Fertility Transition in Urban and Rural Areas of Sub-Saharan Africa*

David Shapiro
Professor of Economics, Demography, and Women's Studies
The Pennsylvania State University
416 Kern Graduate Building
University Park, PA 16802
USA
dshapiro@psu.edu

and

B. Oleko Tambashe
Research Associate Professor
Department of International Health and Development
School of Public Health and Tropical Medicine
Tulane University
1440 Canal St., Suite 2200
New Orleans, LA 70112
USA
btambashe@payson.tulane.edu

September 2000

* This is a revised version of a paper originally presented at the 1999 Chaire Quetelet Symposium in Demography at the Catholic University of Louvain, Louvain-la-Neuve, Belgium. That paper, in French, is presently in press for the Actes of the 1999 Chaire Quetelet. We are extremely grateful to the Chaire Quetelet organizers for encouraging us to pursue this topic, for helpful comments on an earlier version of the paper, and for granting us permission to publish a revised version in English to complement the forthcoming version in French. This research was partially supported by the William and Flora Hewlett Foundation grant in International Demography to the Population Research Institute at the Pennsylvania State University. We are indebted to Tesfayi Gebreselassie for outstanding research assistance. Responsibility for the contents of this paper rests solely with the authors.

Abstract

This paper provides an overview and analyses of the role of urban areas in fertility transition in sub-Saharan Africa. Data from the 40 Demographic and Health Surveys (DHS) that have been carried out in 25 different countries are used to examine fertility levels and trends, separately for urban and rural areas. Levels and changes in age-specific fertility are also examined for a number of countries. In addition, the paper provides evidence on the extent to which urban-rural differences in fertility (and hence, presumably, changes in fertility) are linked to differences in women's schooling, age at marriage, contraceptive use, and infant and child mortality. The analyses indicate that urban areas play a key role in the process of fertility transition that is presently unfolding in sub-Saharan Africa. Further, our examination of trends, using countries in which multiple DHS surveys have been carried out, leads us to suggest that there may be a three-stage transition pattern, with fertility initially declining in urban areas while remaining stable in rural areas, then fertility falling in both settings but more rapidly in urban places, and finally with fertility declining more in rural than in urban areas.

Introduction

Up through the end of the 1980s, sub-Saharan Africa was characterized as the only major world region in which fertility transition at the level of national populations had not yet begun (Lesthaeghe, 1989). During the past decade, however, this situation has changed considerably. A few countries have shown strong evidence of fertility decline, and a number of other countries appear to be at various early stages of fertility transition (Tabutin, 1997). Even prior to the emergence of fertility decline at the national level, however, there were clear signs of fertility decline in urban areas (cf., Jolly and Gribble, 1993), with fertility being especially low in capital cities as compared to other urban and rural areas (Cohen, 1993).

From a theoretical or conceptual perspective, the emergence of fertility transition in urban areas is not at all unexpected. Whether one looks at the question from the perspective of the Easterlin synthesis framework (Easterlin, 1975; Easterlin and Crimmins, 1985) or that of Caldwell's wealth-flow theory (Caldwell, 1976, 1982), it is possible to make a good case that the net benefits to parents of having large numbers of children are distinctly lower in urban than in rural places. In rural areas children typically begin contributing to agricultural production at relatively early ages, whereas this benefit of children to parents is either not present or else substantially diminished in urban places, and especially so in large cities.

Alternatively, onset of fertility transition in urban areas is integral to innovation-diffusion theories emphasizing urban settings as places of innovation in fertility behavior (Reed et al., 1999). Greater opportunities for schooling in urban places and the corresponding higher school enrollment rates are also a contributing factor raising the net cost of children to urban parents and bringing into play quality-quantity tradeoffs. Increased age at marriage, greater contraceptive use, declining infant

and child mortality, and economic crisis are additional factors that have been identified in the literature as contributing to changes in reproductive behavior.

This paper explores in some detail urban areas as the place of origin of fertility transition in sub-Saharan Africa. The objectives of the paper are two-fold. First, we provide an overview of the role of urban areas in reproductive change by examining recent data on levels and trends of fertility, and patterns of fertility by age in a number of countries, separately for urban and rural areas. In those cases where the data permit, we also consider differences between fertility behavior in capital cities and in other urban places. Second, we attempt to quantify the importance of the various factors mentioned above in contributing to the differentials in fertility. More specifically, we provide evidence on the extent to which urban-rural differences in fertility (and hence, presumably, changes in fertility) are linked to differences in schooling, age at marriage, contraceptive use, and infant and child mortality.

The data used in the paper are from the Demographic and Health Surveys (DHS) that have been carried out since the mid/late 1980s. To date, there are 25 countries in sub-Saharan Africa in which at least one DHS survey has been conducted, and in 13 of these countries there have been at least two DHS surveys. The larger group provides an opportunity to examine levels of the total fertility rate and age-specific fertility rates separately for urban and rural areas, and in a number of these cases data are reported separately for the capital city or region and other urban areas. The smaller group of countries in which there have been multiple surveys allows one to examine trends in fertility, and to determine if those trends are common to both urban and rural areas, or if fertility decline is concentrated in urban places.

The following section provides a descriptive overview of levels and trends in fertility,

separately for urban and rural places. Patterns of age-specific fertility rates and changes over time are also examined for countries with multiple DHS surveys. Once the descriptive overview establishes the nature of the changes that have taken and are taking place, we then attempt to assess the importance of several key factors that are presumably contributing to these changes. As noted earlier, several different (and not mutually exclusive) factors may prove to be relevant here, including in particular education/school enrollment, age at marriage, contraceptive use, infant/child mortality, and economic crisis. Multivariate regression analyses of the age-specific fertility rates of rural and urban women are estimated in an attempt to identify the factors that we believe to be helpful in contributing to the observed differences and changes in fertility. The concluding section of the paper reviews the evidence on the role of urban places in the process of fertility transition in sub-Saharan Africa, and discusses issues for further research.

Levels and Trends in Urban and Rural Fertility in Sub-Saharan Africa

Table 1 shows data on total fertility rates, overall and separately for urban and rural places, for the 40 national DHS surveys that have been carried out in sub-Saharan Africa.[1] The 25 countries involved had an estimated total population in 1995 of more than 350 million, or about 62 percent of that of sub-Saharan Africa.[2] In addition, information on total fertility rates of capital cities or

[1]We have limited our analyses to those countries on the continent. Hence, the Comoro Islands and Madagascar are not included in the analyses here. Further, we have ignored two early DHS surveys that covered only sub-national populations: Northern Sudan and Ondo State in Nigeria.

[2]Four countries not covered by the DHS surveys, Ethiopia, the Democratic Republic of Congo (DRC), South Africa, and the Sudan account for another 30 percent of the balance of the population of sub-Saharan Africa. Coverage of the DHS surveys varies considerably by region within Africa: while more than 90 percent of the population of Western Africa is included in the DHS surveys, the figure falls to 63 percent for Eastern Africa, and in Middle and Southern Africa

regions and of other urban places is also shown in Table 1 for those countries where the survey reports provide such detail.

* Table 1 here *

The estimated total fertility rates are always lower in urban areas than in rural areas. Among the 25 countries, in only six cases is the difference less than 1.0, and for 11 countries it reaches or exceeds 2.0.[3] The average difference (unweighted) for all of the surveys taken together is 1.8, reflecting an average rural total fertility rate of 6.6 as compared to an average of 4.8 for urban places. If one considers only the most recent survey for each country, the average total fertility rate in rural areas falls slightly to 6.4, that for urban places declines to 4.6, and hence the urban-rural difference remains at 1.8. These figures thus indicate that on average, urban fertility is almost 30 percent lower than rural fertility.

Further, in those cases where data are given for the capital city or region separately from other urban places, the total fertility rate is always lower in the capital city. Among the 13 surveys for which data are provided for both the capital and other urban areas, the mean difference in total fertility rates between the two is about 1.1 overall (that difference is 1.0 if one looks only at the most recent surveys for each country). More broadly, of the 21 surveys that report a TFR for the capital city or region, fertility in the capital is lower than in all urban areas in 20 cases (Uganda in 1988-89 is the sole exception).

---

the corresponding numbers are 23 and 6 percent, respectively. The absence of the DRC and South Africa is largely responsible for the low coverage in the latter two regions.

[3]The six countries in which the urban-rural difference was less than one were the Central African Republic (1994-95), Chad (1996-97), Liberia (1986), Mali (1987), Mozambique (1997), and Niger (1992). Note that both Mali and Niger had subsequent DHS surveys in which the urban-rural gap in fertility had widened substantially.

These urban-rural and capital-other urban fertility differentials do not appear to exhibit much in the way of any regional pattern. They are slightly larger in Western Africa than in Eastern Africa, most notably if one focuses on the most recent survey for each country (for example, the urban-rural difference is 2.1 in Western Africa as compared to 1.8 in Eastern Africa). There are also somewhat smaller urban-rural differences among the countries of Middle Africa (the average is only 1.0), but it should be noted that there are only four surveys for countries in Middle Africa.

For 13 of the countries shown in Table 1, there are multiple DHS surveys. The duration between surveys among these countries ranges from 4 to 10 years, with an average of just under 6. Here we consider changes over time in fertility, by place of residence, between the two most recent surveys for each country. With respect to rural total fertility rates, the data show increases (Niger, Mali) or stability (Burkina Faso, Senegal[4]) in four cases. It is noteworthy that three of these countries are among those with especially high fertility, with the national TFR approaching or exceeding seven.[5] In seven of the countries these rural fertility rates show modest declines ranging from about 0.3 to 0.5. In the only two countries in which the most recent national TFR is below five, Zimbabwe and Kenya, rural fertility declines are relatively large. In Zimbabwe the rural TFR fell by 1.2 between the two DHS surveys, and in Kenya it fell by more than 0.6 between the two most recent surveys after having fallen by 1.2 between the first and second surveys. Overall, the (unweighted) average rural TFR declines by about 0.3 between the two most recent DHS surveys.

[4]Senegal and Kenya are the two countries in which there have been three DHS surveys. There was a decline in rural fertility of 0.56 in Senegal between the first and second surveys, but then no further change between the second and third surveys.

[5]Four of the 13 countries had TFRs as of the last DHS survey that were in excess of 6.5: Burkina Faso (6.8), Mali (6.7), Niger (7.5), and Uganda (6.86).

For urban areas, by contrast, there are declines in TFRs for all 13 countries, and these tend to be relatively large. Except for Kenya, which experienced a drop in urban fertility of 1.36 between 1989 and 1993 but of only .32 between 1993 and 1998, the declines between the two most recent surveys range from 0.7 to 1.4, and average almost 0.9. As a consequence of these changes in rural and urban fertility, the urban-rural difference in fertility is greater in the most recent survey than in the preceding survey in 11 of the 13 countries. The exceptions are Zimbabwe and Kenya, the two countries with the lowest overall fertility levels. Further, in those cases where data are available, it is evident that while fertility is consistently lower in capital cities or regions as compared to other urban areas, the declines in fertility between DHS surveys tend in general to be somewhat smaller in the capital cities than in the other urban places.

It appears that the observed decline in fertility between the two most recent DHS surveys depends on the initial level of fertility, as may be seen in Table 2. For the five countries that had a national TFR in excess of 6.5 as of the earlier survey, there was an overall (unweighted) decline of 0.34 on average, reflecting essentially no change in rural fertility (the average decline in the rural TFR was 0.03) and a substantial decline in the urban TFR (by more than 0.9). For the six countries with an initial national TFR between 5.5 and 6.5, by contrast, between the two most recent DHS surveys the overall decline exceeds 0.5, being primarily the outcome of a modest drop of almost 0.3 in rural areas and a distinctly larger decline in excess of 0.9 in urban places.[6] Finally, for the two

[6]It should be noted that the average duration between surveys in this latter group was only 4.8 years, compared to an average of 7.2 years for the five countries in the high-fertility group. Hence, while the overall absolute declines in urban fertility of countries in the two groups are comparable, it is clear that the pace of urban fertility decline is distinctly more rapid in the group with lower fertility. More specifically, the decline per year in the urban TFR in the high-fertility group is 0.127, compared to a figure of 0.193 for the medium-fertility group.

countries with an initial national TFR of less than 5.5, the overall decline approached 0.9, reflecting a fall in the average rural TFR that was greater than 0.9 and a drop in the average urban TFR of almost .55.[7]

* Table 2 here *

The figures in the preceding paragraph give the absolute changes for the high-, medium-, and low-fertility groups. It is useful to consider the relative changes as well. Among the five high-fertility countries, the average overall drop in the TFR was 5 percent, with a decline in the average rural TFR of less than half of one percent and a fall in the average urban TFR of 16 percent. Among the six medium-fertility countries, for which (as indicated in footnote 6) the average duration between surveys was only two-thirds of that of the high-fertility group, the average national decline was 9 percent: the average rural TFR was reduced by 4 percent while the average urban TFR diminished by 18 percent. And lastly, the two low-fertility countries experience the largest overall decline, 16 percent: the average rural TFR fell by almost 16 percent, compared to a decline in the average urban TFR of not quite 15 percent.

These results are suggestive of a three-stage transition pattern in which overall fertility decline is accelerating. In the initial stage, with overall fertility quite high, rural fertility is more or less stable while urban fertility declines. Subsequently, both urban and rural fertility decline, with the decreases in the former being clearly larger than those in the latter. And finally, when a generally low overall level of fertility has been reached, the pace of continued fertility decline appears to be as great or greater in rural than in urban areas. Given the relatively small number of countries under

[7]Changes in the national TFR in any country reflect not only the changes in the urban and rural TFRs, but also population redistribution, which typically is from higher-fertility rural areas to lower-fertility urban places.

consideration here, we do not wish to push this three-stage scenario too hard; however, we believe that the results are quite suggestive.[8]

Age-specific fertility rates are shown in Figures 1a and 1b for urban and rural areas in five of the countries that have had multiple DHS surveys. The five countries, Mali, Ghana, Cameroon, Kenya, and Zimbabwe, were chosen in order to represent a variety of demographic situations while also coming from different parts of the continent. In particular, Mali has continuing high fertility, and as noted above, actually had an increase in rural fertility between the two DHS surveys, while urban fertility declined, but by a relatively modest amount. Ghana and Cameroon, in the medium-fertility group, have experienced recent declines in fertility in both rural and urban places, with the declines in Ghana being close to the averages for the 13 countries with multiple DHS surveys and those in Cameroon being somewhat larger. Finally, Kenya and Zimbabwe have the lowest levels of fertility of the countries with at least two DHS surveys, and as already noted the recent declines in fertility there have been larger in rural areas than in urban areas.

* Figures 1a and 1b here *

Examination of Figure 1a shows a distinct widening over time of urban-rural fertility differences in Mali, reflecting increased rural fertility at the same time that urban fertility declined. The widening is most evident among those aged 20-39. From Figure 1b, it is clear that the urban

[8]By focusing only on the two most recent DHS surveys, we excluded possible comparisons for Kenya and Senegal between the first and second DHS surveys of those countries. Had they been included, they would have been in the high-fertility group, and their large drops in rural fertility would have changed the average decline in rural fertility for this group from about zero to almost 0.3, or not quite 4 percent (essentially the same average as that for the medium-fertility group). However, given the longer duration between surveys for the high-fertility countries, it is still the case (after including the initial surveys for Kenya and Senegal) that the pace of rural fertility decline is slowest among the high-fertility countries.

fertility decline in Mali is greatest at ages 25-34, and there is also a noticeable decline among those in the 15-19 age group. In rural areas, fertility increased among women aged 20-29, more than offsetting the declines among women aged 40-49.

Ghana also experienced a widening of urban-rural differences in fertility, but (as noted above) in this case because urban fertility fell by more than the decline in rural fertility. This widening is evident for all age groups in the 20-44 range except for those aged 35-39. Fertility in urban areas declined most among those aged 25-29, and there were large declines also apparent among those aged 20-24, 30-34, and 40-49. In rural areas, fertility fell most among those aged 45-49, with declines also evident among women aged 35-39. In Cameroon, urban-rural fertility differences widened most among those aged 20-29, and also increased noticeably among 15-19 year-old women. In urban areas, the largest fertility drop was seen among those in their 20s, with distinct declines as well among 15-19 and 30-34 year-olds. In rural Cameroon, there was a substantial drop in fertility among those in their early 30s, and rather modest declines among women aged 15-24 and 35-39.

In Kenya, there was a narrowing of urban-rural fertility differences evident among those aged 15-24, 35-39, and 45-49. Among urban women, there were modest declines in fertility for those aged 25-49, and increases in fertility among younger women (ages 15-24). In rural areas, by contrast, declines were largest among those aged 35-39 and 45-49, and negligible among younger women (15-24) and those aged 30-34. Narrowing of urban-rural fertility differences is apparent for Zimbabwe for all ages above 20 except the 40-44 age group. There is a slight widening of differences among those aged 15-19. Declines in fertility among urban women are relatively modest, with the greatest change being among women aged 25-29 and 40-44. Fertility in rural areas fell for

all ages from 20-49, with the largest changes being among those aged 25-34.

This detailed examination of changes over time in urban and rural fertility by age group does reveal some similarities of experience across countries if one separates out the two low-fertility countries. That is, the three countries with high or medium fertility all show widening of urban-rural differences among those aged 25-29, and substantial declines in fertility of urban women aged 25-34. The two low-fertility countries experienced narrowing of urban-rural differences among 45-49 year-old women, and noticeable declines in fertility of urban women aged 35-44 and (for the most part) rural women aged 35-49. At the same time, however, there is substantial diversity of experience across countries. Even within a broad fertility range (i.e., comparing the two medium-fertility countries or the two low-fertility countries), there are distinct differences in age-specific changes over time.

Multivariate Analyses of Age-Specific Fertility Rates

In this section, we report results of multivariate analyses of age-specific fertility rates in urban and rural areas of the DHS countries. More specifically, we analyzed the factors influencing age-specific fertility rates by estimating a series of regressions.[9] For each five-year age group, we regressed the age-specific fertility rates of women in urban and rural areas on variables measuring the percentage of women in the age group and corresponding place of residence who had no

[9]These regressions were estimated for 22 of the 25 countries covered by the DHS surveys. We were unable to include Botswana, Chad, and Eritrea because data from these countries were not available. In addition, data from all but one of the 1998 DHS surveys were not available when we carried out these analyses, so for five countries surveyed in 1998 (Burkina Faso, Cameroon, Côte d'Ivoire, Niger, Togo) we used data from the preceding DHS survey. In all other cases with multiple surveys we used data from the most recent DHS survey.

schooling, the percentage with secondary or higher schooling, the percentage in union, the percentage of women in union using modern contraception, the infant and child mortality rate ($_5q_0$), and a dummy variable distinguishing urban from rural areas.[10]

We anticipated that the percentage with no schooling, the percentage in union, and the infant and child mortality rate would all be positively related to age-specific fertility rates, while the percentage with secondary and higher schooling and the percentage of women in union who were using modern contraception were expected to be negatively related to fertility. The dummy variable for urban residence was expected to have a negative coefficient, reflecting the lower net benefits of children to parents in urban places.

In addition to these multivariate regressions, we also estimated baseline regressions in which the only explanatory variable was the urban dummy. Our expectation here was for a negative coefficient larger in absolute value than the coefficient in the multivariate equations. This hypothesis reflects the fact that the characteristics expected to be associated with lower fertility (e.g., higher levels of schooling, use of modern contraception) are typically more prevalent in urban than in rural places. The mean values of the variables used in these regressions are shown in Appendix Table A-1, and indeed they show that urban women have more schooling, are considerably more likely to use modern contraception, are less likely (especially at younger ages) to be in union, and experience

[10]In contrast to the other variables (apart from the urban dummy), the infant and child mortality rate was not calculated separately for each age group; rather, it was simply the urban or rural rate across all age groups of mothers. Further, earlier versions of these multivariate analyses also included variables measuring the percentage of women in each age group and place of residence who practiced traditional contraception, the time period during which the survey took place (late 1980s, early 1990s, late 1990s), and the national-level change in GDP per capita during the several years prior to the survey. None of these variables proved to be significant in any of the regressions, and hence they are omitted from the results reported here.

distinctly lower infant and child mortality as compared to rural women.

The results of our analyses are reported in Table 3. For each age group, we first give the baseline regression, and then the multivariate estimate with the various explanatory variables. Consider first the baseline regressions, which show gross urban-rural fertility differences. It is apparent that there are highly significant and fairly substantial differences in fertility. These (absolute) differences are largest among women aged 20-24, at almost 68 per thousand, and they exceed 50 per thousand over the age range 25-39. The smallest absolute difference is among women aged 45-49, but since these women have the lowest overall fertility level, this is in fact the age group with the largest relative urban-rural difference (almost 50 percent). There is also a large relative difference (in excess of 40 percent) among women aged 40-44.

* Table 3 here *

In these baseline regressions, the intercept term may be interpreted as the rural age-specific fertility rate, while the sum of the intercept term and the coefficient of the urban dummy variable gives the corresponding urban age-specific rate. Figure 2 shows the age-specific fertility rates implied by the baseline regressions. It is apparent that the maximum difference, in the 20-24 age group, is partly a consequence of this age group having peak fertility among rural women, while the 25-29 age group has peak fertility among urban women. These rates derived from the regressions are identical to the actual (unweighted) average rates reported in Table A-1, and the implied total fertility rates are 6.58 for rural areas and 4.85 for urban areas. Overall, then, there is a gross urban-rural difference in fertility of 1.73, representing 26 percent of the rural level of fertility.

* Figure 2 here *

Once the schooling, contraception, union status, and mortality measures are added to the

regressions, there is a distinct decline in the magnitude of the estimated coefficients for the urban dummy variables. Among women aged 15-19, the coefficient is only about one quarter of its previous size and no longer significant, and among those aged 20-24 the coefficient falls by almost 40 percent. For the other age groups up through ages 35-39 there are declines in the urban coefficients on the order of about 25-30 percent. Taken together, the coefficients of the urban dummy variable in the multivariate regressions imply an urban-rural difference in the total fertility rate of about 1.1. This net urban-rural difference in fertility represents almost 65 percent of the corresponding gross difference. To put the matter a bit differently, controlling for schooling, use of modern contraception, the percentage of women in union, and infant and child mortality allows us to account for more than 35 percent of the observed (gross) urban-rural difference in fertility.

The substantive results of the multivariate analyses suggest, in brief, that different variables influence urban and rural fertility as one moves across age groups. That is, the percentage of women in union is a statistically significant factor affecting fertility rates among women in the two youngest age groups, but not for any other age group. Infant and child mortality is significantly positively related to fertility of women in the three youngest age groups, but is not an influence on fertility in older age groups. The percentage of women using modern contraception is significantly negatively related to the fertility of women in the 25-29 and 30-34 age groups only.[11] Among the older women (age 35 and above), apart from a weakly significant positive coefficient for the percentage of women with no schooling among those aged 45-49, none of the explanatory variables other than the urban

[11]There is an anomalous positive and significant coefficient for use of modern contraception among women aged 15-19. The young women also have an unanticipated significant negative coefficient for the percentage with no schooling.

dummy is significantly related to age-specific fertility rates.[12]

Discussion and Conclusions

There is clear evidence from the overview of data on urban and rural fertility that while urban-rural differences in total fertility rates are pervasive, there is considerable diversity across countries in terms of urban-rural differences in age-specific fertility rates and in the pace and character of fertility change. While we do not find much evidence of regional patterns to the differences by place of residence, it does appear, at least broadly, that there are some systematic differences in trends according to where a country is with respect to fertility transition. In particular, those countries in which overall fertility is rather high (e.g., TFR of 6.5 or greater) frequently experience little change in rural fertility over time, while showing some declines in urban fertility. Countries with medium fertility levels (e.g., TFRs below 6.5 but above 5.5) tend to experience declines in both rural and urban fertility, with the changes being larger in the urban places. And finally, the small number of countries with low overall fertility (TFRs below 5.5) show larger declines in rural fertility than in urban fertility. At the national level, this pattern suggests that there may be an acceleration of fertility transition as a country moves from high to medium to relatively low levels of fertility.

More generally, we believe that fertility transition is well under way in urban areas of sub-

[12]The absence of any significant relationships between women's educational attainment and fertility is somewhat surprising. However, it should be noted that the equations reported in Table 3 include two proximate determinants of fertility, use of modern contraception and the percentage in union, that are themselves influenced by educational attainment. Indeed, if univariate regressions (i.e., with only one explanatory variable) are estimated, we get statistically significant coefficients in the expected direction for each variable and for each age group. Clearly, then, correlations among the different explanatory variables are influencing the results reported in Table 3.

Saharan Africa, and for many countries this transition has extended to rural areas as well. One might well anticipate continuation of this process as time goes by. How far fertility will decline remains to be seen, although in two countries (Kenya and Togo) the most recently observed TFR in the capital city/region has fallen below 3, and in three others (Cameroon, Côte d'Ivoire, and Tanzania) the corresponding figures are less than 3.5.[13]

The multivariate analyses for urban and rural areas in 22 different countries provide an indication of factors contributing to existing differences in fertility by place of residence. These analyses highlight the fact that different factors become more or less important depending on the age group being considered. For example, among women under age 25, the percentage of women in union is significantly positively related to fertility rates, and given the higher percentages in union of rural women in these age groups, this is clearly an important variable in contributing to urban-rural differences in their age-specific fertility rates. Infant and child mortality is positively related to fertility among women aged 15-29, and also helps account for part of the urban-rural difference in fertility. Finally, use of modern contraception is negatively and significantly related to fertility among women aged 25-34. Urban-rural differences persist after controlling for these different factors, but they are distinctly smaller once these variables are included in the analyses.

These factors relevant to understanding the differences by place of residence presumably play an important role as well in contributing to trends in fertility. That is, continued increases in the age at first marriage, the proportion of women practicing modern contraception, and in the extent of urbanization all should contribute to further declines in fertility. Conversely, to the extent that

[13]It seems likely, based on the data in Table 1, that fertility is probably at a similarly low level at present in Accra in Ghana.

economic crisis has contributed to increases in infant and child mortality in some countries in sub-Saharan Africa in recent years (as indicated by data from several of the recent DHS surveys -- cf., Barrère et al., 1999), our multivariate analyses suggest that there may be countervailing tendencies toward increased fertility.

This paper provides a broad overview of the apparent key role of urban areas in fertility transition in sub-Saharan Africa, and reveals some interesting patterns. At the same time, there is clearly much additional work to be done, at multiple levels. We've looked at differentials and made inferences about trends; the next step is to look directly at trends. In particular, once data are available for all of the 1998 DHS surveys, we intend to examine changes in age-specific fertility rates as a function of changes in the explanatory variables used in the multivariate analyses.

Our observations led us to suggest that there may be a three-stage transition pattern, with fertility initially declining in urban areas while remaining stable in rural areas, then fertility falling in both settings but more rapidly in urban places, and finally with fertility declining more in rural than in urban areas. However, it is clear that such a pattern is not universal, as perhaps best illustrated by experience in Kenya (African Population Policy Research Center, 1998). In 1989, the DHS survey in Kenya reported a national total fertility rate of 6.7. Despite this high level of fertility, over the next four years the urban TFR fell by 1.36 while the rural TFR fell by 1.2. Further, if one compares the 1989 DHS data to results from the World Fertility Survey done in Kenya in the late 1970s, one finds that despite a national TFR in excess of 8 in the WFS data, the decline in fertility in rural areas up through 1989 actually was slightly greater than that in urban areas. Issues of land scarcity in rural areas, demand for increased children's schooling, and economic crisis have all been raised as possible explanatory factors. The example of Kenya highlights the importance of both

looking closely at country-specific factors, and incorporating a longer perspective by using earlier results from the World Fertility Surveys.

In this paper, we've simply dealt with urban and rural areas as two separate entities. However, any effort to identify explanatory factors or underlying mechanisms should look at spatial aspects, and in particular the changes in fertility of rural areas should be examined as a function of their proximity to urban places. From a diffusion of innovation perspective, one would presumably expect that rural areas that are close to urban areas and have considerable contact with them would be more likely to initiate fertility decline, other things equal, than more remote rural areas.

There is also room for improvement in the empirical work. As noted in footnote 10 above, we attempted to assess the impact of economic crisis by looking at recent changes in GDP per capita, but were unable to find evidence of any impact. However, since such data are measured at the national level, they fail to distinguish between the effects of crisis in urban versus rural areas. An adequate test of the impact of economic crisis on urban and rural fertility would, at a minimum, have measures of economic crisis specific to each milieu. Further, we saw that the different explanatory variables in our multivariate analyses seem important for some age groups but not others, and this finding cries out for explanation. And in some cases, we might use alternative variables -- e.g., it seems plausible to suggest that school enrollment rates, rather than educational attainment, might be most meaningful in accounting for fertility differences between urban and rural 15-19 year-olds.

In brief, then, we believe that urban areas play a key role in the process of fertility transition that is presently unfolding in sub-Saharan Africa. At the same time, considerable additional investigation is required in order to better understand the ongoing fertility transition and the role of urban areas in the transition.

References

African Population Policy Research Center. 1998. *Fertility Decline in Kenya: Levels, Trends, and Differentials*. Nairobi, Kenya: African Population Policy Research Center.

Barrère, Bernard, Goram Mboup, and Mohammed Ayad. 1999. *Enquêtes Démographiques et de Santé en Afrique de l'Ouest: résultats des Enquêtes Démographiques et de Santé réalisées au Burkina Faso (1998-99), au Cameroun (1998), en Côte d'Ivoire (1998-99) et au Togo (1998)*. Calverton, Maryland, Macro International Inc.

Caldwell, John C. 1976. "Toward A Restatement of Demographic Transition Theory." *Population and Development Review*, Vol. 2, Nos. 3 and 4 (September/December), pp. 321-366.

Caldwell, John C. 1982. *Theory of Fertility Decline*. London: Academic Press.

Cohen, Barney. 1993. "Fertility Levels, Differentials, and Trends." In Karen A. Foote, Kenneth H. Hill, and Linda G. Martin (eds.), *Demographic Change in Sub-Saharan Africa*, pp. 8-67. Washington, DC: National Academy Press.

Easterlin, Richard A. 1975. "An Economic Framework for Fertility Analysis." *Studies in Family Planning*, Vol. 6, pp. 54-63.

Easterlin, Richard A. and Eileen M. Crimmins. 1985. *The Fertility Revolution: A Supply-Demand Analysis*. Chicago: University of Chicago Press.

Jolly, Carole L. and James N. Gribble. 1993. "The Proximate Determinants of Fertility." In Karen A. Foote, Kenneth H. Hill, and Linda G. Martin (eds.), *Demographic Change in Sub-Saharan Africa*, pp. 68-116. Washington, DC: National Academy Press.

Lesthaeghe, Ron J. (ed.) 1989. *Reproduction and Social Organization in Sub-Saharan Africa*. Berkeley: University of California Press.

Reed, Holly, Rona Briere, and John Casterline (eds.). 1999. "The Role of Diffusion Processes in Fertility Change in Developing Countries: Report of a Workshop." Committee on Population, National Research Council. Washington, DC: National Academy Press.

Tabutin, Dominique. 1997. "Les transitions démographiques en Afrique sub-Saharienne: Spécificités, changements... et incertitudes." In International Union for the Scientific Study of Population, *International Population Conference, Beijing 1997, Vol. 1*, pp. 219-247. Liège, Belgium: International Union for the Scientific Study of Population.

Table 1. Total Fertility Rates, Urban and Rural Places

Country (year of survey)	National TFR	Rural	Urban	Capital City/ region	Other Urban
Benin (1996)	6.32	7.02	5.24	---	---
Botswana (1988)	4.9	5.4	3.9	---	---
Burkina Faso (1993)	6.9	7.3	5.0	4.7	5.5
Burkina Faso (1998)	6.8	7.31	4.05	---	---
Burundi* (1987)	6.6	6.6	5.2	---	---
Cameroon (1991)	5.82	6.29	5.17	4.41	5.64
Cameroon (1998)	5.2	5.8	3.9	3.1	4.5
Central African Republic (1994/95)	5.07	5.23	4.86	4.66	5.06
Chad (1996/97)	6.6	6.8	6.1	5.8	6.3
Cote d'Ivoire (1994)	5.7	6.4	4.7	4.1	---
Cote d'Ivoire (1998)	5.21	6.03	4.02	3.45	4.89
Eritrea (1995)	6.10	6.99	4.23	---	---
Ghana (1988)	6.41	6.63	5.13	4.54	---
Ghana (1993)	5.50	6.36	3.99	3.56	---
Kenya (1989)	6.7	7.0	4.8	---	---
Kenya (1993)	5.4	5.8	3.44	3.40	---
Kenya (1998)	4.7	5.16	3.12	2.61	---
Liberia (1986)	6.5	6.8	6.1	---	---
Malawi (1992)	6.73	6.88	5.51	---	---
Mali* (1987)	6.73	6.97	6.09	---	---
Mali (1995/96)	6.7	7.3	5.4	4.7	5.9
Mozambique (1997)	5.61	5.75	5.12	---	---
Namibia (1992)	5.4	6.3	4.0	---	---
Niger (1992)	7.37	7.52	6.71	5.86	7.24
Niger (1998)	7.5	7.9	5.9	5.2	6.5
Nigeria (1990)	6.01	6.33	5.03	---	---

Rwanda (1992)	6.23	6.33	4.51	---	---
Senegal (1986)	6.6	7.3	5.6	---	---
Senegal (1992/93)	6.03	6.74	5.06	---	---
Senegal (1997)	5.67	6.74	4.29	---	---
Tanzania (1991/92)	6.25	6.59	5.14	4.00	5.60
Tanzania (1996)	5.82	6.34	4.11	3.43	4.36
Togo (1988)	6.59	6.98	4.72	4.13	5.66
Togo (1998)	5.40	6.54	3.32	2.91	3.85
Uganda (1988/89)	7.4	7.6	5.7	5.9	---
Uganda (1995)	6.86	7.17	4.97	---	---
Zambia (1992)	6.5	7.1	5.8	5.5	---
Zambia (1996)	6.08	6.86	5.08	4.87	---
Zimbabwe (1988/89)	5.31	6.06	3.86	---	---
Zimbabwe (1994)	4.29	4.85	3.09	---	---

Note: *Ages 15-44
--- = not available

Table 2. Levels and Changes in Fertility Between the Two Most Recent DHS Surveys, by Initial Level of Fertility and Place of Residence*

(13 countries with multiple DHS surveys)

Initial National TFR	Countries	Levels						Changes					
		National		Rural		Urban		National		Rural		Urban	
		TFR_0	TFR_1	TFR_0	TFR_1	TFR_0	TFR_1	Absolute	Relative	Absolute	Relative	Absolute	Relative
>6.5	Burkina Faso, Mali, Niger, Togo, Uganda	7.00	6.66	7.27	7.24	5.64	4.73	.34	5%	.03	0.4%	.91	16%
5.5-6.5	Cameroon, Cote d'Ivoire, Ghana, Senegal, Tanzania, Zambia	6.12	5.58	6.63	6.36	5.17	4.23	.54	9%	.27	4%	.94	18%
<5.5	Kenya, Zimbabwe	5.36	4.50	5.93	5.01	3.65	3.11	.86	16%	.92	16%	.54	15%

* TFR figures are unweighted averages. TFR_0 refers to the level of the TFR as of the next-most-recent DHS survey, and TFR_1 gives the level of the TFR as of the most recent survey.

Table 3. Multivariate Analyses of Age-Specific Fertility Rates

Age Group	Urban	Explanatory Variables: Schooling		Modern Contraception	In Union	$_5q_0$	Intercept	$\bar{R}^2$	F
		None	Secondary+						
15-19	-43.5**	---	---	---	---	---	158.0**	.187	10.9**
	-12.0	-.579**	-.292	2.976*	2.566**	.277**	39.4*	.791	28.2**
20-24	-67.5**	---	---	---	---	---	286.3**	.453	36.7**
	-41.3**	-.325	.460	-.568	1.180**	.413**	134.0**	.764	24.2**
25-29	-53.8**	---	---	---	---	---	282.0**	.430	33.4**
	-38.8**	.007	.571	-1.173*	-.008	.294**	233.8**	.675	15.9**
30-34	-56.0**	---	---	---	---	---	247.6**	.455	36.9**
	-39.4**	.265	.612	-1.266*	.549	.005	179.5**	.646	14.1**
35-39	-60.5**	---	---	---	---	---	191.6**	.425	32.8**
	-46.5**	.441	1.100	-.923	1.125	.001	64.4	.606	12.0**
40-44	-43.2**	---	---	---	---	---	105.6**	.438	34.5**
	-27.2**	.168	-.548	-.276	-.368	.008	113.9*	.493	8.0**
45-49	-21.9**	---	---	---	---	---	44.4**	.269	16.8**
	-19.0**	.402$^+$	.009	.516	.104	-.002	5.4	.284	3.8**

** significant at the .01 level
* significant at the .05 level
$^+$ significant at the .10 level

Sample size = 44.

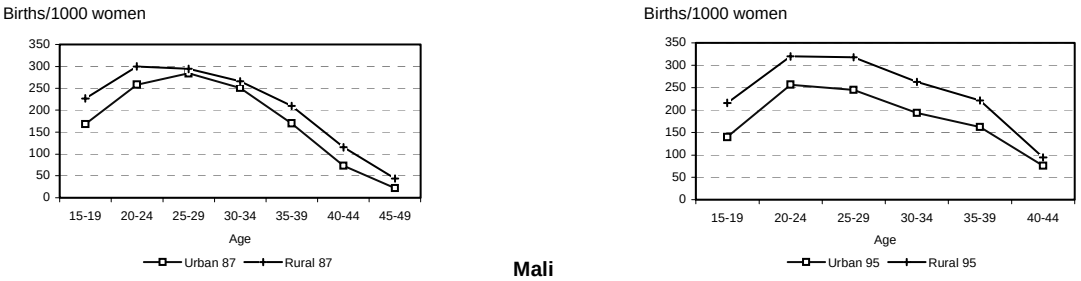
Table A-1. Mean Values of the Variables Used in the Multivariate Analyses of Age-Specific Fertility Rates[a, b]

Urban					
Age Group	Schooling		Modern Contraception	In Union	Age-Specific Fertility Rate
	None	Secondary+			
15-19	19	33	5	21	115
20-24	23	38	14	57	219
25-29	28	36	20	76	228
30-34	33	30	21	81	192
35-39	39	23	22	80	131
40-44	47	18	20	76	62
45-49	58	12	12	74	23
Rural					
15-19	43	12	2	35	158
20-24	49	13	6	75	286
25-29	55	11	8	86	282
30-34	61	7	8	88	248
35-39	66	5	8	87	192
40-44	71	4	8	85	106
45-49	76	3	5	83	44

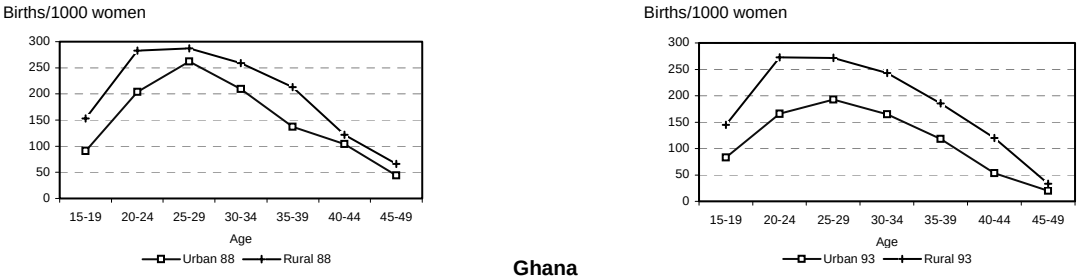
[a] All variables are expressed as percentages, except the age-specific fertility rates, which are per thousand.

[b] Infant and child mortality ($_5q_0$) rates (per thousand) are not calculated separately by age group. The figures for urban and rural places in each country are used in each age-group regression. For urban places, the mean of $_5q_0$ is 139, and for rural places, the mean is 185.

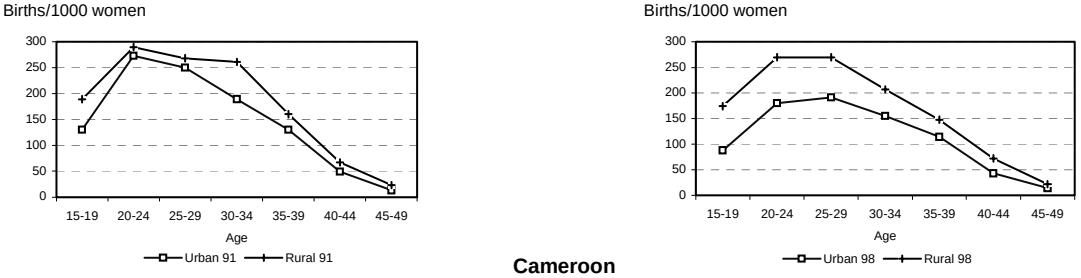
Figure 1a
Urban and Rural Age-Specific Fertility Rates Trends,
Two Most Recent DHS Surveys, Selected Countries



Mali

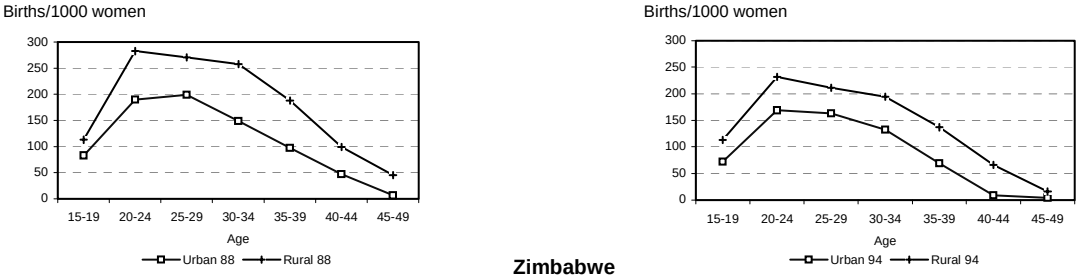


Ghana



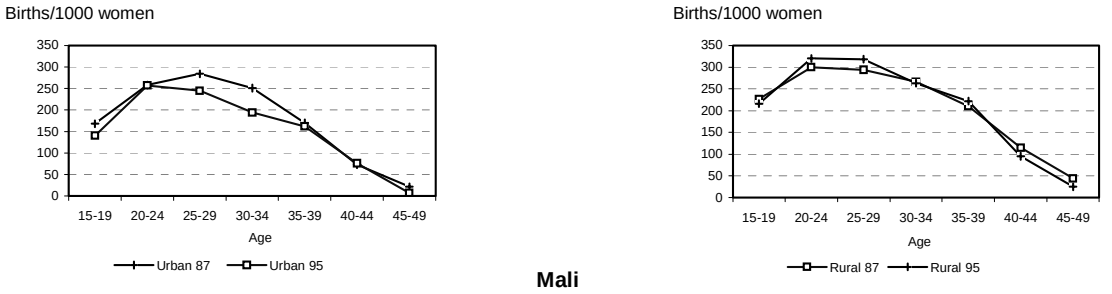
Cameroon

Kenya

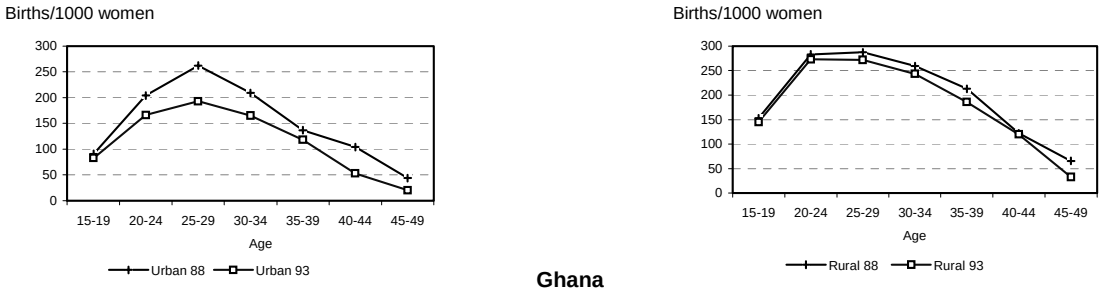


Zimbabwe

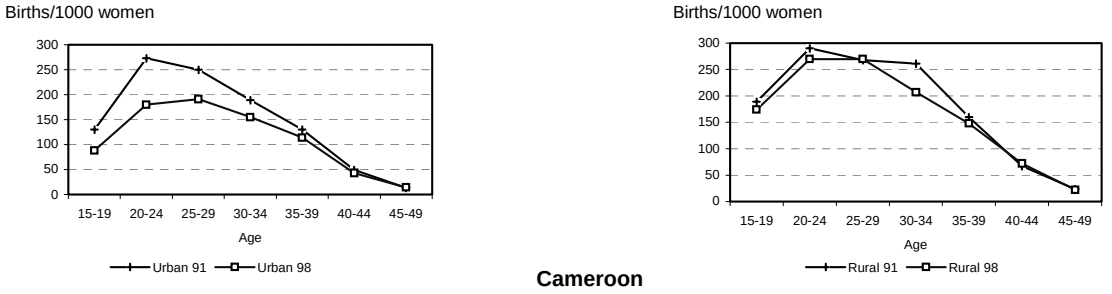
Figure 1b
Trends in Urban and Rural Age-Specific Fertility Rates,
Two Most Recent DHS Surveys, Selected Countries



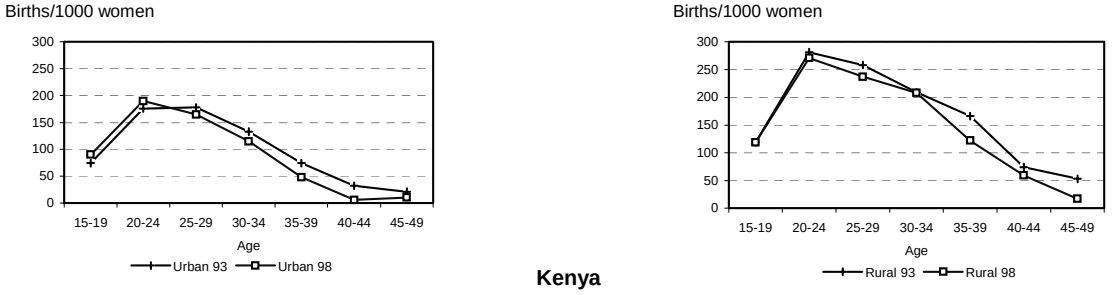
Mali



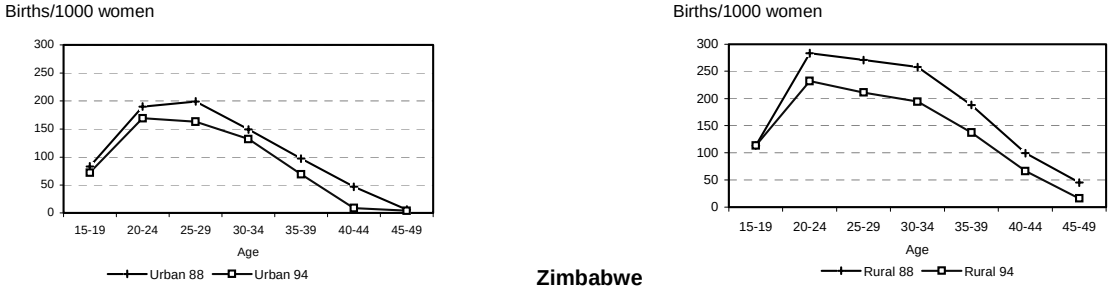
Ghana



Cameroon

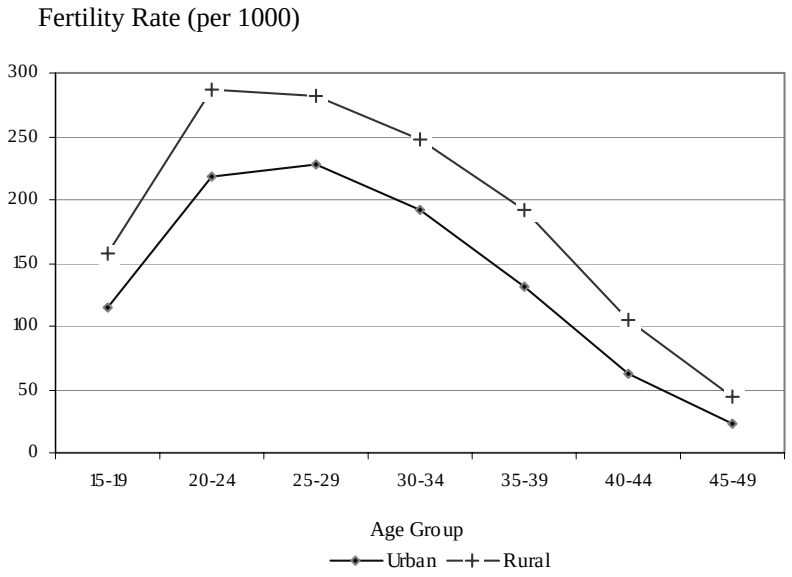


Kenya



Zimbabwe

Fig. 2. Age-Specific Fertility Rates, Urban and Rural Areas



Calculated from baseline regressions in Table 3.