# DHS ANALYTICAL REPORTS

5

# Components of Unexpected Fertility Decline in Sub-Saharan Africa

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**Demographic and Health Surveys**
**Analytical Reports No. 5**

# Components of Unexpected Fertility Decline in Sub-Saharan Africa

ANN K. BLANC
PROSPER V. POUKOUTA

Macro International Inc.
Calverton, Maryland USA

September 1997

Recommended citation:

Blanc, Ann. K. and Prosper V. Poukouta. 1997. *Components of Unexpected Fertility Decline in Sub-Saharan Africa.* DHS Analytical Reports No. 5 Calverton, Maryland: Macro International Inc.

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# Preface

One of the most significant contributions of the DHS project is the creation of an internationally comparable body of data on the demographic and health characteristics of populations in developing countries. The *DHS Analytical Reports* series and the *DHS Comparative Studies* series examine these data across countries in a comparative framework, focusing on specific topics.

The overall objectives of the DHS comparative research are: to describe similarities and differences between countries and regions, to highlight subgroups with specific needs, to provide information for policy formulation at the international level, and to examine individual country results in an international context. While *Comparative Studies* are primarily descriptive, *Analytical Reports* utilize a more analytical approach.

The comparative analysis of DHS data is carried out primarily by staff at the DHS headquarters in Calverton, Maryland. The topics covered are selected by staff in conjunction with the DHS Scientific Advisory Committee and USAID.

The *Analytical Reports* series is comprised of in-depth, focused studies on a variety of substantive topics. The studies employ a range of methodologies, including multivariate statistical techniques, and are based on a variable number of data sets depending on the topic under study.

It is anticipated that the *Analytical Reports* will enhance the understanding of significant issues in the fields of international population and health for analysts and policymakers.

Martin Vaessen
Project Director

# Acknowledgments

The authors wish to thank Siân Curtis, John Bongaarts, and Stan Becker for helpful comments on earlier versions of this report. We also appreciate the data processing assistance of Trevor Croft. Production assistance was provided by Mary Lane, Catherine Sansone, and Celia Siebenmann.

# Executive Summary

The contraceptive prevalence rate can be used to predict the level of fertility in most populations with considerable accuracy. The statistical relationship derived from a linear regression of contraceptive prevalence on the total fertility rate also implies a relationship between *change* in contraceptive prevalence and *change* in fertility. Specifically, the regression line indicates that an increase of 15 percentage points in contraceptive prevalence among married women is associated with a decline of about one child in the total fertility rate. The purpose of this report is to examine the situation in four countries in sub-Saharan Africa—Ghana, Kenya, Senegal, and Zimbabwe—which appear to deviate substantially from this expected pattern. Specifically, these are countries in which fertility has declined by a greater amount than would be expected on the basis of increases in contraceptive prevalence.

Each of the countries examined has conducted two surveys under the Demographic and Health Surveys program. The surveys used in this analysis and their dates are: Ghana, 1988 and 1993; Kenya, 1989 and 1993; Senegal, 1986 and 1992/1993; Zimbabwe, 1988 and 1994.

While fertility was more than 6 children per woman in the late 1980s in Ghana, Kenya, and Senegal, it declined to about 5.5 children in Ghana and Kenya and about 6 children in Senegal by the early 1990s. Zimbabwe already had a total fertility rate of 5.4 in 1988 which dropped further to 4.3 in 1994. Contraceptive prevalence was quite low at 13 percent in Ghana in 1988 but had increased to 20 percent in 1993. Kenya, with levels of fertility similar to Ghana, had much higher levels of contraceptive use—27 percent in 1989 and 33 percent in 1993. In Senegal, contraceptive use was very low at around 5 percent in 1986 and by 1992 had increased to almost 7 percent. Zimbabwe, in contrast, had reached more than 40 percent prevalence by 1988 and close to 50 percent six years later.

The analysis reveals a number of factors that have contributed to larger than expected fertility declines in these four countries: a shift to the use of more effective methods of contraception, the lag effect of rapid increases in contraceptive adoption, stability in the duration of postpartum insusceptibility, and changes in marriage and sexual behavior.

A strong shift to the use of more effective methods of contraception is evident in Kenya and Senegal, resulting in a distribution of use by method that favors modern methods more than countries at similar overall levels of prevalence. Accompanied by increases in overall prevalence, this shift has undoubtedly played a large role in accelerated rates of decline. In Ghana, a shift to modern methods has also occurred, but it remains a country with a lower than average share of use of modern methods. At the same time, in all four countries, women's fertility preferences have altered so that more users of contraceptive methods are those who want no more children compared with those who want to delay the next birth. Only in Kenya, however, does the proportion of contraceptive users who wish to limit their fertility even approach the levels found outside of sub-Saharan Africa.

The speed at which the adoption of contraception has occurred, particularly in Zimbabwe and Kenya has probably created a situation in which fertility levels as estimated from a birth history "lag behind" the level of contraceptive use. Although this lag effect occurs to some extent in all countries, if it is greater in these four countries than elsewhere, the countries would be unlikely to fit expectations based on the standard regression line. In Zimbabwe and Kenya, this effect may be a large part of the explanation for the unexpected declines in fertility. Indeed, the use of the contraceptive prevalence rate from the earlier survey results in a predicted total fertility rate that exactly matches that observed in the later survey.

Amenorrhea associated with prolonged breastfeeding and the practice of postpartum abstinence are the most significant factors reducing fertility from its maximum level in these countries, although the duration of this behavior has not changed much over the last several years. The role of changes in postpartum insusceptibility in fertility change appears, therefore, to be minimal although that lack of change may have contributed to larger than expected declines given the increase in contraceptive prevalence; this is because declines in postpartum insusceptibility generally accompany increases in contraceptive use. At the same time, the extent of overlap between postpartum insusceptibility and contraceptive use has decreased in Ghana, Kenya, and Senegal which, other things being equal, would yield a stronger fertility effect for the same contraceptive prevalence.

The role of marriage in excess fertility decline is much more difficult to assess. Definitional uncertainties surrounding marriage and its use as a proxy for exposure to sexual intercourse in sub-Saharan Africa combined with doubts about the quality of marriage data in these four countries preclude clear conclusions. Relatively early initiation of marriage continues to be the norm in these four countries. Nevertheless, there is a general tendency toward later marriage and perhaps slightly later initiation of sexual intercourse which has contributed to the observed declines although perhaps not as much as would be expected given the increases in contraceptive prevalence.

Finally, a multivariate analysis using the survey data suggests that fertility regulating behavior not captured by the standard measurement of contraceptive use, exists to some degree in all four countries. Specifically, women who want no more children and those who want to delay the next birth by at least two years have lower coital frequency than those who want another child soon. Further, the differences between these groups has widened over time, at least in Ghana and Zimbabwe. This widening difference may be part of the explanation for excess fertility decline in these countries.

In many ways, the unexpectedly large fertility declines observed in Ghana, Kenya, Senegal, and Zimbabwe are the result of differing changes in factors affecting fertility directly or indirectly. A strong common thread in the evidence is not apparent. What is clear is that in Kenya and Zimbabwe, declines that began in the mid-1980s are continuing, perhaps with increasing velocity, in the 1990s. In Senegal and Ghana, the latest evidence confirms earlier tentative indications that fertility had begun to decline. What may characterize African fertility transitions in the future is the extent to which they are the result of increasing contraceptive use unaccompanied by significant changes in the other proximate determinants and the speed at which they occur.

# 1 Introduction

As data on fertility and its proximate determinants have accumulated over the last several decades, there is strong evidence that the relationship between the level of contraceptive prevalence in a population and its current fertility are closely correlated and that the statistical relationship is nearly universal. Linear regressions of contraceptive prevalence on the total fertility rate calculated by various researchers show that the level of contraceptive prevalence can be used to predict the level of fertility with considerable accuracy in most populations. Indeed, the relationship has proven to be sufficiently strong and universal that deviations from it are the subject of country-specific analyses (see for example, Bongaarts, 1987; Adamchak and Mbvizo, 1990; Thomas and Mercer, 1995; Curtis and Diamond, 1995; Go et al., 1995; Jain, 1996; Gajanayake and Caldwell, 1990).

The statistical relationship derived from the regression line implies a relationship between *change* in contraceptive prevalence and *change* in fertility as well. Specifically, for an increase of 15 percentage points in contraceptive prevalence among married women, a decline of about one child in the total fertility rate may be expected (Ross and Frankenberg, 1993). The purpose of this report is to examine the situation in four countries in sub-Saharan Africa—Ghana, Kenya, Senegal, and Zimbabwe—which appear to deviate substantially from this expected pattern. These are countries in which fertility has declined by a greater amount than would be expected on the basis of increases in contraceptive prevalence.

The magnitude of observed declines in fertility in sub-Saharan Africa and the reasons for such declines have been the subject of much recent analysis and debate (Thomas and Muvandi, 1994; Blanc and Rutstein, 1994; Cohen, 1993; Rutenberg and Diamond, 1993; Dow et al., 1994; van de Walle and Foster, 1990; Rutenberg, 1995, Working Group on Kenya, 1993; Pison et al., 1995; Muhwava and Timæus, 1996; Lesthaeghe and Jolly, 1994; Onuoha and Timæus, 1995). Aside from technical issues of measurement and data quality, these analyses raise the question of whether fertility decline is proceeding along a different path in sub-Saharan Africa from that which has been followed by countries in other parts of the world (Caldwell et al., 1992; Gould and Brown, 1996). Are the countries which have experienced fertility decline without matching contraceptive prevalence increases simply deviations from a "universal" pattern or have the unique demographic features of this region produced a situation which yields a different pattern? Indeed, given signs of erosion in the traditional fertility suppressing mechanism of postpartum abstinence and the decline in the prevalence of secondary sterility, a smaller than predicted decline in fertility might be anticipated, not a larger one. Various explanations for the deviations from expected declines in fertility are examined here, including an analysis of changes in the proximate determinants and an examination of data quality. The report also looks at some information that suggests the existence of fertility regulating behavior that would not be captured by standard measures of contraceptive use.

# 2 Data

Each of the countries examined has conducted two surveys under the Demographic and Health Surveys program. The surveys used in this analysis and their dates are: Ghana, 1988 and 1993; Kenya, 1989 and 1993; Senegal, 1986 and 1992/1993; Zimbabwe, 1988/89 and 1994. The surveys are nationally representative (with minor exclusions) and include data for all women age 15-49. In all of the surveys, a full live birth history was collected from all eligible women. For this report, total fertility rates are calculated using the birth history data for the period 1-36 months prior to the interview date. The exception is the 1993 Ghana survey for which fertility rates were calculated based on the period 1-59 months prior to the interview date due to data quality problems that will be discussed in a later section. Information on contraceptive use is collected from all women, regardless of marital status, although the contraceptive prevalence rates used in this paper refer to currently married women.

Table 2.1 presents the three-year total fertility rates and contraceptive prevalence rates for currently married women. In addition, 95 percent confidence intervals for each estimate are shown.[1] While fertility was more than 6 children per woman in the late 1980s in Ghana, Kenya, and Senegal, it declined to about 5.5 children in Ghana and Kenya and about 6 children in Senegal by the early 1990s. Zimbabwe already had a total fertility rate of 5.4 in 1988 which dropped further to 4.3 in 1994. The confidence intervals show that the fertility estimates within each country do not overlap, except in Senegal where the lower bound estimate for 1986 is 6.1 and the upper bound estimate for 1992/93 is 6.3.

Contraceptive prevalence was quite low at 13 percent in Ghana in 1988 but had increased to 20 percent in 1993. Interestingly, Kenya, with levels of fertility similar to Ghana, has much higher levels of contraceptive use—27 percent in 1989 and 33 percent in 1993. In Senegal, contraceptive use was very low at around 5 percent in 1986 and in 1992 had increased to almost 7 percent.[2] Zimbabwe, in contrast, had reached more than 40 percent prevalence by 1988 and close to 50 percent six years later. The confidence intervals around the contraceptive prevalence estimates do not overlap in any country, strong evidence that contraceptive prevalence has increased significantly in each of the four countries.

The age pattern of fertility decline (Figure 2.1) shows the greatest percentage declines occurring among the 15-19 year olds in Kenya and Senegal. In Ghana and Zimbabwe, it is the 40-44 and 45-49 year old groups that experienced the greatest percentage decrease, although because fertility is low in these age groups the absolute declines are small. Among the primary reproductive ages of 20-39, percentage declines average around 19 percent in Kenya, 20 percent in Zimbabwe, 12 percent in Ghana, and 5 percent in Senegal. In Ghana and Zimbabwe, the age-specific fertility rates are lower in every age group at the time of the later survey than at the time of the earlier survey. In Kenya among 45-49 year olds and in Senegal among 40-44 year olds, the rate for the more recent survey is higher than for the earlier survey. The rates for older women are based on relatively few cases and have large sampling errors, however.

Table 2. 1 Total fertility rate for the three years prior to the survey, contraceptive prevalence among currently married women, and confidence intervals, Demographic and Health Surveys, 1986-1994

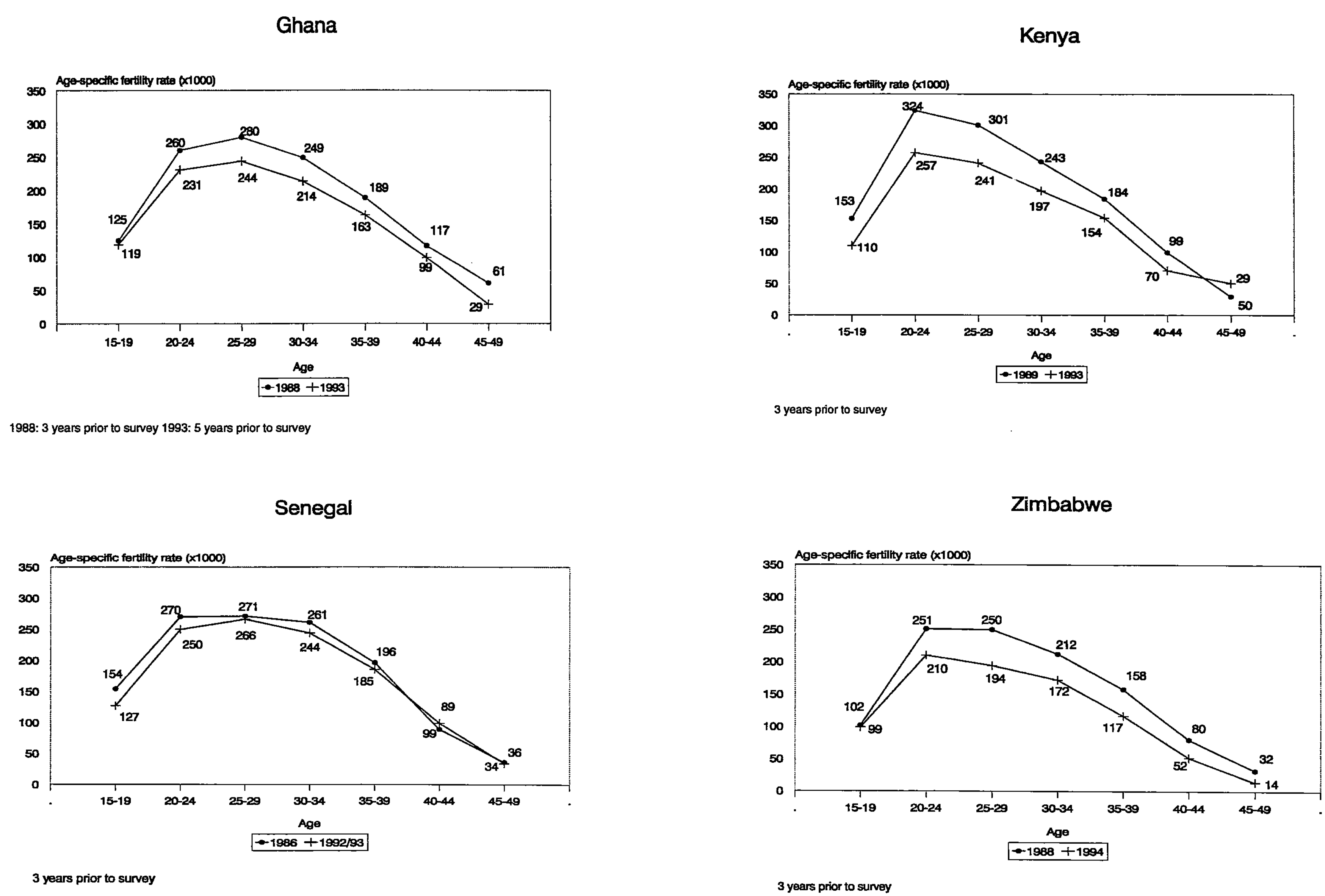
| | Ghana | | Kenya | | Senegal | | Zimbabwe | |
|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| Total fertility rate | 6.4 | 5.5[a] | 6.7 | 5.4 | 6.4 | 6.0 | 5.4 | 4.3 |
| Confidence interval (+/- 2 SE) | 6.1-6.7 | 5.2-5.7 | 6.4-6.9 | 5.1-5.7 | 6.1-6.7 | 5.8-6.3 | 5.1-5.8 | 4.1-4.5 |
| Contraceptive prevalence | 12.9 | 20.3 | 26.9 | 32.7 | 4.6 | 6.7 | 43.1 | 48.1 |
| Confidence interval (+/- 2 SE) | 11.5-14.2 | 18.7-21.9 | 25.0-28.8 | 30.8-34.7 | 4.3-4.9[b] | 6.2-7.2 | 40.9-45.3 | 46.1-50.2 |

[a] Five-year rate
[b] SE estimated based on published CPR

[1] Sampling errors used to calculate the confidence intervals for the contraceptive prevalence rates were estimated using the Taylor linearization method of variance estimation and the jackknife repeated replication method was used for the fertility rates (Wolter, 1985). Estimation was carried out with the ISSA Sampling Error Module (see Rojas, 1997).

[2] In the two surveys in Senegal, extended abstinence is included as a contraceptive method. The rates published in the country reports include this method. However, in this report, extended abstinence is excluded in order to make the contraceptive prevalence rate for Senegal comparable to that for other countries and comparable to the rates used in the standard regression line.

Figure 2.1 Age-specific fertility rates in Ghana, Kenya, Senegal, and Zimbabwe



# 3 Expected vs. Actual Fertility

Figure 3.1 plots contraceptive prevalence and total fertility for 29 sub-Saharan surveys. The solid line represents the regression line [7.2931 - .070(CPR) = TFR] derived from approximately 100 observations from developing countries (Ross and Frankenberg, 1993). Note that both Kenya and Zimbabwe fall substantially above the line (by 1.3 and 1.2 children, respectively) at the time of the first survey in each country.[3] Fertility in Ghana at the first survey is exactly as expected and fertility in Senegal is slightly lower than expected at the first survey. At the time of the second survey, fertility in Kenya and Zimbabwe is still slightly higher than expected, although by much less than in the previous survey. Fertility in Ghana is now below the line by 0.4 children and fertility in Senegal is lower than expected by about 0.8 children.

If the regression line is recalculated using only the data points shown in the graph, it becomes 6.689 - .035 (CPR) = TFR (Figure 3.1). The intercept decreases by 0.6 children and the slope declines by about half (from 0.70 to 0.35). At the same time, the $R^2$, which is 0.88 for the full set of countries, is only 0.31 for sub-Saharan Africa. This suggests that, in general, fertility in the absence of contraception is somewhat lower in sub-Saharan Africa than elsewhere, probably as a result of longer durations of breastfeeding and postpartum abstinence, and the impact of contraception is less, perhaps due to a greater predominance of less effective traditional methods (also see Bledsoe et al., 1997 on the use of contraception to prevent maternal depletion). Further, the relationship between contraceptive prevalence and fertility is somewhat weaker in sub-Saharan Africa than elsewhere, a pattern which has been reported by others (Brown, 1996).

In Figure 3.2, the change in fertility is plotted against the change in contraceptive prevalence for two periods in each of the four countries, as well as for several other countries outside of sub-Saharan Africa. Data for calculating the change over the earlier period for each country is taken from previous (non-DHS) surveys.[4] The graph illustrates clearly that, for the most recent period in Ghana and Kenya, and for both periods in Senegal and Zimbabwe, the decline in fertility is substantially greater than would be expected on the basis of increases in contraceptive prevalence. This discrepancy is largest in Kenya and Zimbabwe, somewhat smaller in Ghana, and smallest in Senegal. The graph also demonstrates that these decreases are unusual relative to other countries outside of the region, with the exception of Bangladesh, a country that also appears to have experienced a fertility decline far greater than expected given the increase in contraceptive prevalence (Mitra et al., 1994; Cleland et al., 1994). Note also that, except for the earlier period in Ghana, all four countries fall even farther below the expected decline based on the regression including only sub-Saharan countries compared to the line based on all countries.

Figure 3.3 shows, for the period between the two DHS surveys, the change in the TFR against the change in contraceptive prevalence for urban and rural areas within each country. The discrepancy is largely a rural phenomenon in Kenya, Senegal, and Zimbabwe. In Kenya and Zimbabwe, the decline in rural fertility is about one child more than expected while the decline in urban fertility is .10 and .30 children more, respectively. In rural Senegal, the decrease in fertility is about one-third of a child greater than expected while in urban areas, the discrepancy is .10 child. In contrast, the difference between the actual and expected fertility decline in Ghana is greater in urban areas (approximately 0.5 child) than in rural areas (0.2 child).

Another way of evaluating the decline in fertility against the increase in contraceptive prevalence is to employ a model which is normally used to estimate the level of contraceptive prevalence needed to reach a particular fertility target. For each country, Bongaarts' (1984) basic target-setting model was employed to calculate the increase in contraceptive prevalence that would be required to attain the observed reduction in fertility at observed levels of contraceptive use-effectiveness. This "required" increase in prevalence is between 1.1 and 1.5 times greater than the actual increase in the four countries. These results suggest that the path of fertility decline in the four countries deviates somewhat from the general pattern which is embodied in the assumptions of this target setting model. In particular, the model assumes that the level of fecundity is constant, that induced abortion is negligible, and that trends in marriage and postpartum infecundability cancel out one another. These assumptions will be examined with respect to the four countries included here in later sections of the report.

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[3] Both countries also had higher than expected fertility at the time of the earlier surveys—Kenya in 1977 and Zimbabwe in 1984 (Bongaarts, 1987).

[4] For Ghana, Kenya, and Senegal—World Fertility Survey. For Zimbabwe—Contraceptive Prevalence Survey.

Figure 3.1 Total fertility rate and contraceptive prevalence rate, 29 surveys in sub-Saharan Africa

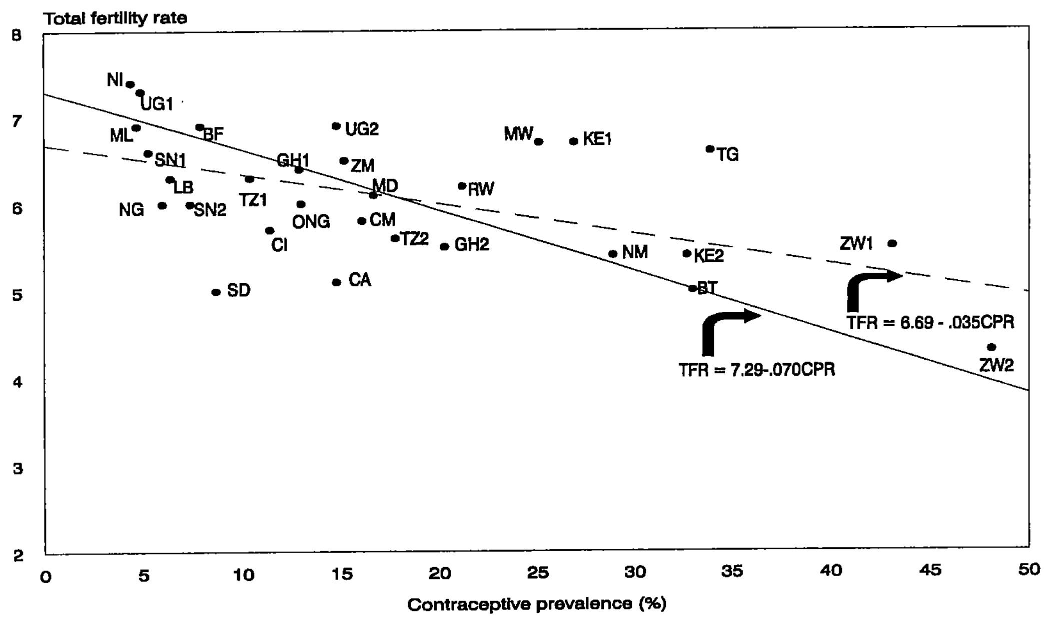



Figure 3.2 CPR increase and corresponding TFR decrease, selected surveys 1977-1995

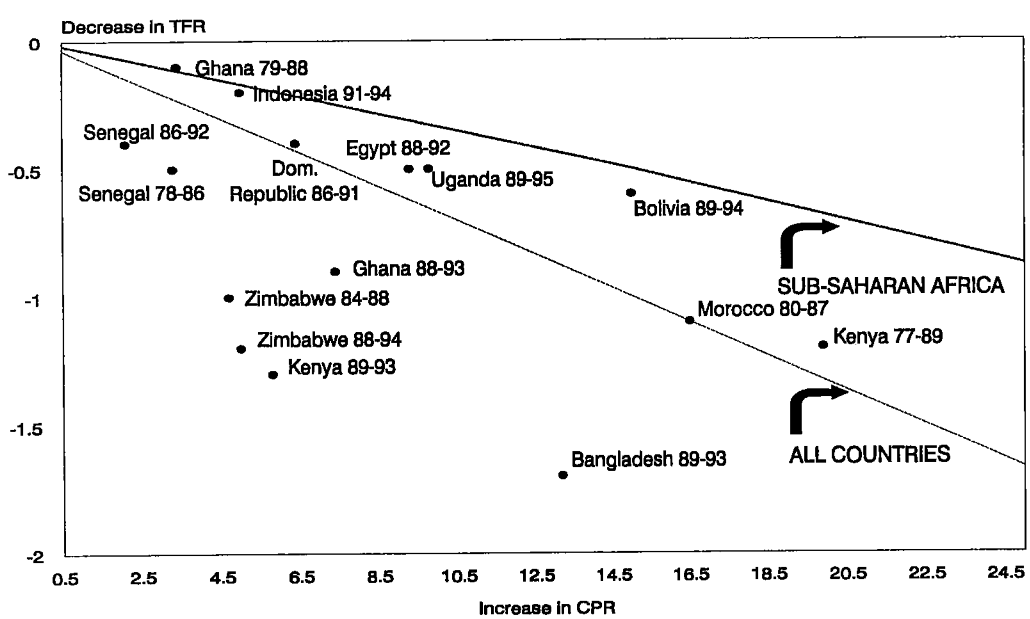
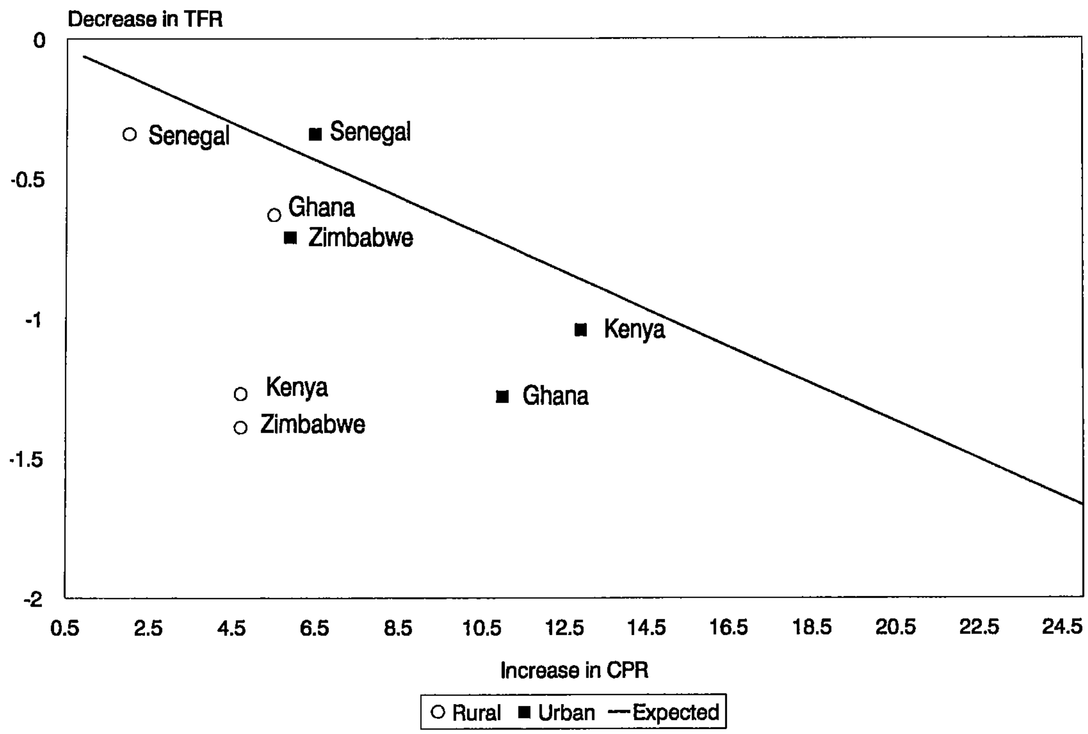


Figure 3.3 CPR increase and corresponding TFR decrease in urban and rural areas in Ghana, Kenya, Senegal, and Zimbabwe



# 4 Possible Explanations for Unexpected Fertility Declines

## 4.1 DATA QUALITY

Deficiencies in the data could be responsible for the inconsistency between contraceptive increase and fertility decline. Errors would most likely result from either an understatement of the increase in contraceptive use or an overstatement of the decrease in fertility. In order for the magnitude of change in fertility to be influenced, however, the underestimate of fertility would have to be more severe at the time of the second survey so that the decline in fertility would be overestimated.

The accuracy of reports of contraceptive use are difficult to assess but, if anything, contraceptive use is expected to be underreported, not overreported. A woman may be reluctant to report using a contraceptive method due to embarrassment or perhaps because she is using without her husband's knowledge. An analysis of so-called "shy" users was carried out for 34 DHS surveys (Arnold et al., 1993). The analysis looks at the percentage of fecund, exposed women who have not had a recent birth and who claim not to be using contraception. It concludes that, assuming that all of these women are actually using contraception, in only 4 of 11 countries in sub-Saharan Africa would the prevalence among women under 40 increase by more than 10 percent; "shy" users are not found to be a significant factor in any country.

Internal checks on the accuracy of reporting of most modern contraceptive use are difficult, if not impossible to devise.[5] There are, however, some checks that can be performed on the internal consistency of reporting of barrier methods, withdrawal, and periodic abstinence. These can be used as indicators of the overall quality of reporting of contraceptive use. The analysis by Arnold et al. (1993) examines the possibility that the use of barrier methods is incorrectly reported by checking whether current users of barrier methods have had sexual intercourse recently. Since barrier methods are only used at the time of sexual intercourse, it is expected that women who report current use of these methods (or withdrawal) will be recently sexually active. Although the number of women reporting the use of barrier methods or withdrawal is small in the four countries, most of them also report having recent sexual relations (Table 4.1). The highest percentage of married users of barrier methods or withdrawal reporting that they did not have sexual relations in the two months prior to the survey occurs in the first survey in Ghana (28 percent). This percentage declines to 13 in the later survey. In Kenya and Zimbabwe, however, the percentages increase from the earlier to the later survey.

An additional check on the reporting of contraceptive use can be made by examining the proportion of current users of periodic abstinence who say that they are also amenorrheic or abstaining from sexual intercourse. Since effective use of this method requires that couples abstain on certain days of the monthly cycle, it is necessary to both know which days are "safe" days and to be able to identify those days for a particular woman. Table 4.1 shows the percentage of current users of periodic abstinence who also report that they are amenorrheic or postpartum abstaining. Also shown is the percentage of users of periodic abstinence who correctly identified the "safe period" as the middle of the menstrual cycle. Again, small numbers of users preclude definitive conclusions but, on the whole, the majority of users of periodic abstinence are not amenorrheic or abstaining postpartum. In Ghana (1988), however, 41 percent of those using periodic abstinence reported being amenorrheic or abstaining. The corresponding percentage in the later survey in Ghana is still substantial at 19 percent. Underreporting of sexual activity is probably contributing to the anomaly in Ghana. Coital frequency as reported in this survey is unusually low relative to other countries in the region (Blanc and Rutenberg, 1991). In Kenya, this type of inconsistency decreased slightly from the earlier to the later surveys while in Senegal it increased.

Among users of periodic abstinence, relatively few responded that the "safe period" is in the middle of a woman's cycle. In Kenya for both surveys, only about a third of the women responded correctly to this question. At the same time, however, it is possible that the question is formulated in such a way that it is difficult to answer accurately. Relatively large percentages of women said the safe period occurs "before period begins" or "after period ends," both of which suggest that women recognize that counting days

[5] An analysis of reporting in the contraceptive history calendar in the 1994 Zimbabwe survey, however, suggests that the data are of high quality relative to several other countries (Curtis and Blanc, 1997).

Table 4.1 Indicators of the quality of reporting of current contraceptive use, Demographic and Health Surveys, 1986-1994

| | Current users of periodic abstinence | | | | | | | | Current users of barrier methods or withdrawal | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Percent amenorrheic or abstaining post partum | | Percent who said safe period is middle of cycle | | Percent who don't know safe period[1] | | Number | | Percent who did not have sex in last 2 months | | Number | |
| Country | Earlier survey | Later survey | Earlier survey | Later survey | Earlier survey | Later survey | Earlier survey | Later survey | Earlier survey | Later survey | Earlier survey | Later survey |
| Ghana | 41 | 19 | 46 | 56 | 12 | 17 | 196 | 241 | 28 | 13 | 46 | 178 |
| Kenya | 19 | 14 | 29 | 33 | 8 | 17 | 357 | 206 | 5 | 18 | 56 | 59 |
| Senegal | 3 | 11 | 57 | 66 | 3 | 0 | 30 | 35 | U | 3 | 7 | 29 |
| Zimbabwe | * | * | * | * | * | * | 8 | 4 | 9 | 14 | 167 | 245 |

* Figure is based on fewer than 25 cases and has been suppressed
[1] Answered "during period," "at any time," or "don't know"
U = Unknown (not available)

relative to a woman's monthly cycle is central to using the method. Still, in Ghana and Kenya, more than 10 percent of users of periodic abstinence answered that the safe period is "during her period," "at any time," or "don't know." These results suggest that periodic abstinence may be *overreported*, i.e., that some of those who claim to be using periodic abstinence are not, in fact, doing so or are practicing it incorrectly and that this type of overreporting has probably not decreased over time.

The underreporting of births and incorrect reporting of the timing of births are potentially significant factors contributing to the contraceptive prevalence/fertility inconsistency. However, as noted above, in order for this problem to affect the consistency between change in contraceptive prevalence and change in fertility, the underreporting would have to be more severe at the second survey than at the first. This seems unlikely to begin with on the grounds that reporting ought to improve over time, given increases in women's education and overall socioeconomic development. Nevertheless, circumstances surrounding the implementation of the surveys, even within the same country, may vary. For example, the quality of interviewer training or field supervision may differ between surveys. Two measures of the quality of the birth history data are shown in Table 4.2. In Ghana, the dates of birth of children were more likely to be completely reported (month and year) in the later survey than in the earlier survey. In Zimbabwe, virtually all birth dates were completely reported in both surveys. In Kenya and Senegal, however, the percentage of births with month and year reported actually decreases from the earlier to the later survey. This is particularly dramatic in the case of Senegal in which 82 percent of birth dates were completely reported in 1986 compared with only 59 percent in 1992/93.[6] Again, this difference may be due to the emphasis placed on different parts of the questionnaire during interviewer training or to the supervision during fieldwork.

The displacement of births has been detected in numerous DHS surveys (Arnold, 1990; Marckwardt and Rutstein, 1996). In particular, there is evidence that births are shifted from the fifth to the sixth calendar year prior to the survey. This displacement is probably the result of interviewers' desire to avoid asking a lengthy series of questions about children born in the five calendar years prior to the survey. This period was reduced to three calendar years in DHS-III, partly as an attempt at reducing the displacement problem. Of the surveys included here, Ghana (1993) and Zimbabwe (1994) incorporated this change. The birth ratios shown in Table 4.2 are indicators of the extent to which displacement occurred in each survey. In Ghana, the situation was considerably worse in the later survey than in the earlier survey in spite of the change in the questionnaire. There is also some evidence that more displacement occurred in the later survey in Senegal. In Kenya, on the other hand, there was less displacement in the later survey while in Zimbabwe, little displacement is evident in either survey.[7] Although these birth ratios can provide an indication of the overall quality of the data, displacement does not affect the fertility rates utilized here since the rates are based on births occurring in the three years prior to the survey and displacement chiefly affects births in the fifth and sixth years prior to the survey. For Ghana (1993) , however, we use a five-year fertility rate because the three-year rate would be biased downward by the displacement in the third year prior to the survey.

[6] Interestingly, 99 percent of birth dates were completely reported in the Senegal WFS (Arnold, 1990).

[7] In Zimbabwe, a three-year health section was used, but a six-year event history calendar was also part of the questionnaire.

Table 4.2 Indicators of birth history quality, Demographic and Health Surveys, 1986-1994

| Country | Percent of births in the past 15 years with month and year reported | | Birth ratio[1] five years prior to survey | |
|---|---|---|---|---|
| | Earlier survey | Later survey | Earlier survey | Later survey |
| Ghana | 79.4 | 82.1 | 100.8 | 72.2 |
| Kenya | 97.2 | 91.4 | 79.0 | 86.5 |
| Senegal | 81.6 | 59.4 | 88.7 | 82.5 |
| Zimbabwe | 99.6 | 99.7 | 97.2 | 91.9 |

[1] The birth ratio x years before the survey = $(B_x/0.5\,(B_{x-1} + B_{x+1})) \times 100$ where $B_x$ = number of births x years before the survey. For Ghana and Zimbabwe, birth ratio for later survey refers to three years prior to survey.

Figure 4.1 graphs the number of births per year in each of the later surveys. While the displacement in all of the surveys, except Zimbabwe, is obvious, there is no evidence that births have been omitted. Although omission is difficult to detect, note that in each survey the number of births in each year is fairly constant until the displacement occurs, followed by the numbers dropping back to approximately the same level as before the displacement. In surveys with significant omission of births, the number of births is usually lower in the years just prior to the survey compared with earlier years (Marckwardt and Rutstein, 1996).

The birth history data can also be evaluated by comparing estimates of fertility derived from different surveys. In Figure 4.2, cumulative fertility rates for women age 15-39 are shown for various years as calculated from the two surveys for each country. The rates are cumulated only up to age 39 due to truncation as one moves farther back in time. The rates for Ghana are remarkably consistent and actually overlap in overlapping years. In Kenya and Zimbabwe, the rates are also quite consistent; in both countries, however, there is a pattern of higher rates derived from the later survey compared with the earlier survey for overlapping years. This pattern is consistent with birth displacement backward in time. The same pattern occurs in Senegal but the magnitude of the discrepancy is greater with approximately a half a child difference between the two estimates in the overlapping years. This discrepancy has been noted in a previous analysis of birth history data for Senegal and was attributed to displacement of births beyond those associated with the five-year cutoff period discussed above (Pison et al., 1995).

Figure 4.1 Number of births by calendar years prior to survey, Ghana, Kenya, Senegal, and Zimbabwe

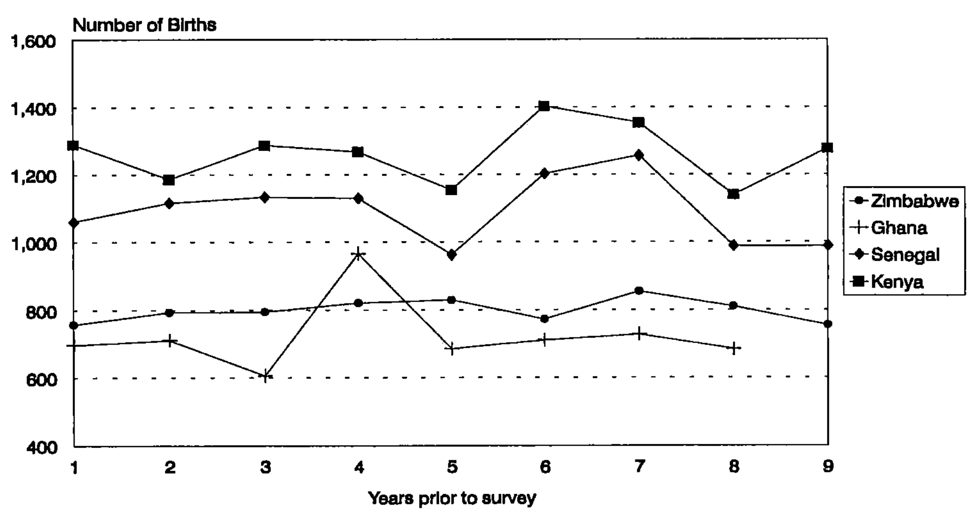
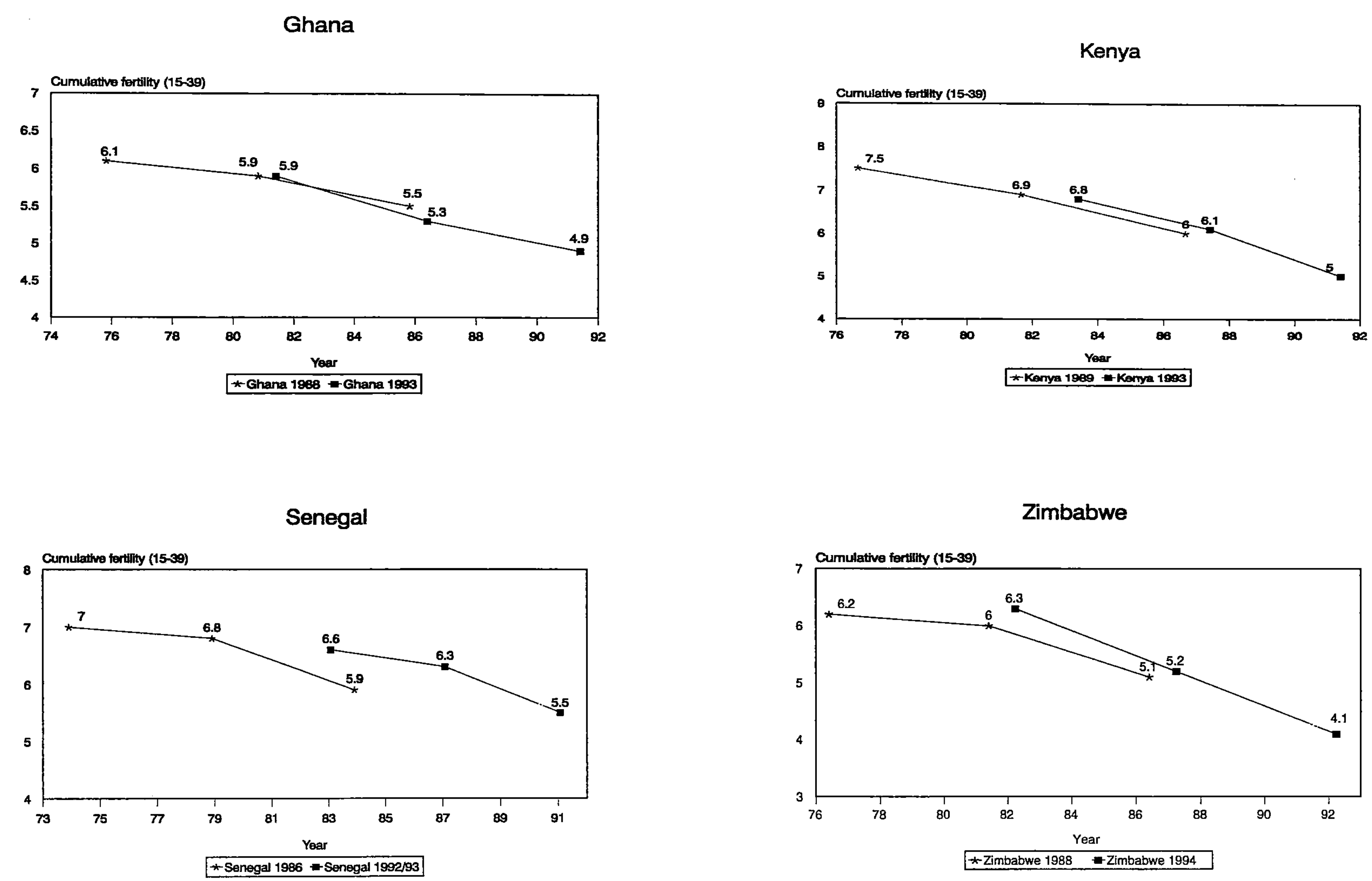


Figure 4.2 Cumulative fertility rates for women 15-39 calculated from two surveys for each country, Ghana, Kenya, Senegal, and Zimbabwe



Overall, the analysis of data quality suggests:

- There is possibly some overreporting or misreporting of the use of periodic abstinence, especially in Ghana. There is no evidence that misreporting decreased over time which suggests that this is not a possible explanation for excess fertility decline.
- The quality of the birth history data is acceptable, but has not improved in all countries over time.
- There is no evidence that omission of births is a significant problem in any survey.
- Displacement that would affect fertility rates for the period closest to the survey has probably occurred in all countries except Zimbabwe and was considerably worse in Ghana in the second survey. The effect of the increase in displacement in Ghana has been minimized here by the use of a fertility rate which spans the years in which displacement is worst.

## 4.2 TIMING OF MEASUREMENT

Another possible explanation for the unexpected declines in fertility is related to the timing of measurement. Contraceptive prevalence is measured at the time of the survey, while the total fertility rate measures fertility at a point centered in the middle of the period for which the rate is calculated. This is true for all of the observations included in the calculation of the "standard" regression line, so some lag time is incorporated into the statistical relationship. If contraceptive prevalence is increasing extremely rapidly, however, it takes some time for fertility to "catch up." It may appear, as in the case of the earlier surveys in Kenya and Zimbabwe, that fertility is "too high" for the prevalence rate. As fertility catches up, however, it becomes more in line with the prevalence rate and a decline greater than expected could occur. This describes the situation in Kenya and Zimbabwe, where large increases in contraceptive prevalence occurred shortly before the first survey and fertility had not yet caught up. By the time of the second survey, the fertility rate is closer to the expected level.

In Kenya, contraceptive prevalence increased from 17 percent in 1984 to 27 percent in 1989 (NCPD and IRD, 1989). If one predicts the 1989 TFR based on the 1984 prevalence figure, a discrepancy of 0.8 children is observed compared with the discrepancy of 1.3 children which results if the 1989 prevalence rate is used to predict the 1989 TFR. However, when the 1989 contraceptive prevalence is used to predict the 1993 TFR, the two figures match exactly (5.4). Similarly, in Zimbabwe, use of the 1984 prevalence figure of 38 percent results in a discrepancy of 0.8 children compared with the 1988 figure while use of the 1988 CPR results in a discrepancy of 1.1 children (CSO and IRD, 1989). When the 1988 prevalence rate is used to predict the 1994 TFR, the numbers match exactly (4.3).

## 4.3 PROXIMATE DETERMINANTS

### 4.3.1 Contraceptive Use

A shift to more effective contraceptive methods could contribute to an acceleration of fertility decline. In order for this shift to account for discrepancies between fertility and contraceptive use, the increase in prevalence would have to be accompanied by a shift to effective methods that is *greater* than for other countries at the same overall level of contraceptive prevalence. This is because the statistical relationship between the total fertility rate and contraceptive prevalence is based on data from a large number of countries with some average level of contraceptive effectiveness.

Table 4.3 shows the distribution of contraceptive use for each country at two points in time and the average distribution of use across 167 surveys as calculated by Ross and Frankenberg (1993). In Ghana, about 40 percent of married users were using modern methods in 1988 compared with 60 percent on average among countries at the same level of overall prevalence. By 1993, almost 50 percent were using modern methods, still significantly lower than the 60 percent average. In Kenya, the percentage using modern methods was less than average in 1989, but more than average at 84 percent in 1993. The same is true in Senegal. In Zimbabwe, the distribution of use heavily favored modern methods in 1988/89 and was even more weighted toward modern methods in 1994. In both years, modern methods represented a significantly greater share of use than in countries at similar overall levels of prevalence. Thus, in Kenya and Senegal, the changes in the distribution of use may have contributed to a greater than expected decline in fertility.

Another possibility is that a shift from use for spacing purposes to use for limiting purposes has resulted in more effective and longer use, which would contribute to a decline in fertility. Averaged across 23 surveys in sub-Saharan Africa, the percentage of users using for spacing purposes is 52 percent versus 48 percent for limiting (Table 4.4). The same percentages averaged across 29 non sub-Saharan African surveys is 25 percent for spacing and 75 percent for limiting (Westoff and Bankole, 1995). Thus, on average, a much greater percentage of use in sub-Saharan Africa is for spacing compared with countries outside of sub-Saharan Africa.

Table 4.3 Distribution of contraceptive users by type of method, Demographic and Health Surveys, 1986-1994

| | Ghana | | Kenya | | Senegal | | Zimbabwe | | Average across 167 surveys[1] by age group | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 | <20 | 20-39 | 40-59 | 60+ |
| CPR | 12.9 | 20.3 | 26.0 | 32.7 | 4.6 | 6.7 | 43.1 | 48.1 | | | | |
| Modern | 40.3 | 49.8 | 66.5 | 83.5 | 52.2 | 71.7 | 83.8 | 87.7 | 60.0 | 75.0 | 76.0 | 85.0 |
| Traditional | 59.7 | 50.3 | 33.5 | 16.5 | 47.8 | 28.4 | 16.2 | 12.3 | 40.0 | 25.0 | 24.0 | 15.0 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

[1] Ross and Frankenberg, 1993:12

Table 4.4 Distribution of contraceptive users by fertility intention, Demographic and Health Surveys, 1986-1994

| | Ghana | | Kenya | | Senegal | | Zimbabwe | | Average[1] | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 | 23 sub-Saharan surveys | 29 non-sub-Saharan surveys |
| Using for spacing | 62.0 | 51.7 | 32.0 | 30.3 | U | 58.1 | 63.8 | 56.1 | 52.3 | 25.4 |
| Using for limiting | 38.0 | 48.3 | 68.0 | 69.7 | U | 41.9 | 36.2 | 43.9 | 47.7 | 74.6 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

[1] Westoff and Bankole, 1995
U = Unknown (not available)

The distribution of use by fertility preference for the four countries at two points in time is also shown in Table 4.4. In Ghana and Zimbabwe, there was a significant shift between the surveys to use for limiting. Nevertheless, the share of use for limiting at the time of the second survey remains far lower than in countries outside of sub-Saharan Africa. In Senegal as well, the distribution of use at the second survey is about average for sub-Saharan Africa with a significantly lower portion for limiting than in other countries. In Kenya, on the other hand, the share of use for limiting far exceeds the average for sub-Saharan Africa and is relatively close to the average for non sub-Saharan countries (70 vs. 75 percent).

### 4.3.2 Marriage

Changes in marriage patterns affect fertility primarily through women's exposure to sexual intercourse. If fertility takes place only within marriage (an assumption which is inexact for much of sub-Saharan Africa), then an increase in age at marriage should result in a decrease in fertility. Overall, as measured by the median age at marriage for women age 20-49 (calculated from the woman's date of marriage and her date of birth), there is some evidence that age at marriage increased in Ghana, Kenya, and Zimbabwe in the period between the two DHS surveys (Table 4.5). No increase is evident in Senegal. In addition, in all four countries, age at marriage increases from the older to the younger cohorts. It is worth noting,

Table 4.5 Median age at marriage by current age, Demographic and Health Surveys, 1986-1994

| | Median age at marriage | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Ghana | | Kenya | | Senegal | | Zimbabwe | |
| Current age | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| 20-24 | 18.7 | 19.0 | 19.8 | - | 17.2 | 17.5 | 19.7 | 19.8 |
| 25-29 | 18.5 | 18.9 | 18.6 | 19.5 | 16.7 | 16.5 | 18.8 | 19.3 |
| 30-34 | 18.1 | 18.6 | 17.9 | 18.9 | 16.5 | 16.0 | 18.5 | 18.7 |
| 35-39 | 18.1 | 19.0 | 17.9 | 18.2 | 16.2 | 16.0 | 19.0 | 18.8 |
| 40-44 | 17.6 | 18.7 | 17.3 | 18.3 | 16.1 | 15.8 | 18.1 | 18.9 |
| 45-49 | 17.8 | 19.0 | 18.5 | 18.1 | 15.9 | 15.8 | 18.6 | 18.9 |
| 20-49 | 18.3 | 18.9 | 18.5 | 19.2 | 16.6 | 16.4 | 18.6 | 18.9 |

however, that a comparison of the reported age at marriage in the two surveys for approximately the same cohorts (e.g., women age 25-29 at the earlier survey and women age 30-34 at the later survey), reveals a pattern that suggests women report higher ages at marriage as they get older, except in Senegal. In all countries, women in the same (or approximately the same) cohort tend to report a higher age at marriage at the time of the second survey. This is especially the case for the older cohorts, casting some doubt on the reporting of date of marriage (see Gage, 1995).

At the same time, the proportions in Table 4.6 portray a clear picture of decline in early marriage in Senegal where the proportion never married increased from 57 to 71 and from 23 to 32 among women age 15-19 and 20-24, respectively. Small, but consistent, decreases in early marriage are evident in the other three countries as well. As will be discussed in a later section, however, delayed marriage does not necessarily imply delayed age at sexual intercourse and, therefore, exposure to the risk of pregnancy. The changes in the pattern of marriage have certainly contributed to fertility declines in the four countries but probably cannot explain the unexpectedly large declines.

### 4.3.3 Postpartum Insusceptibility

Data shown in Table 4.7 suggest that the duration of postpartum insusceptibility (either amenorrhea or abstinence) has not changed appreciably in any country. The duration of breastfeeding may have increased slightly in Ghana, Kenya, and Senegal, but the increases are too small to be significant. Abstinence may also have increased slightly, but the differences are trivial.

Some authors have suggested, however, that an unusually high level of overlap between contraceptive use and postpartum insusceptibility may result in a contraceptive prevalence rate that is 'too high' for the level of fertility at a given point in time. This explanation has been applied to the contraceptive prevalence/TFR inconsistency in Zimbabwe in the 1980s (Boohene and Dow, 1987; Adamchak and Mbvizo, 1990) and a recent study of postpartum behavior shows that the phenomenon persisted

Table 4.6 Percent of women never married among women age 15-19 and 20-24, Demographic and Health Surveys 1986-1994

| | Ghana | | Kenya | | Senegal | | Zimbabwe | |
|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| 15-19 | 75.6 | 77.6 | 79.8 | 83.8 | 56.5 | 70.5 | 80.2 | 79.2 |
| 20-24 | 22.6 | 24.7 | 31.8 | 35.5 | 22.6 | 32.1 | 28.5 | 28.4 |

Table 4.7 Mean duration of breastfeeding, postpartum amenorrhea, postpartum abstinence and postpartum insusceptibility (months), Demographic and Health Surveys, 1986-1994

| | Ghana | | Kenya | | Senegal | | Zimbabwe | |
|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| Breastfeeding | 20.4 | 21.6 | 19.4 | 20.4 | 18.8 | 20.4 | 19.3 | 18.2 |
| Amenorrhea | 14.0 | 14.1 | 10.9 | 11.4 | 16.2 | 15.3 | 12.6 | 12.6 |
| Abstinence | 13.5 | 14.1 | 5.9 | 6.4 | 7.9 | 7.5 | 4.3 | 6.5 |
| Insusceptibility | 18.1 | 18.1 | 12.6 | 13.7 | 17.5 | 17.1 | 13.6 | 14.6 |

Note: Means are prevalence/incidence.

into the 90s (Sambisa and Curtis, 1997).[8] For purposes of explaining unusually large declines in fertility over time, this hypothesis would suggest that if the prevalence of 'redundant use' declined significantly while the overall level of contraceptive use remained the same or increased ,a rapid drop in fertility would result. Changes in the level of redundant use could result either from shorter durations of breastfeeding or abstinence, or from women initiating use at longer durations since birth. As shown in Table 4.8, the proportion of currently married users who are either amenorrheic or postpartum abstaining has, in fact, decreased in all four countries, *except* Zimbabwe. In Zimbabwe, the proportion of use that is redundant remained virtually unchanged between 1988 and 1994, so this cannot help explain the unexpected drop in fertility.

### 4.3.4 Bongaarts' Model

The contribution of each of the proximate determinants to observed fertility may be summarized by computing indices from the Bongaarts' proximate determinants model at each point in time (for a complete description of the model see Bongaarts and Potter, 1983; Casterline et al., 1984). The model quantifies the inhibiting effects of marriage, postpartum infecundability, contraceptive use, and abortion on maximum biological fertility and may be written as follows:

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

where TFR = the total fertility rate
$TF$ = the total fecundity rate
$C_m$ = index of marriage
$C_c$ = index of contraception
$C_i$ = index of infecundability
$C_a$ = index of abortion.

The indices range in value from 0 to 1. Since the model is multiplicative, the closer the value of an index is to 0, the greater effect it has on reducing fertility from its biological maximum (the total fecundity rate).

Table 4.8 Percentage of currently married contraceptive users who are either amenorrheic or postpartum abstaining, Demographic and Health Surveys, 1986-1994

| Ghana | | Kenya | | Senegal | | Zimbabwe | |
|---|---|---|---|---|---|---|---|
| 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| 27.3 | 13.9 | 14.4 | 9.8 | 24.4 | 20.7 | 25.7 | 26.0 |

[8] The study finds that 59 percent of births occurring in the three years before the 1994 survey were followed by a period of overlap between contraceptive use and postpartum amenorrhea, and the median duration of this overlap was 12 months.

The usual specification of the model incorporates the assumption that all childbearing takes place within marriage (marriage being a proxy for exposure to sexual intercourse). That this assumption is unrealistic in some settings can be seen by the fact that between 10 and 28 percent of women in the four countries under study gave birth before their first marriage (Westoff et al., 1994). Further, the calculation of the index of marriage ($C_m$) as usually specified results in predicted fertility levels for the four countries that are often significantly below observed levels.[9] We therefore also calculate an alternative index of exposure to sexual intercourse ($C_e$) by using a fertility rate that divides all births to women who ever had sexual intercourse by all exposure subsequent to first intercourse. This index represents the reduction in fertility attributable to non-exposure to sexual intercourse. It equals one if all women are exposed to sexual intercourse continuously from age 15 to age 49. While the $C_m$ index as normally calculated probably overestimates the effect of non-exposure in these countries, the $C_e$ index probably under-estimates this effect since the frequency of sexual inter-course for many never married women is low compared with married women (Blanc and Rutenberg, 1991).

Unfortunately, it is not possible to estimate with any accuracy the effect of induced abortion on fertility levels in these four countries since abortion prevalence data do not exist. Anecdotal and other limited evidence from sub-Saharan Africa suggests that the incidence of induced abortion may be quite high and increasing, but few reliable estimates of its prevalence exist (Coeytaux, 1988). In a recent paper, however, Johnston and Hill (1996) indirectly estimate the index of abortion ($C_a$) for 26 countries using DHS data. Of the four countries included here, only two—Kenya and Senegal—are included in Johnston and Hill's analysis. Their estimates suggest that the effect of abortion was negligible in both countries at the time of the first survey but had increased substantially by the time of the second survey. $C_a$ was estimated at .80 in Senegal and .75 in Kenya for the later surveys.

The four indices of the Bongaarts model are shown in Table 4.9. The value of $C_i$ varies little from one period to the next, reflecting the stability over time in the duration of postpartum insusceptibility. Normally, the overall effect of postpartum infecundability would be expected to decrease as the effects of contraception and delayed marriage increase (Bongaarts and Kirmeyer, 1982). This does not appear to be the case here, however, which may be an additional contributing factor to the unexpectedly large fertility declines

The value of $C_c$, which incorporates both increases in contraceptive prevalence and average method effective-ness, decreases in all countries as expected. The decline is particularly large in Zimbabwe, where the value of $C_c$ decreased by 12 percent. The value of $C_m$ declines by approximately 5 percent in Senegal and Kenya, by 3 percent in Zimbabwe and remains the same in Ghana. In contrast, $C_e$ declines in Ghana and Zimbabwe, but not in Kenya. (It is not possible to calculate this index for the earlier survey in Senegal because information on age at first sex was not collected.) Clearly, although postpartum insusceptibility remains the proximate determinant with the greatest overall effect on the reduction of fertility levels, the greatest change has occurred in the effect of contraceptive use.

Table 4.9 Bongaarts' model indices, Demographic and Health Surveys, 1986-1994

| | $C_i$ | | | $C_c$ | | | $C_m$ | | | $C_e$ | | | TF[1] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Earlier survey | Later survey | % change | Earlier survey | Later survey | % change | Earlier survey | Later survey | % change | Earlier survey | Later survey | % change | Earlier survey | Later survey |
| Ghana | .55 | .55 | 0 | .87 | .80 | -8.1 | .84 | .84 | 0 | .98 | .95 | -3.2 | 13.6 | 13.1 |
| Kenya | .64 | .62 | -3.2 | .72 | .66 | -9.1 | .80 | .76 | -5.3 | .95 | .95 | 0 | 15.3 | 13.9 |
| Senegal | .56 | .56 | 0 | .95 | .93 | -2.2 | .85 | .81 | -4.9 | U | .87 | U | U | 13.2 |
| Zimbabwe | .62 | .60 | -3.3 | .56 | .50 | -12.0 | .75 | .73 | -2.7 | .87 | .84 | -3.6 | 17.8 | 17.1 |

[1] Calculated with $C_e$
U = Unknown (not available)

[9] Fertility levels are predicted with the equation: $TFR = 15.3 \times C_i \times C_c \times C_m$

Total fecundity rates (TF) are calculated from the indices and are also shown in Table 4.9. These rates represent what the level of fertility would be if all women had maximum exposure to sexual intercourse, if no one used contraception and there was no breastfeeding or postpartum abstinence. In theory, total fecundity should be approximately equal in all populations and Bongaarts estimates its value at around 15.3. Total fecundity rates estimated for the four countries are mostly well below 15.3, except in Zimbabwe, where they are 17.8 and 17.1 for the earlier and later surveys, respectively. It is interesting that in the three countries for which the calculation is possible, the value of TF is lower in the second survey than in the first survey. Some of the factors that may result in a value of TF lower than 15.3 include omitted proximate determinants (e.g., abortion), errors in the data, and approximations used in estimating the indices (United Nations, 1987). Although Bongaarts maintains that total fecundity is probably constant across populations, we suggest that the observed variations in TF may be due partly to differences in coital frequency that exist within and across populations. We examine variations in coital frequency below.

## 4.4 ADJUSTMENT OF SEXUAL BEHAVIOR

Next, we consider the likelihood that fertility regulating behavior that is not captured by standard measures of the proximate determinants may be having some effect on observed fertility decline. The prolongation of birth intervals by abstaining from sex is a traditional and virtually universal practice in sub-Saharan countries. In the same way that historical studies have shown that populations in the past regulated their fertility successfully without resort to "modern" contraception (e.g., Santow, 1995; van de Walle and Muhsam, 1995; Feng et al., 1995; Das Gupta, 1995), evidence indicates that women in African settings have effectively controlled fertility, and have indeed practiced fertility regulation without recourse to "modern" contraception. In contrast to some historical European populations in which withdrawal is thought to be the primary means of regulating births, birth spacing in Africa was achieved by means of a nearly universal taboo on postpartum sexual relations, which varied in length from a few weeks after birth to two or three years in various societies (Schoenmaeckers et al., 1981). In contrast to the practice of postpartum abstinence, however, we hypothesize that couples may also attempt to prolong the birth interval or to avoid additional births altogether by abstaining from sexual intercourse for periods of varying length and without strict regard to the woman's menstrual cycle (i.e., not periodic abstinence). There is scattered evidence that such practices exist in sub-Saharan Africa (also see Tsui et al., 1991 on Sri Lanka; Feng, et al., 1995 on China). For example, in a recent study of two districts in Uganda, 62 percent of married women and 68 percent of their partners recognized "sporadic abstinence"[10] as a method of family planning. This method accounted for 8 percent of total use among women and 14 percent among men (Blanc et al., 1996). Scheonmaeckers et al. (1981) cite anthropological evidence based mostly on populations in East and Southern Africa of the erosion of the postpartum sex taboo; reduced frequency of intercourse and/or withdrawal are used to shorten the period of postpartum abstinence while maintaining appropriate intervals between births. There is also some evidence that various forms of nonpenetrative sex are practiced in some cultures to avoid a pregnancy, especially a premarital one (Olowo-Freers and Barton, 1992; Kies, 1987).

We attempt to examine the evidence for the practice of regulating sexual behavior to achieve fertility goals by utilizing DHS data on sexual intercourse and fertility preferences. If couples adjust their sexual behavior in accordance with their fertility desires, we would expect to find that women who are not using contraception and who wish to avoid or delay a birth would have sexual intercourse less frequently than those who either want a birth soon or are undecided on the matter. If this occurs, then an excess decline in fertility would be expected if the practice became more widespread over time. Even if the practice did not become more widespread over time, however, excess fertility decline could still occur if the distribution of women across categories of fertility preferences shifted toward more women wanting to delay or stop having children.

Table 4.10 presents, for exposed women,[11] results from linear regression models of the number of days since last sexual intercourse for each of the surveys.[12] If one assumes that the probability of coitus is constant, then the

[10] Sporadic abstinence was defined in the study as follows: "In order to prevent pregnancy, some men and women avoid sexual intercourse by various means, such as pretending to be ill, spending nights away from home, or 'facing the wall'."

[11] We define as "exposed" those women who are currently married/living together, not pregnant, not amenorrheic, and who did not declare themselves infecund when asked about future fertility preferences.

[12] The exception is the earlier survey in Senegal because data are not available in that survey on recency of sexual intercourse.

Table 4.10 Linear regression coefficients from model of days since last intercourse among exposed women who had sex in the past 12 months, Demographic and Health Surveys, 1986-1994

| | Not using contraception | | Using a modern method | |
|---|---|---|---|---|
| | Earlier survey | Later survey | Earlier survey | Later survey |
| **Ghana** | | | | |
| Wants 2+ years | 13.7** | 33.0** | -3.6 | 2.8 |
| Undecided | 22.4** | 21.8* | 3.3 | 2.1 |
| Wants no more | 24.1** | 29.7** | 13.8 | 0.2 |
| $R^2$ | 6.2 | 6.6 | 14.7 | 7.2 |
| N | 1,099 | 1,077 | 128 | 275 |
| **Kenya** | | | | |
| Wants 2+ years | 0.8 | 9.4* | 2.6 | 0.2 |
| Undecided | 4.2 | 2.5 | 6.6 | -0.2 |
| Wants no more | 8.4* | 9.5 | 6.0 | 0.2 |
| $R^2$ | 4.8 | 5.4 | 5.4 | 6.0 |
| N | 1,635 | 1,350 | 672 | 1,023 |
| **Senegal** | | | | |
| Wants 2+ years | U | 5.8 | U | 1.3 |
| Undecided | U | 4.9 | U | -1.8 |
| Wants no more | U | 18.5** | U | -2.4 |
| $R^2$ | | 2.5 | | 14.2 |
| N | | 1,723 | | 172 |
| **Zimbabwe** | | | | |
| Wants 2+ years | 10.1* | 24.6** | -1.4 | -4.1 |
| Undecided | 5.1 | 25.0 | -2.4 | 3.7 |
| Wants no more | 5.9 | 23.2** | -0.5 | -1.1 |
| $R^2$ | 1.4 | 3.7 | 1.8 | 1.7 |
| N | 788 | 1,023 | 687 | 1,024 |

Note: Omitted category is *wants another child within 2 years.* Exposed women are married/living together, not pregnant, not amenorrheic, did not declare themselves infecund. Model includes controls for age, number of children ever born, polygynous/monogamous union, ethnicity, level of education, urban-rural residence, and age at first sex.
* p< .05, **p<.01
U = Unknown (not available)

greater the number of days since last intercourse, the lower the frequency of coitus (Leridon, 1993). The calculation is restricted to women who had sexual intercourse at least once in the 12 months preceding the survey and who did not say that they last had sex prior to their last birth in order to eliminate those who are postpartum or "terminally abstaining" and those who are married but not regularly cohabiting with their partner. The models are estimated separately for women who are not using contraception and women who are using modern contraception. The models for women who are using modern contraception are estimated to provide a contrast and to attempt to verify that the results for noncontracepting women are valid. The expectation is that there will be *no* relationship between fertility preferences and coital frequency among users of modern contraception.

Aside from fertility preferences, other variables included in the model are: age, ethnicity, number of children ever born, whether the union is polygynous, level of education, urban-rural residence, and age at first sex. The controls for age and ethnicity are intended to account for the pattern of declining coital frequency with increasing age, and differential coresidence and sexual practices between ethnic groups, respectively. Polygynous unions are distinguished from monogamous ones because coital frequency is generally lower for women (but higher for men) in polygynous unions (Blanc and Gage, forthcoming). Children ever born is included to control for changing fertility preferences with increasing parity. Age at first sex is intended to control for the possible influence of early exposure to sexual intercourse on later coital frequency. The level of education and urban-rural residence are proxies for exposure to Western influences which tend to portray emotional and sexual intimacy within couples as an ideal as opposed to traditional African systems which emphasize familial, rather than conjugal, bonds (Working Group on Factors Affecting Contraceptive Use, 1993).

The mean or percent distribution of each independent variable, except ethnicity, is shown in Tables 4.11 and 4.12. Note that there is a large difference in the mean number of days since last sex between contraceptive users and nonusers, with those who are using contraception having sex on average much more recently than those who are not using. This relationship has been documented in previous research as has a relationship between fertility preferences and coital frequency (Blanc and Rutenberg, 1991; Rutenberg and Blanc, 1991; Wolff and Mason, 1990).

Table 4.11 Distribution and means of variables used in regression of days since last sex, earlier surveys, Demographic and Health Surveys, 1988-89

| | Ghana 1988 | | Kenya 1989 | | Zimbabwe 1988/89 | |
|---|---|---|---|---|---|---|
| | Not using | Using modern | Not using | Using modern | Not using | Using modern |
| **Fertility preference** | | | | | | |
| Wants soon | 40.7 | 11.3 | 24.2 | 4.1 | 50.4 | 13.2 |
| Wants later | 33.5 | 40.6 | 27.6 | 18.0 | 13.1 | 42.6 |
| Undecided | 5.0 | 3.8 | 4.4 | 4.1 | 3.9 | 6.4 |
| Wants no more | 20.8 | 44.4 | 43.4 | 73.7 | 32.4 | 37.7 |
| **Type of marriage** | | | | | | |
| Polygynous | 32.2 | 26.3 | 28.8 | 16.8 | U | U |
| Monogamous | 67.8 | 73.7 | 71.2 | 83.2 | U | U |
| **Residence** | | | | | | |
| Urban | 32.1 | 48.9 | 16.3 | 23.7 | 26.1 | 42.4 |
| Rural | 67.9 | 51.1 | 83.7 | 76.3 | 73.9 | 57.6 |
| **Level of education** | | | | | | |
| None | 46.5 | 27.1 | 38.4 | 27.5 | 49.4 | 12.1 |
| Primary | 48.0 | 62.4 | 49.4 | 44.2 | 36.4 | 57.7 |
| Secondary+ | 5.5 | 10.5 | 12.2 | 28.3 | 14.2 | 30.2 |
| **Mean** | | | | | | |
| Age | 32.2 | 33.3 | 32.3 | 32.9 | 33.9 | 30.7 |
| Children ever born | 3.9 | 4.9 | 4.7 | 5.3 | 4.3 | 4.1 |
| Age at first sex | 16.0 | 15.5 | 15.5 | 16.4 | 16.6 | 17.0 |
| Days since last sex | 36.9 | 18.4 | 23.2 | 14.4 | 15.8 | 10.1 |
| Number of cases (weighted) | 1,124 | 133 | 1,756 | 713 | 811 | 705 |
| Number of cases in regression (unweighted) | 1,099 | 128 | 1,635 | 672 | 788 | 687 |

U = Unknown (not available)

The results in Table 4.10 show that in every survey except the later one in Kenya and the earlier one in Zimbabwe, nonusers of contraception who said that they wanted no more children had sexual intercourse less recently than those who said they wanted a child within the next two years. In Kenya and Zimbabwe, the coefficient is positive but not statistically significant. In general, those who want to delay the next birth by two or more years also had sex less recently than those who want a child soon; this relationship is statistically significant in every survey except the later one in Senegal and the earlier one in Kenya. These results indicate that women who are not using family planning and are exposed to the risk of pregnancy regulate their sexual behavior in accordance with their fertility goals. In contrast, there is no evidence that women who are using modern methods of contraception vary their coital frequency according to their fertility preference.

The interaction of fertility preferences with children ever born was tested in the models to assess the likelihood that the regulation of fertility through sexual behavior becomes stronger as parity increases. Fertility preferences were also interacted with the monogamy/polygyny variable to test the hypothesis that reducing the frequency of sexual intercourse would be more feasible in a relationship in which the male partner has another readily available sexual partner. Neither of these interactions was found to be statistically significant in any country.

Table 4.12 Distribution and means of variables used in regression of days since last sex, later surveys, Demographic and Health Surveys, 1992-1994

| | Ghana 1993 | | Kenya 1993 | | Senegal 1992/93 | | Zimbabwe 1994 | |
|---|---|---|---|---|---|---|---|---|
| | Not using | Using modern | Not using | Using modern | Not using | Using modern | Not using | Using modern |
| **Fertility preference** | | | | | | | | |
| Wants soon | 34.9 | 7.6 | 27.0 | 3.9 | 50.9 | 8.3 | 54.0 | 12.5 |
| Wants later | 27.1 | 33.1 | 25.0 | 19.6 | 20.7 | 35.4 | 11.5 | 40.1 |
| Undecided | 5.6 | 3.6 | 6.6 | 3.4 | 7.1 | 9.9 | 1.7 | 2.7 |
| Wants no more | 32.4 | 47.5 | 41.3 | 52.5 | 21.3 | 37.5 | 32.9 | 37.7 |
| **Type of marriage** | | | | | | | | |
| Polygynous | 32.4 | 24.8 | 23.5 | 11.5 | 53.4 | 32.3 | 22.7 | 12.0 |
| Monogamous | 67.6 | 75.2 | 76.5 | 88.5 | 46.6 | 67.7 | 77.3 | 88.0 |
| **Residence** | | | | | | | | |
| Urban | 32.4 | 51.8 | 15.8 | 21.5 | 29.6 | 20.3 | 25.0 | 40.0 |
| Rural | 67.6 | 48.2 | 84.2 | 78.5 | 70.4 | 79.7 | 75.0 | 60.0 |
| **Level of education** | | | | | | | | |
| None | 47.2 | 14.1 | 27.6 | 12.7 | 87.3 | 39.0 | 20.0 | 9.0 |
| Primary | 47.4 | 66.5 | 56.9 | 52.3 | 9.3 | 29.7 | 56.8 | 48.5 |
| Secondary+ | 5.4 | 19.4 | 15.5 | 35.0 | 3.4 | 31.3 | 23.2 | 42.5 |
| **Mean** | | | | | | | | |
| Age | 32.6 | 32.8 | 31.2 | 32.5 | 32.5 | 34.1 | 33.3 | 30.9 |
| Children ever born | 3.7 | 4.1 | 4.0 | 4.9 | 4.4 | 5.4 | 3.7 | 3.7 |
| Age at first sex | 16.6 | 16.8 | 15.9 | 16.7 | 16.0 | 18.1 | 17.4 | 17.6 |
| Days since last sex | 35.5 | 16.7 | 27.5 | 16.7 | 28.9 | 7.3 | 24.0 | 12.5 |
| Number of cases (weighted) | 1,085 | 278 | 1,448 | 1,123 | 1,834 | 192 | 1,039 | 1,153 |
| Number of cases (unweighted) | 1,077 | 275 | 1,350 | 1,023 | 1,723 | 172 | 1,023 | 1,024 |

Table 4.13 Predicted number of days since last intercourse among exposed women who are not using contraception, by fertility preference, Demographic and Health Surveys, 1988-1994

| | Ghana | | Kenya | | Senegal | | Zimbabwe | |
|---|---|---|---|---|---|---|---|---|
| | 1988 | 1993 | 1989 | 1993 | 1986 | 1992/93 | 1988/89 | 1994 |
| Wants soon (1) | 26.5 | 16.5 | 19.9 | 20.8 | U | 23.4 | 12.0 | 13.0 |
| Undecided (2) | 27.6 | 17.7 | 20.1 | 20.9 | U | 23.7 | 12.3 | 13.4 |
| Wants later (3) | 31.0 | 25.4 | 20.1 | 23.1 | U | 24.6 | 13.4 | 15.8 |
| Wants no more (4) | 31.5 | 26.1 | 23.5 | 25.7 | U | 27.3 | 14.0 | 20.8 |
| (4) - (1) | 5.0 | 9.6 | 3.6 | 3.9 | U | 3.9 | 2.0 | 7.6 |

Note: *Exposed women* are married/living together, not pregnant, not amenorrheic, did not declare themselves infecund.
U = Unknown (not available)

There is also some evidence that the magnitude of the relationship between fertility preferences and the frequency of intercourse among noncontracepting women has increased over time in the three countries for which the comparison is possible. Among women who want no more children, the coefficient increases from 24 to almost 30 in Ghana, from 8 to 9.5 in Kenya, and from 6 to 23 in Zimbabwe. Similarly, the size of the coefficients increases in all three countries among women who want to delay the next birth.

Table 4.13 shows the predicted number of days since last intercourse for exposed women who are not using contraception by fertility preference. The predicted values were obtained by using the coefficients from the regression models and the mean value of each dependent variable. Thus, the predicted values incorporate the effects of both the changes in the size of the coefficients over time as well as any shifts in the distributions of women across categories of fertility preference. The table shows a clear pattern in every survey in which the predicted number of days since last intercourse increases from those who want another birth soon, to those who are undecided, to those who want to delay the next birth, to those who want to avoid another birth. Furthermore, the difference in the number of days since last intercourse between those who want a child soon and those who do not want another birth has increased over time in the three countries in which the comparison is possible, although the increase in very small in Kenya.

Definitive evidence that the practice of regulating sexual behavior to control fertility is widespread enough and effective enough to influence overall fertility levels in these countries would require more direct and detailed information. The data do suggest, however, that fertility regulating behavior which is not captured by the standard measurement of contraceptive use exists in these countries and that the difference in sexual behavior between those who do not want to get pregnant soon and those who do has widened over time, at least in Ghana and Zimbabwe. This widening difference may be part of the explanation for excess fertility decline in these countries.

# 5 Discussion and Conclusion

This analysis has revealed a number of factors that have contributed to larger than expected fertility declines in these four countries. A strong shift to the use of more effective methods of contraception is evident in Kenya and Senegal, resulting in a distribution of use by method that favors modern methods more than countries at similar overall levels of prevalence. Accompanied by increases in overall prevalence, this shift has undoubtedly played a large role in accelerated rates of decline. In Ghana, a shift to modern methods has also occurred, but it remains a country with a lower than average share of use of modern methods. At the same time, in all four countries women's fertility preferences have altered such that more users of contraceptive methods are those who want no more children compared with those who want to delay the next birth. Only in Kenya, however, does the proportion of users who wish to limit their fertility even approach the levels found outside of sub-Saharan Africa.

Sexual abstinence which is not associated with postpartum sexual taboos and which is not practiced with strict regard to the woman's menstrual cycle may contribute to the larger than expected declines in fertility. We have examined some data which suggest that a form of "sporadic abstinence" or reduced coital frequency may be practiced by couples who are attempting to delay the next birth or avoid one altogether. This is a practice which would not be captured by standard DHS questions on contraceptive use. While sporadic abstinence is not a very effective long-term method for individual couples, in the aggregate it could bring down fertility levels. The data suggest that the adjustment of coital frequency to coincide with fertility goals occurs to some degree in all of the countries examined here. Further, we find that the relationship between fertility preferences and coital frequency has strengthened over time.

Amenorrhea associated with prolonged breastfeeding and the practice of postpartum abstinence are the most significant factors reducing fertility from its maximum level in these countries. It is clear, however, that the duration of this behavior has not changed much over the past several years. The role of changes in postpartum insusceptibility in fertility change appears, therefore, to be minimal although that lack of change may have contributed to larger than expected declines given the increase in contraceptive prevalence because declines in postpartum insusceptibility generally accompany increases in contraceptive use. At the same time, the extent of overlap between postpartum insusceptibility and contraceptive use has decreased in Ghana, Kenya, and Senegal which, other things being equal, would yield a stronger fertility effect for the same contraceptive prevalence.

The role of marriage is much more difficult to assess. Definitional uncertainties surrounding marriage and its use as a proxy for exposure to sexual intercourse in sub-Saharan Africa combined with doubts about the quality of marriage data in these four countries preclude clear conclusions. Relatively early initiation of marriage continues to be the norm in these four countries. Nevertheless, there is a general tendency toward later marriage and perhaps slightly later initiation of sexual intercourse which has contributed to the observed declines although perhaps not as much as would be expected given the increases in contraceptive prevalence.

The speed at which the adoption of contraception has occurred, particularly in Zimbabwe and Kenya, is likely to have created a situation in which fertility levels as estimated from a birth history, "lag behind" the level of contraceptive use. Although this lag effect occurs to some extent in all countries, if it is greater in these four countries than elsewhere, the countries would be unlikely to fit the standard regression line. In fact, in Zimbabwe and Kenya, this effect may largely explain the unexpected declines in fertility since use of the contraceptive prevalence rate from the earlier survey results in a predicted total fertility rate that exactly matches that observed in the later survey.

Finally, our inability to include reliable quantitative measures of the prevalence of induced abortion in our assessment severely handicaps our capacity to tell the whole fertility story. The lack of information on induced abortion is a continuing problem for which there is no practical solution in sight (Huntington et al., 1996).

In many ways, the unexpectedly large fertility declines observed in Ghana, Kenya, Senegal, and Zimbabwe are the result of differing changes in components. A strong common thread in the evidence is not apparent. What is clear is that in Kenya and Zimbabwe, declines that began in the mid-1980s are continuing, perhaps with increasing velocity, in the 1990s. In Senegal and Ghana, the latest evidence confirms earlier tentative indications that fertility had begun to decline (Arnold and Blanc, 1990). The evidence for a different kind of fertility transition in sub-Saharan Africa is mixed. The fact that fertility levels were higher than expected in Kenya and Zimbabwe for some time before they began to drop, while this was not the case in Ghana and Senegal, would seem to belie a general pattern. One common result, however, is that postpartum behavior (breastfeeding and abstinence) does not seem to have changed significantly in any of the four countries. It may be the case that, unlike most other regions, long periods of postpartum insusceptibility that result from a combination of breastfeeding and abstinence will continue to be common in sub-Saharan Africa even as contraceptive use increases and early marriage declines. On the other hand, couples may increasingly adopt modern contraceptive methods to ensure desired birth interval length and make long periods of abstinence unnecessary (Bledsoe et al., 1994).

What is clear is that the speed of fertility decline in some of sub-Saharan countries in recent years is almost unprecedented and that this speed is what may characterize African fertility transitions in the future. Examination of the veracity and characteristics of this decline are important if we are to understand the nature of fertility decline in general. Our analysis is a step in this direction. As evidence accumulates of incipient fertility declines in other sub-Saharan countries and of speedy declines that are taking place in other areas of the world, further analysis and continued efforts to improve data quality are warranted.

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# Appendix

## Summary of DHS-I, DHS-II, and DHS-III Surveys, 1985-1996

| Region and Country | Date of Fieldwork | Implementing Organization | Respondents | Sample Size | Male/Husband Survey | Supplemental Studies, Modules, and Additional Questions |
|---|---|---|---|---|---|---|
| **SUB-SAHARAN AFRICA** | | | | | | |
| **DHS-I** | | | | | | |
| Botswana | Aug-Dec 1988 | Central Statistics Office | AW 15-49 | 4,368 | | AIDS, PC, adolescent fertility |
| Burundi | Apr-Jul 1987 | Département de la Population, Ministère de l'Intérieur | AW 15-49 | 3,970 | 542 Husbands | CA, SAI, adult mortality |
| Ghana | Feb-May 1988 | Ghana Statistical Service | AW 15-49 | 4,488 | 943 Husbands | CA, SM, WE |
| Kenya | Dec-May 1988/89 | National Council for Population and Development | AW 15-49 | 7,150 | 1,133 Husbands | |
| Liberia | Feb-Jul 1986 | Bureau of Statistics, Ministry of Planning and Economic Affairs | AW 15-49 | 5,239 | | TBH, employment status |
| Mali | Mar-Aug 1987 | Institut du Sahel, USED/CERPOD | AW 15-49 | 3,200 | 970 Men 20-55 | CA, VC, childhood physical handicaps |
| Ondo State, Nigeria | Sep-Jan 1986/87 | Ministry of Health, Ondo State | AW 15-49 | 4,213 | | CA, TBH |
| Senegal | Apr-Jul 1986 | Direction de la Statistique, Ministère de l'Economie et des Finances | AW 15-49 | 4,415 | | CA, CD |
| Sudan | Nov-May 1989/90 | Department of Statistics, Ministry of Economic and National Planning | EMW 15-49 | 5,860 | | FC, M, MM |
| Togo | Jun-Nov 1988 | Unité de Recherche Démographique, Université du Benin | AW 15-49 | 3,360 | | CA, SAI, marriage history |
| Uganda | Sep-Feb 1988/89 | Ministry of Health | AW 15-49 | 4,730 | | CA, SAI |
| Zimbabwe | Sep-Jan 1988/89 | Central Statistical Office | AW 15-49 | 4,201 | | AIDS, CA, PC, SAI, WE |
| **DHS-II** | | | | | | |
| Burkina Faso | Dec-Mar 1992/93 | Institut National de la Statistique et de la Démographie | AW 15-49 | 6,354 | 1,845 Men 18+ | AIDS, CA, MA, SAI |
| Cameroon | Apr-Sep 1991 | Direction Nationale du Deuxième Recensement Général de la Population et de l'Habitat | AW 15-49 | 3,871 | 814 Husbands | CA, CD, SAI |
| Madagascar | May-Nov 1992 | Centre National de Recherches sur l'Environement | AW 15-49 | 6,260 | | CA, MM, SAI |
| Malawi | Sep-Nov 1992 | National Statistical Office | AW 15-49 | 4,850 | 1,151 Men 20-54 | AIDS, CA, MA, MM, SAI |
| Namibia | Jul-Nov 1992 | Ministry of Health and Social Services, Central Statistical Office | AW 15-49 | 5,421 | | CA, CD, MA, MM |
| Niger | Mar-Jun 1992 | Direction de la Statistique et des Comtes Nationaux | AW 15-49 | 6,503 | 1,570 Husbands | CA, MA, MM, SAI |
| Nigeria | Apr-Oct 1990 | Federal Office of Statistics | AW 15-49 | 8,781 | | CA, SAI |
| Rwanda | Jun-Oct 1992 | Office National de la Population | AW 15-49 | 6,551 | 598 Husbands | CA |
| Senegal | Nov-Aug 1992/93 | Direction de la Prévision et de la Statistique | AW 15-49 | 6,310 | 1,436 Men 20+ | AIDS, CA, MA, MM, SAI |

| | | | | | | |
|---|---|---|---|---|---|---|
| Tanzania | Oct-Mar 1991/92 | Bureau of Statistics, Planning Commission | AW 15-49 | 9,238 | 2,114 Men 15-60 | AIDS, CA, MA, SAI |
| Zambia | Jan-May 1992 | University of Zambia | AW 15-49 | 7,060 | | AIDS, CA, MA |
| **DHS-III** | | | | | | |
| Benin | Jun-Aug 1996 | Institut National de la Statistique | AW 15-49 | 5,491 | 1,535 Men 20-64 | AIDS, CA, MA, MM, SAI |
| Central African Republic | Sep-Mar 1994/95 | Direction des Statistiques Démographiques et Sociales | AW 15-49 | 5,884 | 1,729 Men 15-59 | AIDS, CA, CD, MA, MM, SAI |
| Comoros | Mar-May 1996 | Centre National de Documentation et de la Recherche Scientifique | AW 15-49 | 3,050 | 795 Men 15-64 | CA, MA |
| Côte d'Ivoire | Jun-Nov 1994 | Institut National de la Statistique | AW 15-49 | 8,099 | 2,552 Men 12-49 | CA, MA, SAI |
| Eritrea | Sep-Jan 1995/96 | National Statistics Office | AW 15-49 | 5,054 | 1,114 Men 15-59 | AIDS, CA, MA, MM, SAI |
| Ghana | Sep-Dec 1993 | Ghana Statistical Service | AW 15-49 | 4,562 | 1,302 Men 15-59 | CA, MA |
| Kenya | Feb-Aug 1993 | National Council for Population and Development | AW 15-49 | 7,540 | 2,336 Men 15-54 | AIDS, CA, MA, SAI |
| Malawi (KAP)[a] | Jun-Oct 1996 | National Statistical Office | AW 15-49 | 2,683 | 2,658 Men 15-54 | AIDS |
| Mali | Nov-Apr 1995/96 | CPS/MSSPA et DNSI | AW 15-49 | 9,704 | 2,474 Men 15-59 | AIDS, CA, MA, MM, SAI |
| Tanzania (KAP)[a] | Jul-Sep 1994 | Bureau of Statistics, Planning Commission | AW 15-49 | 4,225 | 2,097 Men 15-59 | AIDS, PC |
| Tanzania (In-depth) | Jun-Oct 1995 | Bureau of Statistics, Planning Commission | AW 15-49 | 2,130 | | Adult and childhood mortality estimation |
| Tanzania | Jul-Nov 1996 | Bureau of Statistics, Planning Commission | AW 15-49 | 8,120 | 2,256 Men 15-59 | AIDS, CA, MA, MM |
| Uganda | Mar-Aug 1995 | Statistics Department, Ministry of Finance and Economic Planning | AW 15-49 | 7,070 | 1,996 Men 15-59 | AIDS, CA, MA, MM, SAI |
| Uganda (In-depth) | Oct-Jan 1995/96 | Institute of Statistics and Applied Economics, Makerere University | AW 20-44 | 1,750 | 1,356 Partners | Negotiating reproductive outcomes |
| Zambia | Jul-Jan 1996/97 | Central Statistics Office | AW 15-49 | 8,021 | 1,849 Men 15-59 | AIDS, CA, MA, MM |
| Zimbabwe | Jul-Nov 1994 | Central Statistical Office | AW 15-49 | 6,128 | 2,141 Men 15-54 | AIDS, CA, MA, MM, PC, SAI |
| **NEAR EAST/NORTH AFRICA** | | | | | | |
| **DHS-I** | | | | | | |
| Egypt | Oct-Jan 1988/89 | National Population Council | EMW 15-49 | 8,911 | | CA, CD, MM, PC, SAI, WE, WS |
| Morocco | May-Jul 1987 | Ministère de la Santé Publique | EMW 15-49 | 5,982 | | CA, CD, S |
| Tunisia | Jun-Oct 1988 | Office National de la Famille et de la Population | EMW 15-49 | 4,184 | | CA, S, SAI |
| **DHS-II** | | | | | | |
| Egypt | Nov-Dec 1992 | National Population Council | EMW 15-49 | 9,864 | 2,466 Husbands | CA, MA, PC, SM |
| Jordan | Oct-Dec 1990 | Department of Statistics, Ministry of Health | EMW 15-49 | 6,461 | | CA, SAI |
| Morocco | Jan-Apr 1992 | Ministère de la Santé Publique | AW 15-49 | 9,256 | 1,336 Men 20-70 | CA, MA, MM, SAI |
| Yemen | Nov-Jan 1991/92 | Central Statistical Organization | EMW 15-49 | 5,687 | | CA, CD, SAI |

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| **DHS-III** | | | | | | |
| Egypt | Nov-Jan 1995/96 | National Population Council | EMW 15-49 | 14,779 | | CA, FC, MA, WS |
| Morocco (Panel) | Apr-May 1995 | Ministère de la Santé Publique | AW 15-49 | 4,753 | | |
| **ASIA** | | | | | | |
| **DHS-I** | | | | | | |
| Indonesia | Sep-Dec 1987 | Central Bureau of Statistics, National Family Planning Coordinating Board | EMW 15-49 | 11,884 | | PC, SM |
| Nepal (In-depth) | Feb-Apr 1987 | New Era | CMW 15-49 | 1,623 | | KAP-gap survey |
| Sri Lanka | Jan-Mar 1987 | Department of Census and Statistics, Ministry of Plan Implementation | EMW 15-49 | 5,865 | | CA, NFP |
| Thailand | Mar-Jun 1987 | Institute of Population Studies Chulalongkorn University | EMW 15-49 | 6,775 | | CA, S, SAI |
| **DHS-II** | | | | | | |
| Indonesia | May-Jul 1991 | Central Bureau of Statistics, NFPCB/MOH | EMW 15-49 | 22,909 | | PC, SM |
| Pakistan | Dec-May 1990/91 | National Institute of Population Studies | EMW 15-49 | 6,611 | 1,354 Husbands | CA |
| **DHS-III** | | | | | | |
| Bangladesh | Nov-Mar 1993/94 | Mitra & Associates/NIPORT | EMW 10-49 | 9,640 | 3,284 Husbands | PC, SAI, SM |
| Bangladesh | Nov-Mar 1996/97 | Mitra & Associates/NIPORT | EMW 10-49 | 9,127 | 3,346 EMM | CA, MA, SM |
| Indonesia | Jul-Nov 1994 | Central Bureau of Statistics/ NFPCB/MOH | EMW 15-49 | 28,168 | | MM, PC, SAI, SM |
| Kazakstan | May-Aug 1995 | Institute of Nutrition, National Academy of Sciences | AW 15-49 | 3,771 | | CA, MA |
| Nepal | Jan-Jun 1996 | Ministry of Health/New ERA | EMW 15-49 | 8,429 | | CA, MA, MM |
| Philippines | Apr-Jun 1993 | National Statistics Office | AW 15-49 | 15,029 | | MM, SAI |
| Turkey | Aug-Oct 1993 | General Directorate of MCH/FP Ministry of Health | EMW <50 | 6,519 | | CA, MA |
| Uzbekistan | Jun-Oct 1996 | Research Institute of Obstetrics and Gynecology | AW 15-49 | 4,415 | | CA, MA |
| **LATIN AMERICA/CARIBBEAN** | | | | | | |
| **DHS-I** | | | | | | |
| Bolivia | Feb-Jul 1989 | Instituto Nacional de Estadística | AW 15-49 | 7,923 | | CA, CD, MM, PC, S, WE |
| Bolivia (In-depth) | Feb-Jul 1989 | Instituto Nacional de Estadística | AW 15-49 | 7,923 | | Health |
| Brazil | May-Aug 1986 | Sociedade Civil Bem-Estar Familiar no Brasil | AW 15-44 | 5,892 | | CA, S, SM, abortion, young adult use of contraception |
| Colombia | Oct-Dec 1986 | Corporación Centro Regional de Población, Ministerio de Salud | AW 15-49 | 5,329 | | CA, PC, S, SAI, SM |
| Dominican Republic | Sep-Dec 1986 | Consejo Nacional de Población y Familia | AW 15-49 | 7,649 | | CA, NFP, S, SAI, family planning communication |
| Dominican Republic (Experimental) | Sep-Dec 1986 | Consejo Nacional de Población y Familia | AW 15-49 | 3,885 | | S, SAI |
| Ecuador | Jan-Mar 1987 | Centro de Estudios de Población y Paternidad Responsable | AW 15-49 | 4,713 | | CD, SAI, employment |

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| El Salvador | May-Jun 1985 | Asociación Demográfica Salvadoreña | AW 15-49 | 5,207 | | CA, S, TBH |
| Guatemala | Oct-Dec 1987 | Instituto de Nutrición de Centro América y Panamá | AW 15-44 | 5,160 | | CA, S, SAI |
| Mexico | Feb-May 1987 | Dirección General de Planificación Familiar, Secretaría de Salud | AW 15-49 | 9,310 | | NFP, S, employment |
| Peru | Sep-Dec 1986 | Instituto Nacional de Estadística | AW 15-49 | 4,999 | | NFP, employment, cost of family planning |
| Peru (Experimental) | Sep-Dec 1986 | Instituto Nacional de Estadística | AW 15-49 | 2,534 | | |
| Trinidad and Tobago | May-Aug 1987 | Family Planning Association of Trinidad and Tobago | AW 15-49 | 3,806 | | CA, NFP, breastfeeding |
| **DHS-II** | | | | | | |
| Brazil (NE) | Sep-Dec 1991 | Sociedade Civil Bem-Estar Familiar no Brasil | AW 15-49 | 6,222 | 1,266 Husbands | AIDS, PC |
| Colombia | May-Aug 1990 | PROFAMILIA | AW 15-49 | 8,644 | | AIDS |
| Dominican Republic | Jul-Nov 1991 | Instituto de Estudios de Población y Desarrollo (PROFAMILIA), Oficina Nacional de Planificación | AW 15-49 | 7,320 | | CA, MA, S, SAI |
| Paraguay | May-Aug 1990 | Centro Paraguayo de Estudios de Población | AW 15-49 | 5,827 | | CA, SAI |
| Peru | Oct-Mar 1991/92 | Instituto Nacional de Estadística e Informática | AW 15-49 | 15,882 | | CA, MA, MM, SAI |
| **DHS-III** | | | | | | |
| Bolivia | Nov-May 1993/94 | Instituto Nacional de Estadística | AW 15-49 | 8,603[b] | | AIDS, CA, CD, MA, MM, S, SAI |
| Brazil | Mar-Jun 1996 | Sociedade Civil Bem-Estar Familiar no Brasil | AW 15-49 | 12,612 | 2,949 Men 15-59 | AIDS, CA, MA, MM, PC, S |
| Colombia | Mar-Jun 1995 | PROFAMILIA | AW 15-49 | 11,140 | | AIDS, CA, MA, PC |
| Dominican Republic | Aug-Dec 1996 | CESDEM/PROFAMILIA | AW 15-49 | 8,422 | 2,279 Men 15-64 | CA, MA |
| Guatemala | Jun-Dec 1995 | Instituto Nacional de Estadística | AW 15-49 | 12,403 | | AIDS, CA, MA, MM, S |
| Haiti | Jul-Jan 1994/95 | Institut Haitien de l'Enfance | AW 15-49 | 5,356 | 1,610 Men 15-59 | AIDS, CA, CD, MA, SAI |
| Peru | Aug-Nov 1996 | Instituto Nacional de Estadística e Informática | AW 15-49 | 28,951 | 2,487 Men 15-59 | CA, MA, MM |

[a] No health or birth history section in questionnaire.
[b] Household questionnaire was administered in 26,144 households.

AIDS acquired immune deficiency syndrome
AW all women
CA child anthropometry
CD causes of death (verbal reports of symptoms)
CMW currently married women
EMW ever-married women
FC female circumcision
M migration
MA maternal anthropometry
MM maternal mortality
NFP natural family planning
PC pill compliance
S sterilization
SAI service availability information
SM social marketing
TBH truncated birth history
VC value of children
WE women's employment
WS women's status

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