

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

Background

Davis and Blake (1956) first introduced the term intermediate variables of fertility to describe the biological and behavioral mechanisms through which social, economic and cultural conditions can affect fertility. Bongaarts (1978) later developed a model that provides estimates of the relative effects of the intermediate variables on fertility. Bongaarts and Potter (1983) identified four key variables, or proximate determinants, that account for most cross-country variation in fertility levels: they are marriage, contraceptive use, induced abortion, and postpartum infecundability. In this paper, the Bongaarts model is applied to data from the 2000 Ethiopia Demographic Health Survey (EDHS) to estimate the relative contribution of the different proximate determinants in bringing fertility below its biological maximum in the Oromia Region of Ethiopia.

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.

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 Oromia Region. Table 1 presents the distribution of marital status and mean age at first marriage by five-year age groups. By international standards the median age at marriage of 16 in Oromia is relatively young. However, compared to Ethiopia as whole, women in Oromia tend to marry at slightly older ages - the median age at first marriage for all of Ethiopia is 16.4. Marriage is also nearly universal among women in Oromia with only one percent or less of women age 30 and above never married. Formerly married women also constitute a relatively small proportion of women in the reproductive ages. Nine percent of women age 15-49 in Oromia are divorced, separated, or widowed. Early marriage and relatively few women living outside of a union, especially in the peak fertility ages of 20-29 places many women at a high risk of pregnancy which translates into high fertility rates in the absence of widespread contraceptive use. The rural-urban difference in the median age at marriage in Oromia is relatively modest, although a greater proportion of women in urban areas are living outside of unions compared to rural areas.

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

Background Characteristics	Never Married	Currently Married	Formerly Married	Median Age at First Marriage
Age Group				
15-19	76.6 %	20.9 %	2.4 %	--
20-24	27.4	66.0	6.6	17.0
25-29	8.2	81.8	10.0	17.0
30-34	1.1	89.8	9.1	15.0
35-39	0.7	88.0	11.4	16.0
40-44	0.6	80.0	19.5	15.0
45-49	0.0	78.3	21.7	16.0
Place of Residence				
Urban	41.8	44.0	14.2	17.0*
Rural	25.0	67.0	8.0	16.0*
All Women	27.5	63.5	8.9	16.0*

*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 Oromia region is below the already exceptionally low national level. Less than five percent of all women age 15-49 in Oromiya are currently using a contraceptive method, and only 6.6 percent of currently married women are using contraception. Among women who practice birth control, use of modern methods is twice as common as use of traditional methods. Rural-urban differences in contraceptive use are striking. Close to one-third (31.6 percent) of currently married women in urban areas of the Oromia Region currently use contraception, compared to 3.5 percent of married women in rural areas.

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

Background	All Women			Currently in Union		
	Modern	Traditional	Any method	Modern	Traditional	Any method
Age Group						
15-19	0.3	0.3	0.6	1.5	1.5	3.0
20-24	2.8	2.2	5.0	3.6	3.0	6.6
25-29	4.9	1.8	6.8	5.4	2.2	7.6
30-34	6.6	1.3	7.9	7.1	1.4	8.5
35-39	5.0	3.3	8.3	5.7	3.8	9.5
40-44	2.5	0.4	2.9	3.1	0.5	3.6
45-49	0.5	2.8	3.3	0.6	3.6	1.2
Place of Residence						
Urban	11.7	4.5	16.2	23.3	9.4	31.6
Rural	1.3	1.0	2.3	2.0	1.5	3.5
All women	3.0	1.5	4.5	4.3	2.3	6.6

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 Oromia Region on average breastfeed their babies for close to 20 months. In contrast to contraceptive practices, which differ greatly between rural and urban areas, women in rural and urban areas on average breastfeed their babies for similar durations (18.8 months in urban areas compared to 20 months in urban areas). Age differences in breastfeeding durations are, however, quite significant and follow a clear pattern with younger women breastfeeding for shorter durations than older women. For example, the mean duration of breastfeeding for women age 20-24 is 17.2 months compared to 21.6 months for women age 40-44.

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 wait 8.5 months for their first menses after a childbirth compared to 13.1 months for women age 30-34, and 14.6 months for women age 40-44. Shorter periods of breastfeeding and postpartum amenorrhea at younger ages translates into higher fertility if contraception is not practiced.

Postpartum abstinence is on average relatively short in the Oromia Region. The overall mean for all women is only 2.9 months. Given the significantly longer period of postpartum amenorrhea, postpartum abstinence is not a significant factor in determining fertility levels in the Oromia region.

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

	Breastfeeding	Postpartum Amenorrhea	Postpartum Abstinence
Age Group			
15-19	14.4	8.5	2.4
20-24	17.2	9.5	2.6
25-29	18.5	12.2	2.6
30-34	19.7	13.1	3.3
35-39	22.8	14.4	3.5
40-44	21.6	14.6	2.7
45-49	24.9	16.5	4.2
Place of Residence			
Urban	18.8	9.7	3.9
Rural	20.0	12.8	2.8
All Women	19.8	12.4	2.9

Estimation of the Indices

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

In the Oromia Region the index of marriage (C_m) equals 0.71, which means delayed marriage and non-marriage reduce fertility by 29 percent below what it would otherwise be if marriage was universal among all women age 15-49. In urban areas the index is even lower at 0.53 compared to 0.75 in rural areas.

Contraceptive use in Oromia reduces fertility by 12 percent below its biological maximum. The index of contraception (C_a) is 0.88 for the region as a whole, and is 0.72 in urban areas compared to 0.98 in rural areas.

Postpartum infecundability plays the biggest role of the three principal proximate determinants in reducing fertility in the Oromia Region. The index of postpartum infecundability (C_i) is 0.57 for the region as a whole, but 0.69 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 Oromia 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 approximately 1 in urban and rural areas indicating that primary sterility is not a common enough occurrence in the Oromiya Region to significantly 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 (6.5 compared to 6.7). 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 (4.2 compared to 3.0). 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, Oromiya Region, Ethiopia, 2000

Index/Measure	Region Total	Urban	Rural
C_m	0.71	0.53	0.75
C_c	0.88	0.72	0.98
C_i	0.57	0.69	0.56
C_p	1.04	1.04	1.04
Predicted TFR ¹	5.7	4.2	6.5
Observed TFR ²	6.3	3.0	6.7

¹ Predicted by Bongaarts' formula.

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

Summaries and Conclusions

Non-marriage (due either to delayed marriage or the exit from marriage) and prolonged breastfeeding are the two most important factors that keep fertility below its biological maximum in the Oromiya Region, especially in rural areas. In urban areas, delayed marriage plays an even more important role in keeping fertility down, and contraceptive use approaches breastfeeding in terms of the magnitude of its inhibiting effects on fertility.

References

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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:

POPULATION STUDIES AND TRAINING CENTER • BROWN UNIVERSITY • USA
Box 1836 • Providence, RI 02912 • USA

DEMOGRAPHIC TRAINING & RESEARCH CENTER • ADDIS ABABA UNIVERSITY
Addis Ababa, Ethiopia

DEPARTMENT OF POPULATION AND FAMILY HEALTH • JIMMA UNIVERSITY
Jimma, Ethiopia

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