**RESEARCH ARTICLE**

# COMPONENTS OF THE RECENT FERTILITY DECLINE IN AMHARA NATIONAL REGIONAL STATE, ETHIOPIA: A DECOMPOSITION ANALYSIS OF ETHIOPIA DEMOGRAPHIC AND HEALTH SURVEY

Getachew Nibret[1], Nega Mihret[2], and Tariku Dejene[3]

**ABSTRACT**

*The purpose of the study was to examine socioeconomic and demographic factors that are responsible for the recent fertility decline in the Amhara National Regional State, Ethiopia by using the 2000, 2005 and 2011 Ethiopia Demographic and Health Survey. Data management and analysis were carried out using STATA 13. The analysis technique employed in this study was multivariate decomposition. The findings of the study showed that there was on average 537 excess births among 1,000 women of the reproductive age during the year 2000 as compared to the year 2001 with a 95% CI (422.7, 650.4) in the region. The result also showed that about 96% (516.0 births per 1,000 women) of these excess births are attributable to differences in characteristics of women between the two periods with 95% CI (378.3, 653.6). The remaining 4% (20.6 births per 1,000 women) are explained by the changes in response to behaviour. In conclusion, the primary drivers of the recent fertility change during the last decade in the region were the shift observed in the age at first marriage, improvement in child survival and increased urbanization.*

**Keywords**: demography, decomposition, fertility decline, Amhara, Ethiopia

## INTRODUCTION

Fertility is the most dynamic element in determining the size, rate of growth and the age-sex structure of a population. In the absence of substantial migration, at any given level of mortality, changes in fertility causes variations in the rates of natural increase exert a powerful influence on the age structure of a population. Fertility is a major expanding force in population dynamics and a major neutralizing force to population reduction through mortality. Fertility is also a vital factor in the determination of the social, economic and political features of a nation. The fertility of a particular population results from a complex interaction of different factors, and different groups within a population may respond to similar factors in different ways. These different groups within a population are likely to display

1. Lecturer, Department of Population Studies, University of Gondar, Ethiopia. Corresponding author. Email: getachewnibret@gmail.com.
2. Lecturer, Department of Population Studies, University of Gondar, Ethiopia. Email: nigamihret@yahoo.com.
3. Assistant Professor, Center of Population Studies, Addis Ababa University, Ethiopia. Email: tariku_dejene@yahoo.com.

different fertility levels and trends (Bogue, 1971; Graft, 1979; United Nations, 1987).

In Ethiopia the total fertility rate was 6.7 children per woman in 1990 and 5.2 children per woman in 2005, the reduction in the total fertility rate over the 15-year span was not as anticipated (Central Statistical Agency [Ethiopia], 1993; Central Statistical Agency [Ethiopia] & ORC Macro, 2006). In particular, there was a slight difference between the 2005 and 2011 in fertility rate (4.8 children per woman). However, a considerable regional variation in the reduction of fertility was observed. The overall decline of fertility in the Amhara National Regional State between 2000 (5.9 children per women) and 2011 (4.2 children per women), for instance, was very high as compared to the corresponding figure for the Oromiya National Regional State (6.4 Vs. 5.6) and the Southern Nations Nationalities and Peoples Region (5.9 Vs. 4.9) (Central Statistical Agency [Ethiopia] & ORC Macro, 2001, 2006; Central Statistical Agency [Ethiopia] & ICF International, 2012).

The specific factors that explain the incipient course of fertility transition in the region and their relative contribution, however, are unknown. It is not clear whether the decision on the number of children is taken purely privately within the household decision-making framework or whether it was influenced by socioeconomic development discourse or it is shaped and regulated at the community level. Neither it is known whether the National Population Policy targets of 4.0 total fertility rate in 2015 (Transitional Government of Ethiopia, 1993) have been sufficiently well-implemented in the Amhara National Regional State to have significantly influenced the age at first marriage, reproductive intentions, and under-five mortality in the region. In addition, detailed studies on nature and paces of fertility in the Amhara National Regional State is valuable and needed as major input for planning, implementation, and evaluation of population and development programs and the study of differentials of fertility has importance in detecting relevant variables of interest for interventions. Therefore, the aim of the present study was to examine socioeconomic and demographic factors of the recent fertility change in the region.

## METHODS

### Data sources

The main data sources for the present study were the 2000 and 2011 Ethiopia Demographic and Health Survey (EDHS). The 2000 and 2011 Ethiopia Demographic and Health Surveys are parts of the worldwide MEASURE DHS project funded by the United States Agency for International Development (USAID). The Ethiopia Demographic and Health Survey primarily targeted women aged 15-49 and used standardized questionnaires. The sample for all Ethiopia Demographic and Health Survey were based on a two-stage stratified sample of the households (Central Statistical Agency [Ethiopia] & ICF International, 2012). The EDHS data had records of 1,909 and 2,087 women of reproductive age for Amhara region for the years 2000 and 2011, respectively. All records of women for the region were considered in the analysis.

**Variable specification**

The main response variable of the present study was children ever born which is most closely related to the number of children a woman has had when she is done having children and is a self-reported measure of completed fertility for those women surveyed. Two groups of explanatory variables, demographic and socio-economic, were considered in the present study. The explanatory variables included were the place of residence, women's education, current mother's age, experience of under-five children's death, age at first union, and reproductive intentions.

**Analysis**

Data management and analysis were carried out using the STATA 13. The analysis technique employed in this study was multivariate decomposition. The analysis technique uses Poisson regression model of children ever born to women of two groups. In this study, time is considered as a grouping variable to decompose the average number of births into the components attributable to differences in characteristics, endowment, and a component attributable to differences in the effects of characteristics or behavioural responses and coefficients. The decomposition technique is an improvement over many other decomposition methods as it resolves the problems of path dependence by computing asymptotic standard errors and identification problem for dummy variables included in the model. The 2000 Ethiopia Demographic and Health Survey was considered for the sake of comparison while the 2011 Ethiopia Demographic and Health Survey was taken as a reference group. The endowment reflects the expected difference in children ever born if women in the comparison group were given the distribution of covariates prevailing in the reference group. The characteristic component reflects the expected difference in children ever born if women in the reference group experienced behavioural responses of the comparison group for each covariate (Powers, 2011).

**Data quality assessment**

Reconstructing fertility trends by calendar year over the last fifteen years in all the three surveys were used for assessment of data quality. The visual inspect of the reconstructed trends suggests that data quality varies greatly across surveys and also illustrates different types of data quality problems. Fertility estimates in the Amhara National Regional State seems to be affected by severe data quality problems. Published total fertility rates are well below the reconstructed estimates suggesting possible displacements

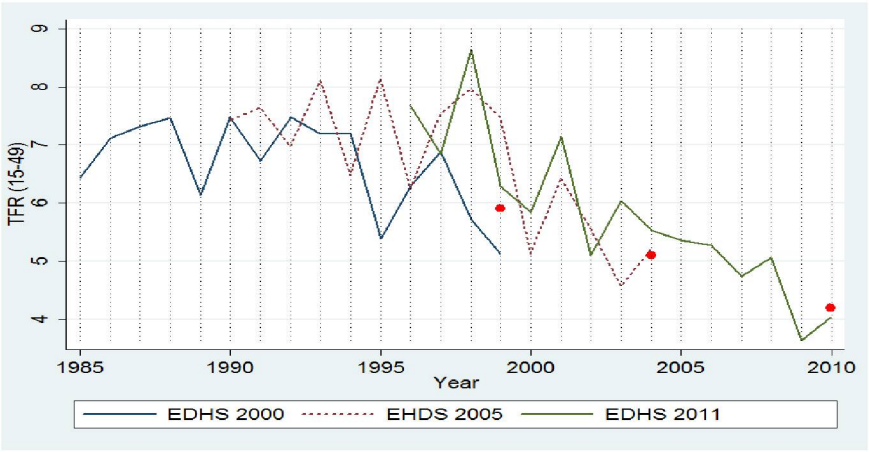


Figure 1: *Comparisons of retrospective estimates of fertility and published total fertility rate, Amhara National Regional State 1985-2010*
*Source*: Calculated from 2000, 2005 and 2011 Ethiopia Demographic and Health Survey data.

## RESULTS

The proportion of women of reproductive age who were married before reaching 18 years of age has shown a significant reduction from 80.0% to 63.4% in the period 2000 to 2011. An improvement in child survival was also witnessed which was signalled by the fall in proportion of women with a history of child death from 35.6% to 24.8%. A slight increase in percentage of women desiring to bear an additional child, from 51.2% to 56.3%, was also observed during the same period (Table 1).

Again socioeconomic characteristics as measured by urbanization over time and improvement in educational status of women were also observed. The proportion of women who were living in urban areas rose from 12.2% to 22.5%; moreover, the proportion of women who had at least a primary level of education in the region increased by more than twofold from 16.5% to 38.6% (Table 1).

A decline in the average number of lifetime fertility, children ever born, was observed in the 11-year span considered. The average number of children ever born per 1,000 women of reproductive age was 3,391 in 2000 and 2,854 in 2011. The average number of children ever born to women was disaggregated by various characteristics of women. The disaggregated result shows that the magnitude of fertility was higher among women who were married early, illiterate and rural resident during both survey periods. In addition, women with a history of child death and those who do not want to bear an additional child had the highest fertility. The average number of children ever born to women of age group 15-19 across time shows a per 1,000 in 2011.

Table 1: *Percentage distribution of women by demographic and socioeconomic characteristics 2000 and 2011, Amhara National Regional State*

| Variables and categories | Survey year | | |
|---|---|---|---|
| | | **2000** | **2011** |
| Current age | 15-19 | 22.0 | 25.3 |
| | 20-24 | 16.9 | 17.3 |
| | 25-29 | 17.0 | 16.4 |
| | 30-34 | 11.8 | 12.2 |
| | 35-39 | 13.2 | 12.2 |
| | 40-44 | 9.2 | 7.9 |
| | 45-49 | 9.9 | 8.7 |
| Early marriage | No | 19.9 | 36.6 |
| | Yes | 80.1 | 63.4 |
| Experience of child death | No | 64.4 | 75.2 |
| | Yes | 35.6 | 24.8 |
| Reproductive intention | No | 48.8 | 43.7 |
| | Yes | 51.2 | 56.3 |
| Education | Illiterate | 83.5 | 61.4 |
| | Primary | 10.7 | 29.4 |
| | Secondary+ | 5.8 | 9.2 |
| Residence | Urban | 12.2 | 21.5 |
| | Rural | 87.8 | 78.5 |
| Total | 100.0 | 100.0 | |
| Number of observations | 1,909(3,820) | 2,087 | |

*Source*: Calculated from 2000 and 2011 Ethiopia Demographic and Health Survey data.

Table 2: *Distribution of women and average number of children ever born per 1,000 women by demographic and socioeconomic characteristics of women 2000 and 2011, Amhara National Regional State*

| Variables and categories | | Survey year | | | |
|---|---|---|---|---|---|
| | | 2000 | | 2011 | |
| | | No. | ACEB/1,000 women | No. | ACEB/1,000 women |
| Current age | 15-19 | 842 | 265 | 1,123 | 115 |
| | 20-24 | 647 | 1,443 | 766 | 1,067 |
| | 25-29 | 650 | 2,925 | 728 | 2,359 |
| | 30-34 | 449 | 4,655 | 541 | 3,919 |
| | 35-39 | 504 | 5,500 | 541 | 5,142 |
| | 40-44 | 351 | 6,809 | 349 | 6,227 |
| | 45-49 | 378 | 7,000 | 387 | 7,544 |
| Early marriage | No | 762 | 1,119 | 1,622 | 809 |
| | Yes | 3,058 | 3,957 | 2,812 | 4,034 |
| Reproductive | No | 1,865 | 4,590 | 1,937 | 4,469 |
| | Yes | 1,955 | 2,246 | 2,497 | 1,602 |
| Experience of child death | No | 2,461 | 2,017 | 3,335 | 1,755 |
| | Yes | 1,359 | 5,879 | 1,098 | 6,193 |
| Education | Illiterate | 3,191 | 3,761 | 2,723 | 4,003 |
| | Primary | 408 | 1,713 | 1,303 | 1,182 |
| | Secondary+ | 221 | 1,145 | 407 | 528 |
| Residence | Urban | 465 | 2,326 | 953 | 1,815 |
| | Rural | 3,355 | 3,539 | 3,480 | 3,139 |
| Total | | 3,820 | 3,391 | 4,433 | 2,854 |

*Source*: Calculated from 2000 and 2011 Ethiopia Demographic and Health Survey data.
*Note*: ACEB = Average Number of Children Ever Born.

However, this gap narrows down over time as age advances. This is an evidence of the women in the region who were attempting to postpone their debut to reproduction over time (Table 2).

The detailed decomposition of fertility using three groups of determinants of fertility is undertaken. The decomposition produces two component, endowment and coefficient, for each characteristic considered in the analysis. As such, the endowment and coefficient contribution of each determinant to the change in fertility across time are outlined along with their 95% CI. A positive endowment coefficient for a covariate indicates the expected reduction in differential of children ever born between the two periods if the distribution of the covariate prevailing during the 2011 survey were prevalent in the comparison period.

There was on average 537 excess births among 1,000 women of the reproductive age during the year 2000 as opposed to the year 2011 in the Amhara National Regional State with a 95% CI (422.7, 650.4). The result shows 96% (516.0 births per 1,000 women) of these excess births are attributable to differences in characteristics of women between the two periods with 95% CI (378.3, 653.6). The remaining 4% (20.6 births per 1,000 women) are explained by the changes in response to a behaviour; albeit, the result is not statistically significant (Table 3).

The larger proportion of the differential, 84.1% happened due to the shift in demographic characteristics during the period. Women were postponing reproduction to later age for various reasons over the course of time. This preference has contributed to 19% (102 births per 1,000 women) with a 95% CI (88.3, 115.7) of the gap in fertility of the region over the 11-year span. The shift in the level of early marriage observed in the reference period resulted to an average reduction of 225 births per 1,000 women with 95% CI (183.8, 266.0).

The decline in child mortality is another demographic determinant that exerted an influence in the fertility change in the region. The change in the experience of the death of children, particularly under-five mortality, among women in the region across 2000 to 2011 contributed to a 19.6% (105 births per 1,000 women) with a 95% CI (85.7, 124.2) decline in fertility. The difference in desire for more children accounted 3.6% of the fertility gap in the region between 2000 and 2011 (Table 3).

Even though education of a mother is an empirically established noteworthy predictor of fertility, its contribution to the change in fertility of the region was insignificant. Furthermore, the degree of community literacy was observed to have no importance in the fertility decline of the region. The contribution due to the difference in place of residence was significant and 42.4 births per 1,000 women with 95% CI (16.2, 68.5), that is, 8% of the total differential was obviated due to urbanization (Table 3).

Table 3: *Decomposition of change in children ever born (2000-2011), Amhara National Regional State*

| Variables | Endowment | | Coefficient | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Coef. | P-value | 95% | CI | % | Coef. | P-value | 95% | CI | % |
| Demographic | 451.1 | | | | 84.1 | -28.5 | | | | -5.4 |
| Age | 102.0 | 0.00 | 88.3 | 115.7 | 19.0 | -26.5 | 0.81 | -238.4 | 185.5 | -4.9 |
| Married early | 224.9 | 0.00 | 183.8 | 266.0 | 41.9 | -7.8 | 0.83 | -78.5 | 62.9 | -1.5 |
| Child death | 105.0 | 0.00 | 85.7 | 124.2 | 19.6 | 2.9 | 0.81 | -20.5 | 26.4 | 0.5 |
| Desire for | 19.2 | 0.00 | 12.2 | 26.2 | 3.6 | 2.9 | 0.84 | -24.2 | 30.0 | 0.5 |
| Socioeconomic | 153.5 | | | | 28.6 | -56.3 | | | | -10.4 |
| Illiterate | 13.6 | 0.46 | -22.6 | 49.9 | 2.5 | -36.2 | 0.81 | -332.6 | 260.2 | -6.7 |
| Primary | 2.0 | 0.91 | -35.0 | 39.1 | 0.4 | -4.5 | 0.82 | -41.8 | 32.9 | -0.8 |
| Secondary + | 1.7 | 0.71 | -7.5 | 11.0 | 0.3 | 6.8 | 0.81 | -49.0 | 62.6 | 1.3 |
| Urban | 42.4 | 0.00 | 16.2 | 68.5 | 7.9 | -9.4 | 0.82 | -89.4 | 70.6 | -1.8 |
| Community literacy* | 93.8 | 0.12 | -25.5 | 2130 | 17.5 | -13.0 | 0.79 | -107.9 | 82.0 | -2.4 |
| Constant | NA | NA | NA | NA | NA | 101.7 | 0.81 | -729.4 | 932.8 | 19.0 |
| Component | 516.0 | 0.000 | 378.3 | 653.6 | 96.2 | 20.6 | 0.826 | -162.4 | 203.6 | 3.8 |
| Raw Difference | 536.5 | 0.000 | 422.7 | 650.4 | 100. | | | | | |
| Number of observations | | 3,996 | | | | | | | | |

*Source*: Calculated from 2000 and 2011 Ethiopia Demographic and Health Survey data.
*Notes:* NA = Not Applicable CI = Confidence Interval * Community literacy refers to the proportion of women of reproductive age with at least a primary level of education within a cluster/community

## DISCUSSION

The recent fertility declined in the region necessitates an understanding of the causes of the change since this can provide relevant information for framing population and reproductive health program and policy. The analysis revealed that over the last decade the majority (96%) of the change in fertility was attributable to changes in characteristics and endowment. The demographic changes have the greatest contribution (contributing to 84% to the total change), and they were the increase in women's age at first marriage and postponement of births to later ages, improvement in child survival and increase in the proportion of women who wanted to limit birth.

The improvement of age at first marriage alone contributed to a 42% reduction of the average number of children ever born in the region during the last decade. Age at first marriage; female education; awareness for having small and prosperous family; and contraception are the four essential preconditions for deliberate family limitation in sub-Saharan Africa (United Nations Economic Commission for Africa, 2002). In societies where marriage happens at an early age, the beginning of childbirth is early and the period during which women bear children is relatively long, resulting in higher fertility than in those societies where the age at marriage is late (Bongaarts & Potter, 1983).A number of studies have also linked fertility decline to a rise in age at first marriage (Blacker, 2002; Ekisa & Hinde, 2005; Vavrus, 2000; Woldemicael, 2008).

Demographic changes related to women's experience of the death of children emerged amongst the drivers of the recent fertility decline in Amhara region. This finding conforms to the previous studies that documented a vicious cycle of poor child survival, low practice of fertility regulation and high fertility (Bertrand, 2003; Gyimah, 2002; United Nations, 2012). Our finding corroborates with the replacement effect theory, which refers to couples' deliberate attempts to replace any child who dies at an early age in order to attain a desired number of surviving off-springs at the end of their reproductive life (United Nations, 2012; Easterlin, 1985). The African fertility decline has begun in Kenya, Botswana, and Zimbabwe due to the reduction in infant mortality rates to a level below 70 per 1,000 live births (Caldwell et al., 1992). Blacker (2002) observed that better development indicators such as under-five mortality experience had a strong link with a substantial fertility decline.

About 29% of the overall changes in fertility were attributable to changes related to socioeconomic condition. Our results shed light on the role of urbanization for the recent fertility decline in the region. The rate of urbanization in the region has increased from 9% in 1994 to 17% in 2016 (Central Statistical Agency [Ethiopia], 1999, 2013). The behavioural and lifestyle changes that accompany urbanization are believed to be responsible for increased desire for small family and adoption of contraception (Adhikari, 2010; Bertrand, 2003). There have been marked declines in urban fertility since 2000, but the rural-urban fertility gap has widened to nearly 2 children. The national urban total fertility rate has declined from 3.4 in 2000 to

approximately 2.6 in 2011 with the rate of 0.2 child/year/mother (Central Statistical Agency [Ethiopia] & ORC Macro, 2001; Central Statistical Agency [Ethiopia] & ICF International, 2012). Thus, despite the decline of fertility in the region during the last decade, the total fertility rate values in urban areas of the region has been declining approximately in threefold faster rate than that of the national urban average. This continuing urban fertility transition has not yet carried over to rural areas where 85% of the population still lives. Here rural total fertility rate, which had declined from 8.2 children per woman in 2000 to 4.3 children per woman in 2011 (Central Statistical Agency [Ethiopia] & ORC Macro, 2001; Central Statistical Agency [Ethiopia] & ICF International, 2012). Other researches also argued that urbanization emerged as one of the dominant explanations for the observed fertility declines (Watkins, 2000; Ekisa & Hinde, 2005; Woldemicael, 2008; Mutuku, 2013).

## CONCLUSIONS

It is evident that Ethiopia has been experiencing a decline in fertility during the last decade. Although this decline was not equally shared in all the regions of the country, the Amhara National Regional State has shown a marked decline. The fertility rate of the region is one of the lowest compared to the other regions of the country. The major drivers of fertility decline during the last decade were the shift observed in age at first marriage, the improvement in child survival and increased urbanization. The impact of education in reducing fertility is only indirect and has not shown an impact on fertility transition.

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