The Role of Conflict in the Rapid Fertility Decline in Eritrea and Prospects for the Future

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The large fertility decline observed in Eritrea between the mid-1990s and the early part of the new century is examined using data from two detailed national household surveys. Little evidence is found that this decrease in fertility signals the beginning of a sustained decline. Rather, the results indicate that one of the outcomes of the military mobilization and displacement associated with the 1998–2000 border conflict with Ethiopia was a steep reduction in the proportion of women exposed to the risk of pregnancy. Part of this reduction was due to delayed age at marriage, but it came about largely because married women were less likely to be living with their husbands in 2002 than in 1995. Projections of the number of births that could occur if women implement their stated reproductive intentions and a postwar "baby boom" results show that the health system may be facing an increased demand for child health services over the next several years. (Studies in Family Planning 2004; 35[4]: 236–245).

After Eritrea's 30-year war with Ethiopia ended in 1991, followed by its independence in 1993, much of the country's infrastructure was destroyed, its economy was struggling, and it faced numerous health and social development challenges. During the seven-year period from the end of the liberation war until May 1998, the government of Eritrea's efforts concentrated on rebuilding its infrastructure and formulating national economic and social policies that focused on increasing human capital and reducing poverty (NSEO and ORC Macro 2003). Fueled by foreign aid and remittances from abroad, the economy grew rapidly for a short period (Arneberg 1999).

In May 1998, however, a border conflict with Ethiopia led to renewed fighting and casualties, further destruction of infrastructure, large-scale military mobilization, and the displacement of as many as a million people, including 60–70,000 people of Eritrean origin who were expelled from Ethiopia. Among the effects of this recent conflict were housing shortages in some areas and severe disruption of the economy (Arneberg and Pedersen 1999). Agricultural output and revenue derived from port activity were severely reduced, as was trade with Ethiopia, previously a major trading partner. Labor markets suffered temporarily from a lack of manpower resulting from the mobilization of a substantial proportion of Eritrea's young adult population (Arneberg and Pedersen 1999).

Eritrea and Ethiopia signed a peace accord in late 2000, and a United Nations peacekeeping force subsequently was deployed. Although the country has experienced relative peace since that time, it has suffered for the last few years from a severe drought resulting in widespread crop failures, significant decline in rural income, higher food prices, and a precarious nutrition situation in some areas (NSEO and ORC Macro 2003; United Nations Subcommittee on Nutrition 2003). Eritrea remains one of the world's poorest countries with an estimated gross domestic product per capita in 2001 of US$164, compared with $1,270 for all developing countries and $475 for sub-Saharan Africa (UNDP 2003).

According to the results of the 2002 Demographic and Health Survey (DHS), the total fertility rate (TFR) in Eritrea stood at 4.8 births per woman of reproductive age for the three-year period prior to the survey. This rate represents a rapid decline of 1.3 births since 1995, a period of roughly seven years since the previous DHS was conducted. Unlike the decline in many countries in sub-Saharan Africa, however, Eritrea's decrease in fertility cannot be attributed to an increase in contraceptive use. The contraceptive prevalence rate (CPR) among currently married women remained constant at 8 percent. The present analysis is motivated by the search for an explanation of this fertility decline.

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The 1995 and 2002 Demographic and Health Surveys are used here to examine the proximate determinants of the fertility decline in Eritrea. The results of the analysis provide quantitative estimates of the contribution of changes in contraceptive use, marriage, sexual activity, breastfeeding, and postpartum abstinence to the observed decline. Only limited information on the remaining proximate determinant—induced abortion—is available from the surveys. An important question is whether the observed decline in fertility indicates the beginning of a long-term fertility transition or is a temporary result of events occurring during the period between the two surveys. In particular, the possible effect on fertility of military mobilization, fighting, and consequent population displacement between 1998 and 2002 is examined.

In the second part of the analysis, the results of the proximate-determinants analysis are used to look at scenarios in which the values of the primary factor influencing fertility shift and to project potential numbers of future births according to different scenarios. The potential for a "baby boom" that may occur as a result of military demobilization and a return to relative stability is examined. The projections of the potential increase in births could prove useful for planning purposes in the health sector and in other policy areas.

Background

The total population of Eritrea is not known precisely because the country has not conducted a national census since independence. The most accurate available estimate is derived from a count conducted by the Ministry of Local Government in 2001 that put the country's total population at 3.2 million. Eritrea's history is reflected in its basic demographic characteristics. The age distribution of the household population in 2002 demonstrates a dearth of men aged 20–59. The household population is also characterized by a high dependency ratio and a high proportion of female-headed households (NSEO and ORC Macro 2003).

In spite of Eritrea's many setbacks, results from the 2002 DHS indicate improvements in some indicators of the health situation of Eritrean women and children since the mid-1990s. Substantial increases in antenatal care and vaccination coverage were recorded along with smaller advances in skilled attendance at delivery and the nutritional status of young children. For example, the proportion of children aged 12–23 months who received all vaccinations by their first birthday was 30 percent in 1995, compared with 76 percent in 2002. Both infant and under-five mortality rates declined considerably. The under-five mortality rate fell from 136 deaths per 1,000 births in the mid-1990s to 93 deaths in the five-year period prior to the 2002 DHS (NSEO and ORC Macro 2003).

Although the total fertility rate declined during the period between the two DHS, the fertility preferences of Eritrean women did not exhibit similar change. Mean ideal family size among married women was 6.6 children in 1995 and 6.3 children in 2002. More importantly for purposes of this analysis, the proportion of married women who want no more children remained virtually constant, and the proportion who want another child "soon" (that is, within the next two years) increased from 21 percent to 33 percent. Combined with the stability of the contraceptive prevalence rate, the trends in fertility preferences suggest that the observed decline in fertility has not been driven primarily by a desire among couples to limit their fertility but by other unrelated factors, and that a near-term rise in fertility is possible.

Data

The 1995 and 2002 Eritrea Demographic and Health Surveys are nationally representative surveys of households and of women of reproductive age (15–49 years). Because no national census has ever been conducted, the sampling frames for the surveys were constructed based on other information. For the 1995 survey, the sampling frame for rural areas consisted of a list of villages with population counts collected by the Ministry of Local Government; for urban areas, a combination of local administrative information and voter-registration records was used. For the 2002 survey, the sampling frame was based on a list of towns and villages for which population information had been compiled by the Ministry of Local Government. In both surveys, all households in selected sampling units were listed prior to the start of fieldwork, and households were selected from the listings. Within each selected household, some information was collected on the characteristics of the household, and all women of reproductive age were eligible for individual interviews. Interviews were conducted with 5,054 women aged 15–49 in 1995 and with 8,754 women in 2002. The response rate for eligible women exceeded 96 percent in both surveys.

Information from the Health Management Information System (HMIS) is also used in the analysis. This system covers all of the approximately 200 health facilities operated by the Ministry of Health as well as additional industry facilities, private clinics, and religious and other nongovernmental facilities for a total of approximately 320 facilities. The system incorporates information from routine monthly reports of health-facility activity.

Results

Prior research has shown that a strong correlation exists between the TFR and the CPR at the country level, although the correlation has been weaker in sub-Saharan Africa than in other developing regions (see Figure 1) (Blanc and Poukouta 1997; Westoff and Bankole 2001). The solid line shown in Figure 1 is a linear regression line based on data from approximately 100 observations from developing countries ($R^2 = 0.88$). It demonstrates that an increase of 15 percentage points in the CPR is generally associated with a one-child decline in the TFR. The dashed line is based on data from 30 sub-Saharan African countries and implies that an increase of 15 percentage points in contraceptive prevalence is associated with a decline of about 0.5 child in the TFR. The small squares represent data from selected other African countries. The TFR for Eritrea in 1995 is roughly at the level that would be expected for a sub-Saharan African country. For 2002, however, the TFR is below what would be expected by a substantial amount—about 1.6 children.

As noted above, the total fertility rate based on data from the three years prior to the 2002 DHS is 4.8 children per woman (95 percent confidence interval [CI]: 4.5–5.0), and the comparable figure for the three years prior to the 1995 survey is 6.1 (CI: 5.7–6.5). Because circumstances in Eritrea have varied widely from year to year, however, rates averaged over several years may disguise wide swings in period rates. The complete birth history collected for the DHS is used to construct Figure 2, which shows total fertility rates for 12-month periods prior to the 1995 and 2002 surveys. Approximate calendar dates for these rates are shown on the x-axis.[1] The standard errors of these rates are higher than those for rates covering longer periods, so fluctuations should be viewed with caution. Nevertheless, a substantial and rapid decline in fertility clearly occurred between 1997–98 and 2000–01, a decline that may have been accelerated by severe malnutrition due to drought in some areas. Apparently, a turn upward occurred in the year prior to the survey. Although this upturn may be a result of age or date misreporting, it may also signal the beginning of a postwar increase in fertility after the peace accord was reached in late 2000.

Figure 1 Total fertility rate and contraceptive prevalence rate, Eritrea, all developing countries, and sub-Saharan and other African countries

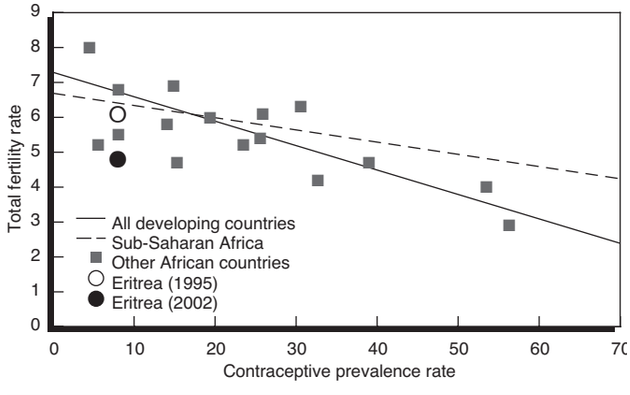
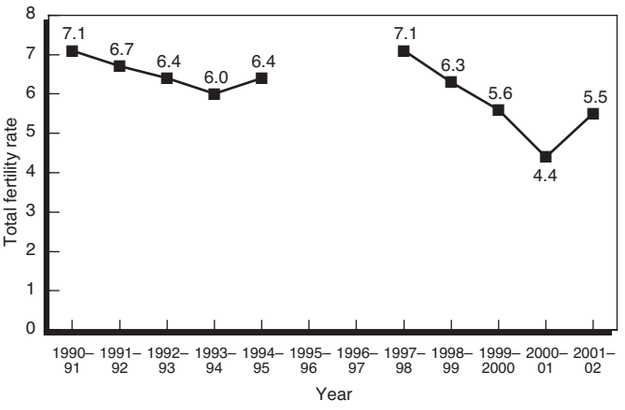


Figure 2 Total fertility rate for single years prior to the 1995 and 2002 Eritrea Demographic and Health Surveys



Contraceptive Use

Total contraceptive prevalence among married women in Eritrea was 8 percent in both 1995 and 2002. In 1995, about half of contraceptive users were using a modern method. This proportion increased slightly to about 60 percent of users by 2002. In 1995, the pill accounted for the largest share of modern contraceptive use; injectables were the most commonly used modern method in 2002 (as shown in Table 1). During the 1995–2002 period, the use of injectables increased from 0.8 percent to 2.6 percent, whereas use of the pill declined from 2.0 percent to 1.4 percent.

Marriage and Exposure to the Risk of Pregnancy

The proportion of women ever married by age is shown in Table 2. In the first three age groups, encompassing ages 15–29, the proportion ever married decreased in the period between the two surveys. This pattern indicates that first marriages are taking place at later ages. The median age at marriage among women aged 25–49 increased between the two surveys from 16.7 to 18.2 years (not shown).

Table 1 Percentage of currently married women aged 15–49 currently using a contraceptive method, by survey year, according to method, Eritrea

Survey year	Method											
	Female sterilization	Pill	IUD	Injectable	Condom	Foam/ jelly	LAM	Periodic abstinence	With-drawal	Any method	Not using a method	(N)
1995	0.3	2.0	0.6	0.8	0.3	0.0	3.0	0.8	0.2	8.0	92.0	(3,371)
2002	0.2	1.4	0.4	2.6	0.6	0.0	2.1	0.7	0.1	8.0	92.0	(5,733)

LAM = Lactational amenorrhea.
Source: DHS final reports.

More significant changes are evident in the proportion of women residing with their husbands at the time of the survey. This proportion declined in all age groups, with particularly large declines in the younger age groups. For example, approximately three in ten married women aged 15–19 were living with their husbands in 2002, compared with six in ten in 1995.[2] Similarly, the proportion of women coresiding with their husbands in 2002 is 0.57 and 0.62 percent times its 1995 value for age groups 20–24 and 25–29, respectively. These shifts are most likely a reflection of the national mobilization that occurred as a result of the 1998–2001 border conflict. For approximately 55 percent of the husbands (aged 18–40) of women surveyed in the 2002 DHS, occupation was reported as military,[3] compared with 9 percent in 1995, and, of these, the vast majority were not living with their spouses. The results of a 2001 national survey of women aged 17–50 also showed a low level of coresidence of spouses due to mobilization; 48 percent of married women in the survey said that their husbands were away serving in the military (Target Research 2001). Labor migration and the displacement of individuals as a result of the conflict likely have contributed also to the increase in the proportion of married couples living apart.

Some ambiguity may be seen in how the question on coresidence was answered by women surveyed for the DHS. Married women were simply asked if their husband was "living with you now or staying elsewhere." How women whose husbands are away temporarily or who live elsewhere but come home for visits may have answered this question is not clear. The question likely would have been answered in the same way in 1995 as in 2002, however, so the change in the number of married couples living together is probably reasonably accurate.

The observed changes in coresidence of spouses are reflected in the proportions of married women who report having had sex in the four weeks prior to the survey. Overall, this proportion in 2002 is 56 percent, that is, 80 percent of its value in 1995, with larger changes being observed in the younger age groups. This shift indicates a clear reduction in married women's exposure to the risk of becoming pregnant.

Postpartum Insusceptibility

In addition to marriage and sex within marriage, women's exposure to the risk of conception is influenced by postpartum behavior. Postpartum amenorrhea—which is largely determined by the duration and intensity of breastfeeding—and postpartum abstinence are the two components of the length of postpartum insusceptibility to becoming pregnant. The overall median duration of insusceptibility declined slightly between 1995 and 2002 from 16.6 to 14.6 months (see Table 3). The duration of postpartum amenorrhea was 14.2 months in 1995 and 13.5 months in 2002. Postpartum abstinence remained about the same at three months. These changes imply that women in Eritrea experienced slightly shorter periods of insusceptibility to pregnancy risk following a birth in 2002 than in 1995.

Table 2 Percentages of ever-married women, married women residing with their husbands, and women who reported having had sex in the four weeks prior to the survey, Eritrea, 1995 and 2002

Age group	Ever married		Residing with husband		Had sex in last four weeks (currently married women)[a]		2002 ÷ 1995		
	1995	2002	1995	2002	1995	2002	Ever married	Residing with husband	Had sex in last four weeks
15–19	37.6	31.0	60.3	30.5	51.2	38.1	0.82	0.51	0.74
20–24	78.1	72.7	74.3	42.1	63.6	42.0	0.93	0.57	0.66
25–29	92.1	88.5	79.0	48.9	67.1	49.8	0.96	0.62	0.74
30–34	95.7	95.4	83.7	60.6	73.5	57.2	1.00	0.72	0.78
35–39	98.2	97.8	88.2	72.4	76.5	63.0	1.00	0.82	0.82
40–44	97.3	99.1	89.2	78.9	75.2	72.2	1.02	0.88	0.96
45–49	98.1	99.1	90.4	88.0	80.1	77.2	1.01	0.97	0.96
Total	80.0	76.7	80.8	58.5	69.5	55.7	0.96	0.72	0.80

[a] Figures exclude missing responses.
Source: DHS reports and special tabulations.

Table 3 Median duration in months of postpartum amenorrhea, abstinence, and insusceptibility, Eritrea

Survey year	Postpartum		
	Amenorrhea	Abstinence	Insusceptibility[a]
1995	14.2	2.7	16.6
2002	13.5	3.0	14.6

[a] Amenorrheic or abstaining.
Source: DHS final reports.

Abortion

In some countries, a substantial proportion of pregnancies are terminated by induced abortion. In order to include the contribution of induced abortion to observed fertility decline in the proximate-determinants model, a total abortion rate (TAR) must be calculated. This rate is equivalent to a total fertility rate but includes only induced abortions (rather than births) in the numerator. Some information about terminated pregnancies was collected in the two DHS conducted in Eritrea. A total induced abortion rate cannot be calculated from either source, but, in the absence of other information, the data are worth examining for any insights they can provide.

In the 1995 DHS, women were asked whether they had had any pregnancy that "ended in a stillbirth, miscarriage, or abortion." Those who said that they had experienced such a pregnancy were then asked separately about the number of stillbirths and the number of miscarriages or abortions. The questions do not permit separating miscarriages from induced abortions, and because the dates of these events were not obtained, calculating a total abortion rate for a specific period is not possible. Nevertheless, 13 percent of women reported ever having experienced a pregnancy termination of any kind (that is, a stillbirth, miscarriage, or abortion), and 10 percent reported having had a miscarriage or abortion. Among women who had ever had a miscarriage or abortion, the average number reported was 1.6.

In the 2002 DHS, women were asked a different set of questions. First, they were asked whether they had ever had a pregnancy that "miscarried, was aborted, or ended in a stillbirth." Those who had had such a pregnancy then reported the date that the last such pregnancy ended and, for those that ended in the five calendar years prior to the survey, how many months the pregnancy had lasted. With these data, separating the three types of termination is not possible.

Approximately 10 percent of respondents in the survey reported ever having experienced a pregnancy termination of any kind, a proportion similar to that reported in 1995. Of these, 18 percent did not report a date or the date was inconsistent with other information in the questionnaire. A proxy for the TAR can be calculated from this information in a number of ways. If only those pregnancies terminated in the three years prior to the survey[4] at a pregnancy duration of less than six months are counted as abortions, the total abortion rate is 0.3 abortions per woman. Pregnancies for which date information is missing are excluded from this calculation. Moreover, some of these pregnancy outcomes were stillbirths, not induced abortions, but the proportion of each kind of termination is unknown. If all were induced abortions, this rate would imply that, at current rates, women would have 0.3 abortions during their reproductive lives, on average. If all pregnancy terminations with missing dates are added to this calculation, the rate increases to 0.4, or approximately one abortion for every 12 live births.

The difficulty of measuring the number of induced abortions accurately and the underreporting of pregnancy terminations are well documented (Rossier 2003). Underreporting is known to be particularly acute in places where induced abortion is illegal or severely restricted, as in Eritrea and in places where the procedure incurs social disapproval. Thus, these survey data undoubtedly yield an underestimate of all pregnancy terminations and most likely an even greater underestimate of the extent of induced abortion in Eritrea, although the magnitude of the bias is unknown.

Other available information offers the impression that induced abortion is commonly practiced in Eritrea. According to the 2002 Ministry of Health annual report based on HMIS data, abortion was the second leading cause of admission to hospitals and health centers among all patients aged five and older. Furthermore, abortion has been the second or third most common cause of admission every year since 1999. In 2002, abortions accounted for more than half of all cases of obstetric emergency and other pregnancy-related risks in Eritrean health facilities (Ministry of Health 2003). A substantial proportion of these are recorded as spontaneous abortions, but knowledgeable persons indicate that perhaps as many as half of them are, in fact, incomplete induced abortions that are initiated outside health facilities.

Determinants of Fertility

The contribution of each of the proximate determinants to observed fertility levels can be summarized by computing indexes from Bongaarts's proximate-determinants model (Bongaarts 1978). This is the standard model for explaining fertility levels and fertility change.[5] The model provides quantitative estimates of the fertility-reducing effects of marriage, contraceptive use, induced abortion, and postpartum infecundability on maximum biological fertility. The model is written as: $TFR = TF \times C_m \times C_c \times C_a \times C_i$, where TFR = total fertility rate; TF = total fecundity rate; C_m = index of marriage; C_c = index of con-

traception; C_a = index of abortion; and C_i = index of infecundability.

The values of the indexes can vary from zero to one. Because the model is multiplicative, the closer the value of an index is to zero, the greater effect it has on reducing fertility from its biological maximum (the total fecundity rate). A comparison of the magnitude of each index provides an estimate of the relative magnitude of each determinant on observed fertility. The total fecundity rate (TF) is set at 15.3.[6] The values of these indexes as calculated from the Eritrea DHS data are shown in Table 4.

The index of marriage measures the effect of nonmarriage on reducing fertility from its biological maximum. It is calculated by taking the ratio of the total fertility rate to the total marital fertility rate (TMFR), a rate that excludes births and exposure to conception (that is, the denominator) prior to first marriage. In other words, the TMFR reflects the number of children that women would have if all women married according to the current age pattern and had children at the rates currently observed among ever-married women. The value of this ratio declines from 0.84 to 0.81 between 1995 and 2002. This decline demonstrates the effect of later age at marriage on fertility reduction.

The index of contraception incorporates both changes in contraceptive prevalence and shifts in the average method effectiveness that result from changes in the variety of methods available. The index is calculated by weighting age-specific, method-specific prevalence rates by the effectiveness of each method. The result is used in an equation developed by Bongaarts that measures the proportionate reduction in marital fertility due to contraceptive use within marriage. Although a slight shift has occurred toward the use of more effective methods in Eritrea, the shift has not been large enough to change the value of the index of contraception.[7] It is 0.92 for both DHS surveys.

The value of the index of postpartum insusceptibility to conception increases slightly from 1995 to 2002, a finding that is consistent with trends in the duration of breastfeeding and abstinence.[8] Although the effect of postpartum insusceptibility has diminished over time, it is still the proximate determinant with the largest effect on the reduction of fertility from the biological maximum.

Table 4 Proximate-determinants model indexes, Eritrea

Indexes	1995	2002
Index of marriage (C_m)	0.84	0.81
Index of exposure(1) (C_e)	na	0.97
Index of exposure(2) (C_e)	0.86	0.78
Index of contraception (C_c)	0.92	0.92
Index of postpartum insusceptibility (C_i)	0.57	0.60
Predicted fertility using C_m	6.7	6.8
Predicted fertility using $C_m + C_{e(1)}$	na	6.6
Predicted fertility using $C_m + C_{e(2)}$	5.8	5.3
Observed fertility (three-year rate)	6.1	4.8

na = Not available.

When the values of TF, C_m, C_c, and C_i are plugged into the proximate-determinants equation, a predicted total fertility rate is obtained. If the predicted total fertility rate is higher than the actual fertility rate, the result suggests either underreporting of one or more of the behaviors measured by the indexes or that the model is missing one or more elements that have an effect on fertility. In the case of Eritrea, the predicted fertility rates of 6.7 children in 1995 and 6.8 in 2002 are substantially higher than the observed rates of 6.1 and 4.8, respectively.

One reason for these disparities is that the abortion index (C_a) has not been included, so the effect of abortion on reducing fertility is not taken into account. The problems with calculating the total induced abortion rate needed for this index have been outlined above. If the proxy TAR of 0.3 for 2002 is used to calculate C_a, the resulting value is 0.98, and the predicted fertility rate would be 6.7 for 2002, still well above the observed rate of 4.8.

Although the effect of induced abortion is, no doubt, underestimated, the primary reason for the large discrepancy between actual and predicted fertility in 2002 is that the index of marriage does not capture the low proportion of married women exposed to the risk of pregnancy because they are not residing with their husbands. In order to account accurately for the fertility-reducing effect of spouses' living separately, a complete coresidence history would be needed for each woman in which her coresidence status is recorded for each month. In the absence of such data, however, two alternative indexes were calculated that provide probable upper and lower limits for this effect.

$C_{e(1)}$, or the index of exposure, is the ratio of the TMFR to a fertility rate that excludes exposure subsequent to the date that a married woman whose husband is currently staying elsewhere last lived with him. This rate is based on a question that was included in the 2002 DHS (but not in the 1995 survey) that asks women who are not currently living with their husbands, "When was the last time that you were living together with your husband/partner?" In effect, the rate measures the number of children that a woman would have if only the time between when she first got married and when she last lived with her husband were considered. Overall, this rate underestimates the effect on fertility of couples' living apart because it does not account for periods when women who are currently living with their spouses lived separately, nor does it account for periods when women who are not currently living with their spouses lived separately. At the same time, the rate also does not account for exposure to pregnancy that may occur when husbands

visit home for short periods of time, a factor that would have the opposite effect on fertility. When this index is included in the proximate-determinants equation for 2002, the equation yields a predicted total fertility rate of 6.6.

$C_{e(2)}$ is the ratio of the TMFR to a fertility rate that excludes births and exposure to conception among women who are not currently residing with their spouses. It represents the hypothetical number of children that women would have if all married women lived with their spouses continuously and had children at the same rate as women who were currently living with their spouses. This index most likely overestimates the effect on fertility of spouses' living separately because it assumes continuous coresidence of married couples, an assumption that, even under "normal" circumstances, is unrealistic. Moreover, coresidence measured at the time of the survey may have been slightly higher than in previous years as a result of the cessation of major hostilities with Ethiopia late in 2000. Nevertheless, the index provides a measure of the potential fertility-reducing effect of married couples' living apart. The value of this index for 1995 is 0.86, and for 2002 it is 0.78. These values generate predicted fertility rates of 5.8 and 5.3 for 1995 and 2002, respectively. The predicted rate is lower than the observed rate in 1995 but still higher than the observed rate in 2002.

Because the index of contraception remained stable and the index of insusceptibility increased between 1995 and 2002, the primary reason for the decline in fertility in Eritrea clearly is a reduction in women's exposure to the risk of conception. This reduction is composed of two parts: The smaller part can be attributed to later age at marriage and the larger part to reduced exposure within marriage.

Current and Predicted Numbers of Births

In order to project the number of births that would occur if the current situation in Eritrea changes, the current number of annual births in the country must be estimated. Because a national census has never been conducted, making such an estimate is difficult. Moreover, the population of Eritrea has moved considerably both internally and internationally in recent years, so that the total population size may have fluctuated significantly over the period discussed here.

Published estimates of the total population of the country in 2000 range from 2.2 million (Ministry of Health 2003) to 3.6 million (UN 2003). The sampling frame used for the 2002 DHS was based on a count compiled by the Ministry of Local Government in 2001. The count yielded a total population of 3.3 million. Although the methodology used by the Ministry to collect the information is not well documented, this estimate appears to be the most reliable available. A projection of the total population forward to 2002 using the annual growth rate of 2.9 percent recommended by the National Statistics and Evaluation Office (NSEO) (Ahmed 2003) yields a population of 3.3 million.

An estimate of the total number of births that occurred nationally in 2002 based on the Ministry of Local Government's total population figure projected to 2002 and on single-year, age-specific fertility rates derived from the 2002 DHS is shown in Table 5. This procedure yields an annual number of births of almost 113,000.[9]

Eligibility for military service in Eritrea begins at age 18. An estimate of the total number of men currently serving in the military is not available from the government of Eritrea. Estimates from various international sources suggest, however, that the size of the armed forces was around 300,000 men and women during the height of the 1998–2000 war. Significant casualties occurred during the war, and perhaps 5,000 were demobilized in a pilot program begun in 2001 (PSI 2004; USDOS 2004). Sixty-five thousand soldiers were slated to be demobilized in a first phase, and this process apparently began with some delays in 2003 (USDOS 2004). Therefore, for purposes of illustration, a projection that estimates the number of additional births that would occur if 65,000 men aged 18–40 are demobilized is shown in Table 6. The first variation of the projection looks at the hypothetical situation in which marital fertility rates return to prewar levels; the second shows the number of additional births if only those women who say they want a child soon have one.

The projections begin with the assumption that the population in 2002 was 3.29 million. The proportion of the population that is male was calculated from the 2002 DHS household schedule at 49.8 percent or 1.64 million men. The de jure population was used for this estimate because it provides a more accurate picture of the sex and age composition of the total population than the de facto population. An exception to the NSEO guidelines about the definition of a "usual" resident was made for this survey. Normally, any resident who has been away

Table 5 Estimate of annual number of births, Eritrea, 2002

Age group	Proportion of females aged 15–49	Age-specific fertility rate	Births
15–19	0.229	0.082	13,197
20–24	0.166	0.200	23,333
25–29	0.176	0.227	28,079
30–34	0.127	0.245	21,868
35–39	0.124	0.185	16,122
40–44	0.095	0.109	7,278
45–49	0.084	0.051	3,011
(N)	(702,808)		(112,888)

Notes: Total population = 3,294,158 (2001 Ministry of Local Government estimate projected forward to 2002). Female population = 50.2 percent = 1,653,667 (based on de jure household population). Female population aged 15–49 = 42.5 percent = 702,808.

from the household for more than six months is not counted as a usual resident; in this survey, however, that requirement was relaxed so that household members who were mobilized or performing their National Service, regardless of how long they may have been away, are included in the de jure population.

Men aged 18–40 comprise 29 percent of the male population, and, of these, 44 percent are married (a calculation also based on the DHS household schedule).[10] Because information is lacking about the marital status of men in the military, we assume that the marital status of those returning would be the same as the marital status of men of the same age in the overall population; thus, 28,860 married men (44 percent of 65,000) would return.

The number of married women aged 15–49 living with their husbands aged 18–40 in 2002 is shown in column 3 of Table 6. The number of such women is calculated by multiplying an estimate of the total number of married women in the country (derived in the same way as the estimate of married men) by the age distribution of women, shown in column 1, and the proportion living with their husbands, shown in column 2. The number of women with returning husbands (see column 5) is the total number of returning married men multiplied by the age distribution of women shown in column 1. This number is added to the number living with their husbands to obtain the total number of women who would be living with their husbands if 65,000 men are demobilized (shown in column 6).

The current marital fertility rate among women not living with their husbands aged 18–40 in 2002 is shown in column 7. Column 8 shows the fertility rate that would be observed among women with returning husbands if fertility rates returned immediately to their prewar levels. The number of additional births in column 9 is calculated by multiplying the number of women with returning husbands by the marital fertility rate in 1995 and then subtracting the number of births that these women would have had even if their husbands had not returned (that is, the fertility rate shown in column 7 multiplied by the number of women with returning husbands). Subtracting these births is necessary because the fertility rate of women whose husbands are away is relatively low, but not zero.

In column 10, the proportion of women who reported that they want a child within the next two years is shown. This proportion is multiplied by the total number of women with returning husbands, and, as above, the number of births these women would have had even if their husbands had not returned is subtracted.

According to a scenario in which 65,000 men return home, the number of additional births would be 3,145 under the hypothetical situation in which fertility rates among women of returning husbands return to prewar levels, and it would be 9,329 if all of those women who said they wanted a child in the next two years have one (columns 9 and 11 in Table 6). These additional births constitute roughly a 3–8 percent increase in the total number of annual births. Moreover, these additional births are 4–13 percent of the number of BCG vaccinations recorded in the HMIS in 2002, which implies that a substantially greater number of children would have to be vaccinated to maintain the 2002 level of coverage. Even assuming that couples would have children as soon as possible after the husband returns, however, all of the additional births would not occur in one year. The timing of the additional births would depend on the pace and timing of demobilization.

These projections examine the consequences of an increase in exposure to pregnancy within marriage. As such,

Table 6 Projection of additional births if 65,000 men aged 18–40 return home from military service, Eritrea

Age group	Percentage distribution of married women aged 15–49 with husband aged 18–40 (1)	Proportion of women living with husband aged 18–40 (2)	Number of married women aged 15–49 living with husband aged 18–40 (3)	Number of married women aged 15–49 not living with husband (4)	Number of married women aged 15–49 with returning husbands (5)	Number of married women living with husband once husband returns (6)	Current marital fertility rate among women not living with husband aged 18–40 (7)	Coresident marital fertility rate in 1995 (8)	Number of additional births if marital fertility returns to 1995 level (9)	Proportion of women who want a child within two years among those not living with husband aged 18–40 (10)	Number of additional births if all women with returning husbands who want a child within two years have one (11)
15–19	18.5	0.29	23,302	57,050	5,339	28,641	210	305	507	0.36	1,523
20–24	28.4	0.41	50,574	72,777	8,196	58,770	219	335	951	0.43	2,740
25–29	32.1	0.43	59,951	79,470	9,264	69,215	227	324	899	0.44	3,144
30–34	14.8	0.45	28,927	35,355	4,271	33,198	155	299	615	0.36	1,285
35–39	5.7	0.55	13,616	11,141	1,645	15,261	140	234	155	0.41	577
40–44	0.4	0.60	1,042	695	115	1,157	0	145	17	0.53	61
45–49	0.1	0.44	191	243	29	220	0	55	2	0.00	0
Total	100.0	—	177,604	256,732	28,860	206,464	4.8	8.5	3,145	—	9,329

Notes: Column 1: Calculated from DHS data. Column 2: Calculated from DHS data. Column 3 = 434,336 (total number of married women aged 15–49) x (1) x (2). Column 4 = 434,336 (total number of married women aged 15–49) x (1) x [(1 – (2)]. Column 5 = 28,860 x (1). Column 6 = (3) + (5). Columns 7 and 8: Calculated from DHS data. Column 9 = [(5) x (8)] – [(5) x (7)] ÷ 1,000. Column 10: Calculated from DHS data. Column 11 = [(5) x (10)] – [[(5) x (7) x (10)] ÷ 1,000]. Numbers in the calculations are more precise than those shown in the table.
— = Not applicable.

they do not account for any rise in nonmarital fertility that might occur as men return home. The projections also do not account for the possible effect on fertility of marriages that may have been delayed as a result of recent events or the effect of improved nutrition on the fecundability of women if drought conditions improve.

Discussion

The large fertility decline observed in Eritrea between the mid-1990s and the early part of the new century has been examined here using data from two detailed national household surveys. The results indicate that one of the outcomes of the military mobilization and displacement associated with the 1998–2000 border conflict with Ethiopia was a steep reduction in the proportion of women exposed to the risk of pregnancy. Part of this reduction was due to delayed age at marriage, but it occurred largely because married women were less likely to be living with their husbands in 2002 than in 1995.

The total fertility rate derived from the 2002 survey remains partially unexplained by the available proximate-determinant data. Higher rates of induced abortion than are recorded in the survey probably explain part of this phenomenon. Another factor may be couples' deliberate postponement of childbirth achieved without the use of a contraceptive. One recent study suggests that uncertainty about the future, inadequate health services, and the lack of traditional supports during pregnancy, childbirth, and the postpartum period have been important features of war-affected areas in Eritrea over the last few years (Almedom et al. 2003). The uncertainty of the labor market, the hardship created by the recent drought, and a lack of adequate housing in urban areas (NSEO 2003) may also have contributed to couples' desire to wait until times are better to have a child. A recent analysis of the determinants of the below-replacement-level fertility recorded in Addis Ababa in 2000 concludes that a rise in the proportion of unmarried women has been the most important factor. The study cites high unemployment and severe housing shortages as the primary reasons for the rise in age at marriage (Sibanda et al. 2003). Prior analyses of marital fertility decline in Ethiopia during the 1970s and '80s also demonstrated the short-term negative effect on marital fertility of years of political and economic upheaval (Lindstrom and Berhanu 1999).

Little evidence suggests that the decline in fertility in Eritrea reflects the beginning of a long-term transition to lower fertility such as has been observed in some other African countries. Couples have not increased their use of contraceptive methods since 1995. More important, however, reported fertility preferences do not indicate that much has changed. The average desired family size has stayed the same, and the proportion of women who want a child in the next two years has increased. The proportion of women who report that they want no more children is only 17 percent in Eritrea, compared with 30–50 percent among women in sub-Saharan African countries that have experienced sustained fertility decline (Westoff and Bankole 2002).

Eritrea has recorded significant accomplishments in child-health indicators over the last several years. Whether these improvements would have been as great if demand had not been reduced as the result of the decline in the number of children needing services is worth considering. Illustrative projections of the potential number of additional births that may occur in a postwar "baby boom" that could be compounded by a postwar "marriage boom" suggest that the health system may be facing an increase of thousands of births over the next few years. Indeed, recent data from the HMIS show that the numbers of women going to facilities for antenatal and delivery care increased in 2001 and 2002 compared with 1998–2000 (Ministry of Health 2003). The number and timing of any additional births will depend on a number of factors, including the pace of demobilization and the ability of couples to implement their stated fertility preferences. A sharp increase in births following demobilization is unlikely to be followed by a quick return to the low level of fertility observed over the last few years. Unless contraceptive use increases substantially, the return to a situation in which the majority of married couples are coresiding implies a return to higher fertility over the medium to long term. In the short term, however, monitoring the number of births and anticipating future increases provide an opportunity for those in the health, education, and housing sectors to plan for a rising demand for services.

Notes

1 For example, because the survey took place roughly in mid-year, the rate for 2000–01 covers mid-2000 to mid-2001.

2 The proportion of women living with their husbands was already low in 1995 primarily as a result of labor migration of both men and women (Arneberg 1999).

3 Many of those who reported having military jobs may have been performing National Service (that is, they were mobilized by the government but may not have been serving in the armed forces).

4 The survey contains information only on the last terminated pregnancy. Calculating the TAR using pregnancies that were terminated in the last three years minimizes but does not eliminate the possibility that pregnancy terminations among women who had more than one termination during the period will be excluded.

5 See Stover (1998) for recent refinements of the model.

6 The value of the total fecundity rate is the theoretical number of births that a woman would have if she were continuously married from age 15 to 44, did not use contraceptives, did not breastfeed, and did not abort any pregnancies. It is based on evidence from a range of historical populations with the highest-recorded fertility.

7 Contraceptive use is measured at the time of the survey. To the extent that the 1998–2000 war with Ethiopia created disruptions in service delivery or supplies, the contraceptive prevalence rate may have been lower for some of the period covered by the TFR.

8 $C_i = 20/(18.5 + I)$ where I is the median duration of postpartum insusceptibility.

9 An alternative method is to use information from the HMIS on events closely associated with births. For example, BCG (bacille Calmette-Guerin) vaccinations are given to babies at birth or soon thereafter. According to the 2002 DHS, 89 percent of children were given BCG vaccinations in 2001–02 before they were one year old. Thus, if the absolute number of BCG vaccinations given is inflated by the percent vaccinated, the resulting number should approximate the total number of births. Because the BCG vaccine is expected to be given at birth, early infant mortality should have little effect on this number. Not all facilities report BCG vaccinations every month to the HMIS, so the number of BCG vaccinations can be adjusted for underreporting by imputing missing data with the average number of vaccinations given in each facility in the months for which reports are made. The calculation yields the following: 74,601 = number of BCG vaccinations given after adjustment for underreporting by facilities and 74,601 ÷ 0.893 = 83,540 = estimated number of births in 2002. This number is most likely an underestimate because it does not include vaccinations given in private facilities that do not report to the HMIS.

10 This percentage is low; approximately 50 percent of men aged 18–40 were recorded as married in the 1995 DHS, suggesting that men also have delayed marriage.

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Acknowledgments

The author wishes to acknowledge permission to use the Demographic and Health Survey data granted by the National Statistics and Evaluation Office of the Government of Eritrea. The author thanks Hagos Ahmed, Woldeyesus Elisa, Yacob Yishak, Linda Lou Kelley, Rod Knight, Sushil Kumar, Dan Wendo, Siân Curtis, and Ron Rindfuss for helpful comments and assistance. Funding for the initial version of this paper was provided by USAID/Eritrea under the MEASURE/Evaluation project at the University of North Carolina.