	-0.16	-5.47	-8.65	-9.54	-10.76	-12.09	-12.24	-13.45	-13.62	-14.78	-17.33
	-0.26	-6.67	-9.96	-11.48	-12.76	-14.49	-15.22	-16.97	-17.67	-19.43	-22.38
asset index	-0.34	-7.68	-11.14	-13.07	-14.77	-16.93	-18.14	-20.23	-21.21	-23.35	-26.23
	-0.41	-7.96	-12.06	-13.61	-15.22	-17.91	-19.47	-21.54	-22.70	-24.56	-26.91
	-0.48	-8.84	-13.25	-15.53	-17.52	-20.30	-21.71	-23.86	-25.39	-27.13	-29.40
	-0.55	-9.21	-13.17	-15.07	-16.87	-19.13	-19.89	-21.67	-23.00	-24.12	-26.02
	-0.63	-7.81	-10.64	-12.31	-13.73	-14.77	-15.41	-16.77	-17.24	-17.80	-19.20
	0.00	-3.49	-2.82	-2.41	-2.04	-1.71	-1.38	-1.01	-0.59	0.03	5.76
						haz					

For a longer time period, Table 14.16 shows that bivariate poverty clearly fell between 1988 and 2000, for any poverty line and for any union or intersection poverty measure.[15] Thus, the overall picture is one of significant declines in bivariate poverty early in the 1990s, but inconclusive results later in the decade. That is inconsistent with Appleton's (2001a, b) results for poverty based on expenditures alone, but it is in line with policymakers' concerns about lack of progress in the late 1990s, especially on the health front.

Conclusions

We have explored the extent to which countries in sub-Saharan Africa have been successful in alleviating poverty over the past couple of decades. Our analysis suggests that Africa is poor compared to the rest of the world and that poverty is not declining consistently or significantly in most African countries. We arrive at this conclusion by considering not only deprivation in the material standard of living (i.e., income or expenditure poverty), but also other dimensions of well-being, especially education and health. We adopt this strategy for theoretical and practical reasons. In the case of the former, poverty should be understood as more than economic deprivation and includes such capabilities as good health, adequate nutrition, literacy, and political freedoms. Expanding our purview to include deprivation in health and education is particularly important. Many measures of well-being, especially those that concern health, are not highly correlated with incomes, so their analysis adds information on deprivation that is not available in incomes. In addition, garnering public support to improve health and education outcomes is easier than for income transfer programs, especially given the externalities associated with such efforts.

Exploring deprivation in health and education also has a number of practical advantages. These variables are measured at the individual level; they are less prone to measurement error; and they are more easily comparable across time and space. Finally, there is a paucity of survey data on incomes or expenditures in Africa. This is both surprising and disappointing in light of the original promise of the Living Standards Measurement Survey initiative, as well as subsequent international efforts such as the Millennium Project. Unfortunately, government statistics agencies in Africa have not been able to pick up the ball that was dropped with the decline in World Bank funding for data collection efforts that were initiated with the LSMS program. In

contrast, the Demographic Health Surveys continue to provide a solid foundation for measuring the non-material standard of living, especially health.

Our findings paint a relatively sobering picture of economic and social progress in Africa. The broad regional comparisons suggest that Africa continues to fall behind relative to other areas of the developing world, a trend that began in the 1970s and continues basically unabated until the present. Country level results indicate that economic poverty has witnessed large fluctuations. With a few notable exceptions, sustained and significant reductions have not been realized. We are somewhat skeptical about the reliability of the headcount numbers based on money-metric measures, for reasons related to the comparability of surveys and the difficulty of defining poverty in terms of the material standard of living. In addition, there are relatively few recent surveys with reliable income and expenditure data required to make inter-temporal comparisons. We therefore focus on issues of deprivation in terms of health and education. In this regard, the one relatively bright spot seems to be the general increase in primary school enrollments. Substantial progress has been made, although countries in Francophone West Africa continue to lag behind.

Similarly, our measures of child health and the health of the mother show very mixed results, both across survey spells of individual countries, and when comparing progress across countries. When we explore the extent to which the lack of progress can be attributed to increasing inequality, our decomposition analysis suggests that while the distribution component is often important, changes in levels of education and health deprivation in African countries are largely

driven by the lack of improvements at the mean. This finding is broadly consistent with what has been reported elsewhere for economic poverty.

In examining changes in health, education and economic well-being for individual countries, we also note a lack of consistency in the movement of the indicators. During similar periods, we often find them moving in opposite directions. We therefore present and apply to the case of Uganda a method to evaluate poverty reduction in multiple dimensions. This approach is particularly useful when one dimension of well-being is improving while another is not, as is often the case in Africa. The results of the multidimensional poverty comparisons reinforce the importance of considering deprivation beyond the material standard of living and provide insight into how to reconcile differing stories that arise from examining each indicator separately.

[1] Cornell University

[2] This ratio can exceed 100 percent if, owing to problems such as grade repetition and delayed enrollment, there are many children outside the age normally associated with the grade range of primary school.

[3] The details of each survey, and the methods used to calculate the poverty numbers are reported at: http://iresearch.worldbank.org/PovcalNet/jsp/index.jsp. In addition, several papers and World Bank documents discuss global trends in poverty employing these data. See for example, Chen and Ravallion (2004, 2007).

[4] Most useful here are characteristics that should not be changing at all over time, such as the mean years of education of a cohort of adults (individuals born in the same year or say, 5-year period) that is beyond school age. Mean heights, ethnicity, and religion of individuals in the cohort would be other good measures. If the sampled populations are the same in two surveys, these means should be statistically equivalent.

[5] Note that very few women actually attend post-secondary school in these samples, so we could use a younger sample of even more-recent graduates using 18 rather than 22 as our lower age limit. The results that we report later for education are almost identical if we do this.

[6] Estimated standard errors consider only sampling error, not measurement error. Since the FGT poverty measures are sums of iid random variables (the poverty gaps raised to the appropriate power), their variance is the sum of the variance of those poverty gaps. The sample variance of the poverty gaps is a consistent estimate. For comparisons across surveys, we use the sum of the two variances, using the independence of the two samples.

[7] A 10 percent confidence level is used to establish statistically significant differences.

[8] Because the choice of six years is arbitrary, we also checked results at 3 years and 9 years. While the headcounts obviously change, the pattern of changes over time is consistent with the results presented here.

[9] We do, in fact, find this consistently in Latin America (Sahn and Younger 2006).

[10] It is also possible for multidimensional poverty to increase even though each individual dimension improves, if the correlation of deprivation in the multiple dimensions increases.

[11] Ravallion (1994) calls these "poverty incidence curves" because of their relation to the headcount, which is also the Foster-Greer-Thorbecke (1984) measure with its parameter set to one.

[12] In the case of Figure 14.3, that is not likely, since the standard cut-off for stunting is –2 z-scores.

[13] The principle of transfer sensitivity says that if we make two equal but offsetting transfers, one from a richer to a poorer person, and the other from a poorer to a richer person, but both of the latter being poorer than the participants in the first transfer, then poverty should decline. The idea is that the benefit of the transfer from a richer to a poorer person, or the cost of a transfer from a poorer to a richer person, is larger the poorer are the two participants.

[14] Bourguignon and Chakravarty (2003) discuss this in detail, calling it a "correlation increasing switch," as do Duclos, Sahn, and Younger (2006a).

[15] Note that many more districts were not covered in the 1988 DHS for security reasons. We limit this analysis to districts that were covered in both 1988 and 2000, so the 2000 data are not the same as those in the previous section, which included all districts covered in the 2000 DHS. The districts that are excluded are mostly in the North, where bivariate poverty did decline

between 1995 and 2000, so it is unlikely that their exclusion explains the difference in the results between Table 14.15 and Table 14.16.

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