

Proximate Determinants of Fertility in Amhara Region, Ethiopia: An application of the Bongaarts Model*

Background

High fertility in Ethiopia is commonly attributed to low levels of socioeconomic development and cultural norms that encourage the desire for many children and limit the ability of couples to effectively control the timing and number of births. Socioeconomic and cultural factors affect fertility indirectly through biological and behavioral mechanisms called the proximate determinants of fertility. Bongaarts (1978) developed a simple mathematical model to quantify the effects of the proximate determinants on fertility. Using this model, Bongaarts and Potter (1983) found that 96 percent of the cross-county variation in fertility could be explained by variation in the level of four proximate determinants: marriage, contraceptive use, postpartum infecundability, and abortion. In this paper, the Bongaarts model is applied to the 2000 Ethiopia Demographic and Health Survey (EDHS) to estimate the absolute and relative effects of marriage patterns, contraceptive use, and postpartum infecundity on the level of fertility in the Amhara Region.

Data and Analysis

The EDHS is the most current, nationally representative, demographic survey carried out in Ethiopia. The survey collected detailed information on background characteristics and fertility related behaviors, including age at marriage and current marital status, number and timing of births, use of contraception, length of

postpartum abstinence, and breastfeeding practices, from women age 15-49.

The Bongaarts model summarizes the effect of each of the proximate determinants of fertility using individual indices that range from 0 to 1, with 0 indicating the greatest possible inhibiting effect on fertility and 1 indicating no inhibiting effect. The index measuring the effect of marriage patterns on fertility is denoted by C_m . It takes the value of 1 when all women of reproductive age are in a union and 0 when no women are in unions. The index of contraception is represented by C_c and equals 1 if no contraception is used and 0 if all fecund women use modern methods that are 100 percent effective. C_i measures the effect of postpartum infecundability, a value of 1 indicates no women are experiencing postpartum infecundability and 0 means all women are experiencing postpartum infecundability. The index of abortion is denoted by C_a and equals 1 in the absence of induced abortion and 0 if all pregnancies are aborted. A fifth proximate determinant, sterility, is frequently used in analyses of fertility in Sub-Saharan African populations where sterility is common. The index of primary sterility is represented by C_p and equals 1 when primary sterility is absent among all women, and 0 if all women of reproductive age are sterile.

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An estimate of the observed total fertility rate (TFR) is produced by multiplying the indices together with the total fertility rate (TF) that one would expect in the absence of the inhibiting effects of the proximate determinants.

$$TFR=TF \times C_m \times C_c \times C_i \times C_a \times C_p$$

When all indices equal one, fertility is at its biological maximum and the predicted TFR equals TF. Based on studies of historical populations with the highest recorded fertility, Bongaarts recommends using 15.3 as an estimate of TF, or the maximum number of births (Bongaarts 1978, 1982). The predicted TFR based on the Bongaarts model will typically differ from the TFR generated from survey or census data because of the underreporting of births, the underreporting of any of the behaviors measured by the indices, or the omission of proximate determinants that are influential in determining fertility levels in the population under study. Due to the questionable reliability of reports on abortions in Ethiopia this report does not estimate an index of abortion (*Ca*).

Marriage Patterns

In populations where most births occur within unions, mean age at first union and the proportion of women in unions are important determinants of aggregate fertility levels. This section provides basic descriptive information on marriage patterns in the Amhara Region. Table 1 presents the distribution of marital status and mean age at first marriage by five-year age groups. Marriage patterns in the Amhara region are characterized by four basic features: (1) near universal marriage by age 25; (2) very early marriage (the mean age of first marriage is 13.7); (3) high levels of marital disruption due to divorce or widowhood (around 20 percent of women are formerly married); and (4) significantly lower mean age at marriage and greater proportions married at any age in rural areas compared to urban areas.

Table 1. Women’s Current Marital Status and Median Age at First Marriage by Age and Place of Residence, Amhara Region, Ethiopia, 2000.

Background Characteristics	Never Married	Currently Married	Formerly Married	Mean Age at First Marriage*
Age Group				
15-19	43.5%	35.8%	20.7%	--
20-24	11.3	68.9	19.8	14.0
25-29	3.2	81.4	15.4	14.0
30-34	1.6	77.7	20.7	14.0
35-39	1.2	80.4	18.5	14.0
40-44	0.0	76.6	23.4	14.0
45-49	0.0	76.5	23.5	14.0
Place of Residence				
Urban	32.5	38.5	29.0	15.0*
Rural	9.6	71.8	18.6	14.0*
All Women	12.4	67.7	19.9	14.0*

* Women age 20-49.

Contraception

Contraceptive use in Ethiopia is exceptionally low, even by Sub-Saharan African standards. In 2000 only eight percent of women in unions in Ethiopia were currently using contraceptives (CSA, 2001). Contraceptive use in the Amhara region is consistent with the low national levels. Only six percent of women of reproductive age in the Amhara Region currently use contraception and only 7.5 percent of married women are currently using contraception. Most women who use contraception are using a modern method: less than one percent of women are using a traditional method. Rural-urban differences in contraceptive use are striking. Over one-third (36.5 percent) of currently married women in urban areas of the Amhara region are currently using a contraceptive, compared to only five percent of married women in rural areas.

Table 2. Current Use of Contraception by Method Type and Marital Status, Amhara Region, Ethiopia, 2000.

Background	All Women			Currently in Union		
	Modern	Traditional	Any method	Modern	Traditional	Any method
Age Group						
15-19	3.1%	0.0%	3.1%	4.7%	0.0%	4.7%
20-24	3.7	0.6	4.3	3.6	0.9	4.5
25-29	9.8	0.3	10.5	10.6	0.4	11.3
30-34	6.5	0.0	6.5	7.7	0.0	7.7
35-39	6.9	1.4	8.7	7.7	1.7	9.9
40-44	5.7	1.1	6.9	7.4	1.5	8.9
45-49	2.6	0.0	2.6	2.8	0.0	2.8
Place of Residence						
Urban	14.4	2.6	17.4	28.7	6.7	36.5
Rural	4.2	0.1	4.4	5.0	0.2	5.3
All women	5.4	0.4	6.0	6.6	0.7	7.5

Postpartum Amenorrhea

Postpartum amenorrhea is the temporary disappearance of menstruation that a woman experiences in the period immediately following childbirth. Studies have established a direct relationship between the length and intensity of breastfeeding and the duration of postpartum amenorrhea (Bongaarts and Potter, 1983). Postpartum abstinence refers to the period of voluntary sexual abstinence that follows childbirth. The length of postpartum abstinence is strongly influenced by cultural norms and prescriptions that vary across ethnic and religious groups regarding the appropriate waiting period before resuming sexual relations. Postpartum infecundability due to postpartum amenorrhea and postpartum abstinence lengthens the time until a next birth and thereby reduces the number of births that a woman eventually has.

Table 3 presents the mean duration of breastfeeding, postpartum amenorrhea and postpartum abstinence by age and place of residence. Women in the Amhara Region on average breastfeed their babies for close to two years (23.9 months). In contrast to marriage patterns and contraceptive use, rural-urban differences in breastfeeding are relatively small (a mean of 24.2 months in rural areas compared to 21.8 months in urban areas). Age differences in breastfeeding durations are, however, quite significant with women in the youngest age groups (15-19 and 20-24) having mean durations of breastfeeding from 3 to 12 months less than women in their late twenties and thirties.

Consistent with the age pattern of breastfeeding, the mean duration of postpartum amenorrhea is shortest at the youngest ages and progressively increases with age. For example, women age 15-19 on average do not resume menstruation until slightly more than 12 months after a birth compared to close to 17 months for women in their twenties, and 27 months for women in their early thirties. Shorter periods of breastfeeding and postpartum amenorrhea among younger women translate into higher fertility if contraception is not practiced.

Postpartum abstinence is on average relatively short in the Amhara Region. The overall mean for all women is only 2.3 months. Given the significantly longer period of postpartum amenorrhea, postpartum abstinence is not a significant factor in determining fertility levels in the Amhara region.

Table 3 Mean Duration of Breastfeeding, Postpartum Amenorrhoea and Abstinence, Amhara Region, Ethiopia 2000.

	Breastfeeding	Postpartum Amenorrhea	Postpartum Abstinence
Age Group			
15-19	15.14	12.21	1.71
20-24	20.40	16.93	2.50
25-29	22.89	16.77	1.93
30-34	27.55	20.57	2.11
35-39	23.06	19.35	2.69
40-44	25.90	21.45	2.24
45-49	32.83	20.85	4.53
Place of Residence			
Urban	21.76	12.41	2.27
Rural	24.20	18.96	2.33
All Women	23.87	18.28	2.32

Estimation of the Indices

Indices for marriage, contraception, postpartum infecundability, and sterility are produced in this section. These indices provide an empirical basis for assessing the relative contribution of the different proximate determinants to lowering fertility.

In the Amhara Region the index of marriage (*Cm*) equals 0.81, which means delayed marriage and non-marriage reduce fertility by 19 percent below what it would otherwise be if marriage were universal among all women age 15-49. In urban areas of the Amhara Region the index is even lower at 0.68 compared to 0.92 in rural areas. Clearly later age at marriage is an important factor in explaining the lower fertility of women living in urban areas.

With respect to contraceptive use, the index of contraception (*Ca*) is close to 1 in the Amhara Region (0.94) indicating that contraceptive use plays a minimal role in bringing fertility below its biological maximum. However, in urban areas where contraceptive use is more common, the index is lower (0.87), and thus reduces fertility more than in rural areas where the index is 0.96.

Postpartum infecundability plays the biggest role of the three principal proximate determinants in reducing fertility in the Amhara Region. The index of postpartum infecundability (C_i) is 0.54 for the region as a whole, but 0.65 in urban areas. The higher value in urban areas, which translates into a smaller impact on fertility, is due to the shorter average length of breastfeeding in urban areas. Given the relatively short duration of postpartum abstinence in the Amhara Region, prolonged breastfeeding is the single most important factor in reducing fertility below its biological maximum in the region.

The index of primary sterility (C_p) is 1.0 in urban and rural areas, which indicates that primary sterility is not a common enough occurrence in the Amhara region to lower aggregate fertility levels.

The predicted TFR for the rural population is relatively close to the TFR estimated from information on births in the last five years. This result suggests that the proximate determinants included in the model are the principal mechanisms by which fertility is reduced below its biological maximum. However, the predicted TFR for the urban population is substantially above the observed TFR (5.55 compared to 3.25). This large difference between the model estimate and the observed value is consistent with the omission of an important proximate determinant from the model. The absence of abortion from the model, as well as underreporting of contraceptive use, are potential sources of the overestimate of fertility.

Table 4 Indexes for Proximate Determinants of Fertility, Amhara Region, Ethiopia, 2000

Index/Measure	Region Total	Urban	Rural
C_m	0.81	0.68	0.92
C_c	0.94	0.87	0.96
C_i	0.50	0.59	0.50
C_p	1.04	1.04	1.04
Predicted TFR ¹	6.06	5.55	7.03
Observed TFR ²	5.94	3.25	6.33

¹ Predicted by Bongaarts' formula.

² Estimated using births in the last five year (Background Report, Issue 3, 2002).

Summaries and Conclusions

This paper assesses the magnitude and relative importance of the three major proximate determinants of fertility in reducing fertility in the Amhara Region in Ethiopia. The findings show that the fertility inhibiting effect of postpartum infecundity is by far the most significant proximate determinant. Delayed marriage and contraceptive use are important in reducing fertility in urban areas. By contrast, early marriage and extremely low levels of contraceptive use keep fertility at high levels in rural areas. Although induced abortion is believed to be one of the major proximate determinants of fertility, especially in urban areas, the current data do not permit an estimate of its impact on fertility.

Because prolonged breastfeeding extends the period of postpartum infecundability, the promotion of breast feeding should continue to receive the attention of the government not only because of its fertility inhibiting effects but also its nutritional benefits for child health. Policies that promote delayed marriage and even a moderate rise in contraceptive use in rural areas will have a noticeable impact of reducing fertility levels given current marriage patterns and the very low levels of contraceptive use.

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The *Partnership in Improving Reproductive Health Background Reports* present findings from work in progress on the dimensions and determinants of fertility and reproductive health in Ethiopia. This work is being conducted by faculty and advanced graduate students at the following institutions:

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