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The demographic components of fertility decline in Addis Ababa, Ethiopia: a decomposition analysis

1. INTRODUCTION

Fertility decline in sub-Saharan Africa is now well documented (Cohen, 1998; Kirk and Pillet, 1998). Although the level and pace of the decline varies widely across countries, all surveys find lower fertility in urban compared to rural areas. Among countries at the outset of the decline, fertility is declining more rapidly in urban than rural areas leading to a widening gap in rural-urban fertility (Cohen, 1998; Kirk and Pillet, 1998). Changing nuptiality is a key component of the decline in urban fertility (Harwood-Lejeune, 2000). Women are entering into unions at older ages and an increasing proportion of women at each age are never married. These changes in union formation are commonly attributed to women's increasing levels education, greater participation in wage employment outside of the home, and the development of alternative roles for women outside of marriage and motherhood (Antonine and Nanitelamio, 2001; Cohen, 1998). In many sub-Saharan African countries delayed marriage has been accompanied by an increase in premarital pregnancies and births, especially among adolescent women (Garenne, Tollman and Kahn, 2000; Meekers, 1994; Singh, 1998). The same conditions of social and economic change that have encouraged women to delay marriage have also been held responsible for eroding the influence and hold of traditional forms of social control over adolescent sexual behavior. With increasing time spend outside of marriage comes a greater risk of premarital sexual relations and pregnancies (Bledsoe and Cohen, 1993; Gage, 1998; Gage-Brandon and Meekers, 1993; Meekers, 1994; Mensch *et al.*, 1999). In some countries the rise in premarital and nonmarital fertility has attenuated the downward effects of delayed marriage on total fertility. Concerns about the negative consequences of premarital sexual relations and childbearing on adolescent women's health and wellbeing have motivated a growing body of research focused on adolescent sexuality in sub-Saharan Africa (Agyei *et al.*, 2000; Gage, 1998; Meekers and Ahmed, 2000; Pillai, Barton and Benefo, 1997).

The contribution of changes in nuptiality patterns and premarital fertility to changes in urban fertility vary substantially among countries in sub-Saharan Africa. For instance, 42 percent of women aged 15-24 in Botswana have had a premarital birth compared to only two percent in Burundi (Gage-Brandon and Meekers, 1993:16). Reasons for the cross-country differences in premarital fertility can be found in regional differences in traditional attitudes regarding adolescent sexuality, religion, adolescent access to reproductive services, and the underlying causes of changes in nuptiality and fertility.

Ethiopia presents a special case of changing nuptiality and fertility. Although fertility at the national level has only recently shown signs of decline, fertility in the capital city of Addis Ababa, by far the largest city in the country, is exceptionally low. The 1994 Population and Housing Census of Ethiopia provided evidence for the first time of below replacement fertility in the capital city of Addis Ababa (*TFR* of 1.8), and perhaps for the first time in a sub-Saharan African city (Central Statistical Authority, 1995). The finding is remarkable given that Ethiopia has one of the highest levels of national fertility in Africa and is one of the poorest countries in the world. In a thorough analysis of census and survey data collected between the late 1970s and mid-1990s Kinfu (2000) argues convincingly that the decline to below replacement fertility in Addis Ababa is authentic and not an artifact of poor data. A special fertility survey conducted in Addis Ababa in 1995 by the Central Statistical Authority also verified the 1994 census findings of below replacement fertility (Central Statistical Authority, 1997). More recently the Ethiopia Demographic and Health Survey 2000 (DHS) found a *TFR* of 1.9 for Addis Ababa (Central Statistical Authority, 2001). Kinfu (2000) attributes the decline in fertility to an increase in the age at marriage and the proportion of women never married, and to a decline in marital fertility. In this paper we present a decomposition analysis of fertility change in Addis Ababa using data from the 1984 and 1994 population censuses. We decompose the period change in age-specific and total fertility rates into three components: change in the proportion married, change in marital fertility rates, and change in nonmarital fertility rates. Our analysis identifies the relative contribution of the various demographic components underlying the

fertility decline in Addis Ababa. In addition to confirming the importance of changes in marriage and marital fertility, we identify change in nonmarital fertility as a key component of fertility decline in Addis Ababa. Contrary to reports of rising premarital fertility in other sub-Saharan African countries, we find that the rise in the proportion of women not married in Addis Ababa has been accompanied by a decline in nonmarital fertility rather than an increase. We suspect that high social and economic costs of single motherhood combined with increased use of contraception and abortion are the primary factors behind the decline in nonmarital fertility.

2. DATA AND METHODS

The data for this study come from a one percent sample of the individual records from the 1984 Population and Housing Census and a five percent sample from the 1994 census. We use questions on births in the last 12 months and current marital status to compute age-specific fertility rates by marital status, and age-specific proportions of women currently married. Currently married includes women in formal and consensual unions, and currently nonmarried includes separated, divorced, widowed and never married women. The Addis Ababa enumeration area for the 1994 census included a larger area than the 1984 census in accordance with the expansion of the city's administrative boundaries. We made the two censuses approximately comparable by including in the 1984 data women living in areas surrounding the city that later became part of the 1994 Addis Ababa enumeration area. Our analysis uses 18,591 women age 15-49 from the 1984 census, and 32,651 women age 15-49 from the 1994 census.

Table I presents the age-specific and total fertility rates by marital status for 1984 and 1994. During the intercensal period the total fertility rate in Addis Ababa declined from 3.06 to 1.78 children per woman, and the total marital fertility rate declined from 5.05 to 4.37. The decline in marital fertility begins at ages 25-29 and becomes more dramatic at older ages. This age pattern of fertility decline is consistent with the adoption of contraception for spacing births and stopping childbearing. Age-specific patterns of contraceptive use among currently married women reported by the 1995 Fertility Survey of Urban Addis Ababa support this interpretation. According to the survey, roughly 50 percent of married women between the ages of 20 and 34 were using contraception, as were 40 percent of married women age 35-39, and 32 percent of married women age 40-44 (Central Statistical Authority, 1997:101).

More noteworthy than the decline in marital fertility are the changes that occurred among nonmarried women. During the intercensal period the total fertility rate for nonmarried women dropped from 1.48 to 0.53 children per woman. This decline is larger in both relative and absolute terms than the decline in marital fertility, and it occurred at all ages, with the exception of 40-44. The low level of nonmarital fertility in Addis Ababa is exceptional by African standards and reflects the presence of strong, negative social sanctions and economic costs associated with out-of-wedlock births in combination with widespread use of contraception and/or abortion¹. The Ethiopia DHS 2000 found that 36 percent of sexually active unmarried women were using modern contraception compared to only six percent of married women. These figures are for the country as a whole: the prevalence of modern contraceptive use among unmarried women in Addis Ababa is certainly even higher. Higher rates of contraceptive use among unmarried women compared to married women have also been reported for other African countries (Kirk and Pillet, 1998). Direct measures of the prevalence of induced abortions in Addis Ababa during the period covered by the two censuses are not available. However, in a study of maternal mortality conducted in Addis Ababa in 1983, Kwast *et al.* (1986) found that abortion was the leading cause of maternal mortality, and that close to one-half of the deaths caused by abortions were among single women.

¹ In a study of single women in three African cities Antoine and Nanitelamio (1991) report average parities for single women aged 25-29 of 0.7 in Pikine, Senegal; 1.5 in Abidjan, Côte d'Ivoire; and 1.5 in Brazzaville, Congo.

Table 1 – Age-specific and total fertility rates by marital status, 1984 and 1994, Addis Ababa, Ethiopia

Age group	All women		Married women		Unmarried women	
	1984	1994	1984	1994	1984	1994
15-19	0.016	0.011	0.157	0.185	0.008	0.005
20-24	0.097	0.050	0.216	0.219	0.041	0.011
25-29	0.157	0.091	0.226	0.193	0.051	0.018
30-34	0.153	0.101	0.189	0.151	0.077	0.020
35-39	0.115	0.062	0.138	0.083	0.062	0.016
40-44	0.048	0.031	0.059	0.031	0.027	0.032
45-49	0.027	0.009	0.025	0.014	0.029	0.003
<i>TFR</i>	3.06	1.78	5.05	4.37	1.48	0.53
N	18,591	32,651	7,927	10,856	10,664	21,795

Source: 1% file of the 1984 Population and Housing Census of Ethiopia and 5% file of the 1994 Census.

The significant difference in the fertility rates for all women compared to married women is an indication of the importance of nonmarriage in accounting for the low total fertility rate in Addis Ababa. With a total fertility rate of 4.37 in 1994, marital fertility in Addis Ababa still remains significantly above replacement levels. Table 2 presents the age-specific proportions of women currently married in the two census years. The overall proportion of women in their reproductive ages who are currently married declined by 25 percent during the intercensal period, from 0.43 in 1984 to 0.33 in 1994. The decline in marriage is concentrated in the ages 20-29 when women are at their reproductive peak. The proportion of women age 20-24 currently married dropped by 40 percent from 0.32 to 0.19, and the proportion of women age 25-29 currently married dropped by close to one-third from 0.60 to 0.42. This dramatic decline in marriage at younger ages combined with the decline in nonmarital fertility has certainly played a large role in the overall decline in fertility in Addis Ababa. Based on an analysis of the Ethiopia 1990 Family and Fertility Survey and the 2000 Ethiopia DHS, Sibanda *et al.* (2003) find that the recent decline in marriage in Addis Ababa is due to increases in the age at marriage and the proportion of women who remain unmarried, and not to a rise in marital instability. In the next section we identify the relative contribution of changes in marriage, and marital and nonmarital fertility rates, to the decline in total fertility in Addis Ababa.

Table 2 – Proportion of women married, by age, 1984 and 1994, Addis Ababa, Ethiopia

Age group	1984	1994
15-19	0.05	0.04
20-24	0.32	0.19
25-29	0.60	0.42
30-34	0.68	0.61
35-39	0.70	0.68
40-44	0.65	0.65
45-49	0.60	0.59
Total	0.43	0.33
N	18,591	32,651

Source: 1% file of the 1984 Population and Housing Census of Ethiopia and 5% file of the 1994 Census.

3. DECOMPOSITION ANALYSIS

We decompose the intercensal change in total fertility into three components: change in the proportion married, change in marital fertility rates, and change in nonmarital fertility rates using a technique introduced by Kitagawa (1955) for decomposing crude birth rates and later extended to total fertility rates by Retherford and Ogawa (1978). Alternative adaptations of Kitagawa's decomposition method have been used to estimate the relative contribution of changes in composition and group-specific fertility rates to

fertility decline in diverse populations (Cho and Retherford, 1973; Gubhaju and Shahidullah, 1990; Khawaja, 2000; Retherford and Cho, 1981; Retherford and Rele, 1989). The total fertility rate can be represented as the weighted sums of the marital (F_{xm}) and nonmarital (F_{xn}) age-specific fertility rates where the weights are the age-specific proportions of women married (k_{xm}) and not married (k_{xn}):

$$TFR = 5 \sum_x (k_{xm} F_{xm} + k_{xn} F_{xn}) \quad [1]$$

Change in the total fertility rate from period t_1 , to t_2 , which is denoted as ΔTFR , is broken down into three components: change in the marital status composition [2a], change in marital fertility rates [2b], and change in nonmarital fertility rates [2c]:

$$\Delta TFR = 5 \sum_x \frac{1}{2} (F_{xm}^{(t_2)} + F_{xm}^{(t_1)}) (k_{xm}^{(t_2)} - k_{xm}^{(t_1)}) + 5 \sum_x \frac{1}{2} (F_{xn}^{(t_2)} + F_{xn}^{(t_1)}) (k_{xn}^{(t_2)} - k_{xn}^{(t_1)}) \quad [2a]$$

$$+ 5 \sum_x \frac{1}{2} (k_{xm}^{(t_2)} + k_{xm}^{(t_1)}) (F_{xm}^{(t_2)} - F_{xm}^{(t_1)}) \quad [2b]$$

$$+ 5 \sum_x \frac{1}{2} (k_{xn}^{(t_2)} + k_{xn}^{(t_1)}) (F_{xn}^{(t_2)} - F_{xn}^{(t_1)}) \quad [2c]$$

Because each of the components of change is calculated for five-year age intervals and then summed across intervals, the decomposition formula can be used to measure the principal components of change in age-specific rates as well as change in the total fertility rate.

The results from the decomposition must be interpreted with some caution. First, the distinction between marital status compositional and marital status fertility contributions in equation [2] is not entirely unambiguous (Retherford and Ogawa, 1978:119). The contribution from change in marital composition [2a] depends not only on changes in the proportions of women married and not married, but also on the mean marital and nonmarital fertility rates for the two census years, which are affected by change in marital and nonmarital fertility rates. Similarly, the contributions from change in fertility [2b and 2c] depend not only on changes in marital and nonmarital fertility, but also on the mean proportions married and not married, which are affected by changes in the proportion married and not married. A second potential problem is created by the movement of women across compositional categories (Retherford and Ogawa, 1978:120). For instance, an increase in the proportion of women not married between the two periods due to an increase in marital disintegration or widowhood, will itself influence nonmarital fertility, if divorced, separated, and widowed women have age-specific fertility rates different from never married women. As mentioned earlier in this paper, the intercensal increase in the proportion of nonmarried women in Addis Ababa is due primarily to delayed marriage and an increase in the proportion of women who never marry, and not to increases in divorce, separation, or widowhood.

Table 3 presents the results of the decomposition of change in total fertility. The decline in marital fertility was the single most important component in the intercensal decline in total fertility, it accounted for 0.51 of the 1.27 child decline, or roughly 41 percent. The decline in nonmarital fertility accounted for 33 percent of the decline in total fertility, and the decline in the proportion of women married accounted for 27 percent of the decline. These results highlight again the important role played by nonmarriage in bringing fertility down so low in Addis Ababa.

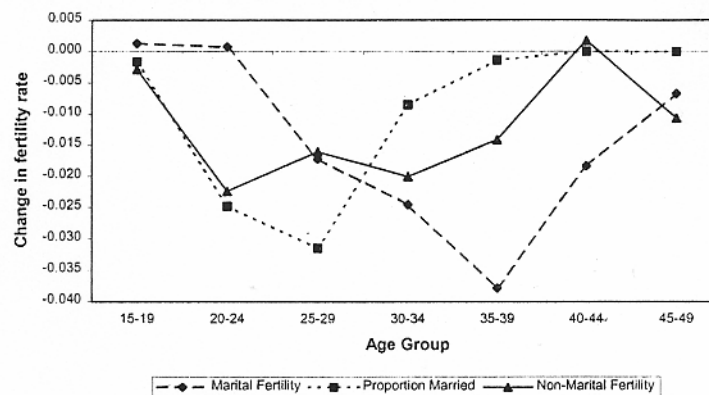
Table 3 – *Decomposition of change in the total fertility rate from 1984 to 1994, Addis Ababa, Ethiopia*

	Change in fertility	Percent contribution to change
<i>Change in TFR due to:</i>		
Change in marital fertility	-0.51	40.5
Change in nonmarital fertility	-0.42	33.2
Change in proportion married	-0.34	26.7
Total change in TFR	-1.27	100.0

Source: 1% file of the 1984 Population and Housing Census of Ethiopia and 5% file of the 1994 Census.

Further insight into the fertility decline in Addis Ababa is provided by Figure 1, which presents the components of change in age-specific fertility. Fertility in the youngest age interval, 15-19 remained relatively unchanged from 1984 to 1994. At ages 20-24 a decline in the proportion of women married and a decline in nonmarital fertility made roughly equal contributions to the decline in fertility. Marital fertility in this age group remained essentially unchanged during the period. However, starting at age 25-29 and moving up into the older age groups, decline in marital fertility becomes the dominant component of the decline in fertility. Between the ages of 30-34 and 40-44 change in marital fertility made the largest contribution to the decline in age-specific fertility rates. Given the tendency for marriage to rise with age (even though the overall proportion of women married has declined), the effect of a change in nonmarital fertility on overall fertility rates becomes less important beyond ages 20-24. Similarly, the decline in the proportion of women married has its biggest impact on fertility rates at ages 20-24 and 25-29, but is of relatively little or no significance at older ages.

Figure 1 – Components of change in age specific fertility



Source: 1% file of the 1984 Population and Housing Census of Ethiopia and 5% file of the 1994 Census.

4. DISCUSSION

The age pattern of the components of change in fertility rates shown in Figure 1 illustrates how the decline in fertility in Addis Ababa is the result of the distinct, but related processes of delayed marriage, and increased control over the occurrence and timing of births inside and outside of marriage. Figure 1 also demonstrates how the relative importance of change in each of the three components varies across the reproductive age span. Factors which keep women out of unions and thus reduce the risk of childbearing are most important at younger ages, while factors which discourage additional births among women in unions are most important in changing fertility rates at older ages. The absence of any significant change in marital fertility rates at young ages (15-24) does not suggest that young couples were unaffected by the social and economic forces that were discouraging births among older married women and unmarried women. The decline in the proportion of currently married women meant that young women who entered into marriage were likely to have become a more select group. For example, given the strong incentives to both delay marriage and avoid single motherhood, the proportion of young women whose marriage was the result of an unplanned pregnancy may have been greater in the more recent census than in the earlier census. A rise in the proportion of unions which resulted from a pregnancy could produce the appearance of stable age-specific fertility rates even though contraceptive use may have risen among married women in the same age groups. Survey data from 1990 and 1995 show that contraceptive use among young married women did indeed rise in Addis Ababa during the period spanned by the two surveys². Clearly, the forces

² In 1990, 38 percent of currently married non-pregnant women age 15-24 in Addis Ababa were using contraception compared to 44 percent of currently married women age 15-24 in 1995 (Central Statistical Authority, 1993:199; Central Statistical Authority, 1997:105).

that were bringing fertility down among older married women were also encouraging younger married women to delay or avoid births as well.

What were these forces? Kinfu (2000) suggests that rising levels of women's education and labor force participation generated higher material and status aspirations which in turn increased the opportunity costs of childbearing for women. The rise in aspirations, however, occurred during a period of political upheaval and economic contraction. The combination of rising aspirations and declining opportunities provided a powerful incentive to women to delay marriage and limit childbearing. Improved child survival and access to effective methods of birth control in Addis Ababa played a key role in the marriage and fertility transition as well (Kinfu, 2000:78). Lindstrom and Berhanu (1999) also attribute the decline in marital fertility that they observed in urban areas of Ethiopia during the 1980s to the convergence of war, political repression, economic decline, and famine which ravaged the country during the 1970s and 1980s. Decline in fertility in response to economic contraction and crisis has been observed in other African cities. Antoine and Nanitelamio (1991) for instance, attribute the trend towards later marriage in urban Senegal to the material difficulties of setting up an independent household. Similarly, Kirk and Pillet (1998) suggest that economic recession and a decade of crisis may be behind the sharp rise in nonmarriage and contraceptive use in Cote d'Ivoire. The case of Addis Ababa and the other urban areas cited here may constitute yet another route to fertility decline in sub-Saharan Africa.

What sets fertility patterns in Addis Ababa off from other urban areas in Africa is that the delay in marriage and the rise in nonmarriage has not been accompanied by a rise in nonmarital births, but rather just the opposite, a decline. This finding is contrary to the expectation of an increase in out-of-wedlock births as women spend more time outside of marriage (Cohen, 1993; Gage-Brandon and Meekers, 1993; Meekers, 1994). We have suggested that increased contraceptive use and abortion are the prime means by which premarital births are being avoided. The Addis Ababa case also provides an example of an urban society in which pervasive insecurity and continued economic setbacks have not led to a breakdown in traditional reproductive patterns and the close connection between marriage and childbearing. The apparent presence of powerful economic costs and negative social sanctions against single motherhood underscore the importance of increasing the accessibility of effective contraceptive methods for women of all ages, and in particular adolescent women.

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