Introduction

Children of urban dwellers in sub-Saharan Africa have generally been found to have better health than children of rural residents (Kuate-Defo, 1996; Chidambaram et al., 1987). The finding tends to hold whether under-five mortality or nutritional status is used as the indicator of health. However, recent evidence suggests that infant and child mortality rates are increasing in many urban areas. For example, a study in Nairobi found that infant mortality rate in slum areas was 20% higher than in rural areas of Kenya, and that under-five mortality rate in the slum area was 35% higher than in rural areas (Ngom, 2002). This result corroborates the finding of an earlier study by Mosley (1989) that mortality rates among under-two children were higher in metropolitan Nairobi than in surrounding rural areas. Mosley linked the counter-intuitive mortality pattern in metro-Nairobi to the poor sanitation and poverty among the large numbers of landless rural poor who had migrated to the city and settled in slums.

Because of these and similar research findings, and because of rapid urbanization and concerns that the economic crises in Africa over the past twenty years might have disproportionately negative effects on the health of urban children, there has been a renewed international attention on the health or urban dwellers. In the process, relatively little attention seems to be paid to the mortality and nutritional status of those in rural areas, particularly children under age five. This paper aims to highlight recent trends in selected health indicators among under-five children in sub-Saharan Africa. We consider the focus on the health of rural children in sub-Saharan Africa important for a couple of reasons. First, most people in the region still live in rural areas and most children are born there. In 2000, it was estimated that 62% (or 493 million) of the people in sub-Saharan Africa lived in rural areas (United Nations, 2001) and, in 2002, about 19.5 million (out of 27 million) live births in the region were born in rural areas. Because childhood mortality rates tend to be higher in rural areas, most under-five deaths in occur in rural areas. Given this large rural population size, it seems unlikely that any effort aimed at improving the health of children in Africa cannot succeed if it ignores the plight of the children in rural areas.

This paper sets out to answer three main questions: First, is the health of under-five children in the rural areas of sub-Saharan Africa getting better or worse? Second, how wide is the rural-urban health gap among children? In particular, the author would like to know whether the rural-urban gap in under-five mortality and in nutritional status is narrowing over time in the light of apparent increases in urban poverty levels in the region. Finally, we want to know the extent to which the rural-urban health disparities among under-five children are explained by socioeconomic and demographic factors. Studies in the US (Clarke and Coward, 1991), in UK (Senior et al., 2000), in Brazil (Sastry, 1997), and Bolivia (Heaton and Forste, 2003) have shown that much of the rural-urban differences in mortality are explained by material and socioeconomic deprivation in rural areas. Therefore, controlling for the effects of socioeconomic differences tends to reduce the rural-urban mortality gap. Knowing how strong the effects of these factors are in explaining rural urban child health disparities in Africa is important.

Data and Methods

The data analyzed in this paper are from 18 sub-Saharan African countries that have participated in the Demographic and Health Surveys (DHS) program between 1984 and 2001 and for which standard recode files were available at the time this analysis began in 2003. The DHS data, which are known to be generally reliable, nationally representative, and cross-nationally comparable, are considered appropriate for this type of analysis. In countries where more than two DHS data sets exist, data from the earliest and the most recent surveys were used. In the analysis, a child's place of residence is considered the same as that of his or her mother. Rural-urban residence is defined as the usual place of residence, not necessarily the de-facto place of residence (or where the respondent was at the time of interview).

In analyzing the differentials in child health indicators between rural and urban areas, we recognize that the dichotomy is not always clear-cut. In most parts of sub-Saharan Africa, very few

large cities are truly urbane in outlook. A large proportion of human settlements that are classified as urban because of their population size may not have a high level of modernity. In 16 of the countries in this analysis, DHS data contain some information on whether the settlement was a big city, medium size towns or countryside. This information was used to investigate whether under-five mortality rates of children in rural areas are comparable to those observed among children in medium-sized towns (which are also urban areas).

The main indicators of child health used in this paper are under-five mortality rate and prevalence of moderate-severe stunting (or low height for age). To obtain under-five mortality rates, the analysis was limited to children born 5-20 years (or 60-239 months) before the date of interview. Children born less than five years were omitted in order to avoid truncation effects on observed risks of under-five mortality. The main drawback of this decision is that some relevant variables that were available for children born within the five years preceding the date of interview such as immunization and place of delivery could not be included in the analysis. However, it was possible to include such variables in the analysis of rural-urban differentials in nutritional status because the data focused on children born within five years of the survey date. Children with height-for-age that is less than –2 (minus two) standard deviation of the reference median were considered to be moderately-severely stunted. Patterns and trends of these indicators are investigated first for rural areas and then compared to the situation in urban areas of sub-Saharan Africa.

After assessing the trends and patterns of rural-urban differences in child morality and nutritional status, the next question was to assess the contributions of socioeconomic and bio-demographic factors to the observed disparities. Scholars have attributed such spatial disparities in child health to differences in income and standard of living (United Nations, 1985:288), educational composition (Cleland et al., 1991:137), and access to better health services in urban areas (Chidambaram et al., 1987; National Research Council, 2003). For example, Trussell and Hammerslough (1983) observed in their study of Sri Lanka that the rural disadvantage actually disappeared once the effects of covariates such as education and economic status were controlled. A similar finding was reported by Hobcraft et al. (1984). Therefore, in this study, we used multivariate logistic regression analysis to assess the effects of maternal education, household economic status, and bio-demographic factors (indicated by maternal age at birth, parity, and preceding birth intervals) on the observed urban health advantage in the region. Maternal education was measured by the highest level of schooling completed by the mother (none, primary, secondary/higher). Household economic status was a composite index based on availability of piped water and toilet, materials for flooring, and ownership of a bike or a car in the household (households with two or less of these items were classified as low, and those with more than two items are classified as middle/high).

In the multivariate analysis of under-five mortality, children who died before their fifth birthday were coded one (1) and zero (0) otherwise. Similarly, in the logistic regression models for moderate-severe stunting, children whose height-for-age is less than –2 standard deviation of the reference median were coded 1, and 0 otherwise. Several models were run for mortality and nutritional status. In general, the first models were a series of main effects models, which contain the gross (unadjusted) effects of rural-urban residence on mortality or stunting in each country. Next, because of the fact that there are more educated people in urban areas and since women with higher levels of education tend to have better child health outcomes than their less-educated counterparts, we fitted a model to assess how much of the rural-urban health gap was explained by rural-urban differences in educational composition. The third set of models added the effects of an index of household economic status to education. Lastly, relevant demographic variables (maternal age at birth, parity and birth intervals) were added to the model. For the models on stunting, only birth intervals was left in the model to represent demographic variables.

Results

Rural patterns and trends

Table 1 presents the levels and trends in under-five mortality rates and in moderate-severe stunting among children in the region. The results in columns 2-3 show that under-five mortality rates were high in rural areas of sub-Saharan Africa in both periods 1 and 2. In period 2 for example, under-five mortality rates are over 100 per thousand live births in all eighteen countries, 150 per thousand or higher in 14 countries, and 200 or higher in six countries. In Niger, which had the worst level of under-five mortality in the table, about three out of ten live births died before their fifth birthday in the 1990s.

Similarly, a large proportion of rural children were stunted in both periods 1 and 2 (Table 1, columns 5-6). In period 2, more than 20% of children in rural areas had moderate-severe stunting was in all 18 countries. In 12 countries, 30% or more of under-five children in rural areas had moderate-severe stunting and this proportion was more than 40% in rural areas of six countries. The highest prevalence of stunting among rural children was observed in Madagascar where about 50% had moderate-severe stunting. In Nigeria, about 47% of children in rural areas were stunted and in Malawi, the proportion stunted was 46%.

In terms of trends in the health of children in rural areas, the results show that under-five mortality rates did not decline in the rural areas of half of the 18 countries (see column 4 of Table 1). Mortality rates stagnated or slightly improved in nine of the 18 countries. The largest improvements in mortality among rural children were observed in Nigeria, which declined by an average of 3% per annum, and Malawi, which declined by an average of 2% in the inter-survey period. However, in countries where under-five mortality rates grew worse, the changes were much more dramatic. For example, in Zimbabwe and Cote d'Ivoire, under-five mortality rates increased by an average of 6-7% per annum, by about 4% in Rwanda and Kenya, and by about 3% in Burkina Faso and Cameroon. Whereas the average annual rate of decline was less than 1% in four of the countries that experienced a decline in mortality, none of the countries that experienced an increase in mortality had an average rate of increase below 1.2%.

Trends in moderate-severe stunting in rural areas of sub-Saharan Africa are shown in column 7 of Table 1. The results suggest that the prevalence of moderate-severe stunting among children in rural areas of most (11 of 17) countries increased over time. Only five countries experienced a decline in stunting in the inter-survey period. The fastest declines were in Ghana, Cote d'Ivoire and Togo – all in West Africa – and the worst increase was in Zimbabwe – increasing at an average of 5% per annum. If we look at trends in both under-five mortality rates and moderate-severe stunting together, only in five countries did both indicators grow worse among rural children over time. In two countries, under-five mortality rates increased among rural children with no change in the proportion stunted. Take Zimbabwe again for example, from the 1980s, under-five mortality increased at an average rate of 7% year in rural areas while childhood stunting increased at 5% per year. Only three countries (Ghana, Madagascar and Togo) experienced improvements in the proportion stunted among rural children as well as in the proportion dying before their fifth birthday. Thus, in most countries in this study, under-five mortality and under-nutrition among under-five children in rural areas did not improve in the 1990s.

Trends in rural-urban health gaps

Table 2 presents a comparison of mortality and moderate-severe stunting among rural and urban children. The results in columns 2-3 show that in both periods 1 and 2, under-five mortality rates were higher in rural areas than in urban areas in virtually all countries. Rural mortality rates were at least 20% higher than in urban areas (or a risk ratio of 1.2) in a vast majority of the countries. In period 2 for example, rural mortality rates were at least 20% higher than urban rates in 16 of the 18 countries and at least 50% higher in eight countries. Similarly, in columns 5-6, rural-urban ratios in moderate to severe stunting are presented for the two survey periods in each

country. The results show that the proportion stunted among rural children is much higher than among urban children – 20% higher in almost every country in the two periods, 40% higher in most countries. In period 2, the proportion stunted among rural children is double that among urban children in Ghana, Senegal and Tanzania.

To investigate whether the rural-urban gaps in mortality and under-nutrition have narrowed over time, the rural-urban ratios in periods 1 and 2 were obtained. If the gap narrowed, the difference between period 1 and 2 (i.e. period 2 minus period 1 ratios) will be negative. For under-five mortality, the results show (Table 2, column 4) that the gap widened in most countries (10 of 18), narrowed in five and showed no change in three. For stunting (column 7), there was no change in rural-urban gap in six countries; the gap narrowed in five countries, but widened in seven countries. Thus, urban advantage in childhood mortality and nutrition does not seem to be diminishing over time. Rather, in many countries, rural areas are falling farther behind in major child health indicators. In most countries, mortality rates declined faster in urban areas than in rural areas. Hence, rural-urban mortality gap widened. Further analysis of the data show that in Togo for example, the rate of decline of under-five mortality rate in urban areas was 11 times as fast as the rate in rural areas.

Rural areas in comparison with large and medium-size urban areas

The results are shown in Table 3 and they show that towns had lower mortality levels than villages and that the rural-town gaps in mortality are narrower than the rural-city gap. That there is wide variation in the level of under-five mortality in large cities across the region is also evident -- with under-five mortality rates ranging from a low of 52 and 53 per thousand live births in Kenyan and Zimbabwean cities to a high of 201 per thousand in Tanzania. Rural under-five mortality also ranged from a low of 83 per thousand live births in Zimbabwe to a high of 343 in Niger republic. Not only were the gaps wide across countries, the results also show that under-five mortality rates were much lower in large cities than towns in 14 of the 16 countries where such data were available (Table 3).

Overall, the gap between rural areas (countryside) and large cities was considerable – under-five mortality rates were at least 50% lower than in rural areas in 14 of the 16 countries. Rural under-five mortality rates were twice as large as in cities in Cote d'Ivoire and Niger Republic. Only in Tanzania was under-five mortality rate in large cities exceeded by mortality rates in rural areas. In Rwanda also, mortality situation in the largest city was worse than in medium-sized towns. It is interesting that both Rwanda and Tanzania which had counter-intuitive under-five mortality patterns were also countries with the fastest rate of urbanization as shown in Appendix Table 1. It is likely that mortality among children of rural-urban migrants, particularly among recent arrivals from the villages, and consequent over-urbanization contributed to the unexpected level of under-five mortality in the large cities.

Multivariate logistic regression results

Next, we investigated whether the large rural-urban gaps in mortality were explained by differences in maternal characteristics by place of residence. Logistic regression models were fitted to the data to tease out how much of the rural-urban gap was explained by to socioeconomic and demographic differences. The first models were main-effects models for each of the countries, and the aim to assess rural-urban differences and their statistical significance. The results (Table 4, column 2) confirm the observations in Table 2 – a large urban child survival advantage, which is statistically significant and not just due to random variation. In model 2, the results show that controlling for the effects of maternal education leads to some narrowing of the mortality gap between rural and urban areas. It led to a 48% reduction in rural-urban gaps in Tanzania, 46% in Cameroon, 45% in Malawi, 44% in Uganda, and 43% in Kenya. However, controlling for maternal education had very little effects (6% reduction) on rural-urban disparity in mortality in Zimbabwe. When household economic index is added to the model, there is a further narrowing of the gap: by

another 30% in Zambia, and by 27% in Mali. Only in a few countries such as Zimbabwe and Niger was the effect of household socioeconomic status bigger than the effects of maternal education. In Kenya, the addition of economic index to the model led to a loss of statistical significance in the rural-urban mortality gap. The results in the last set of models (last column of Table 4) suggest that controlling for the effects of demographic variables did not lead to a major reduction in rural-urban mortality gap. Rather, it led to a slight widening of the rural-urban mortality gap in some countries – suggesting that if rural areas had the demographic distribution of urban areas, the gap in health indicators would have been wider in such countries.

In Table 5, the results of the multivariate analysis of rural-urban gaps in chronic under-nutrition (stunting) are presented. They confirm and amplify the results in Table 2. The worst rural-urban gaps were in Tanzania, Ghana, Mali, Burkina Faso Rwanda, and Malawi – rural children were at least twice as likely to be stunted as urban children in each country. Controlling for the effects of education led to some reduction in the rural urban gap in stunting – a 65% reduction in Nigeria, 50% reduction in Zimbabwe and Madagascar, and 49% reduction in Kenya. In Nigeria and Madagascar, once the effects of maternal education differences in urban and rural areas were taken into account rural-urban gaps in stunting were no longer statistically significant. Results in the next column (Table 5 column 4) shows that adding the index of household economic status further led to a narrowing of the rural-urban gap and to a loss of its statistical significance in Kenya and Zimbabwe. The addition of birth intervals improved the models somewhat, but its effects are usually marginal.