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The Causes of Stalling Fertility Transitions

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ABSTRACT

An examination of fertility trends in countries with multiple DHS surveys found that in the 1990s fertility stalled in mid-transition in seven countries: Bangladesh, Colombia, Dominican Republic, Ghana, Kenya, Peru, and Turkey. In each of these countries fertility was high (>6 births per woman) in the 1950s and then declined to fewer than 5 births per woman in the early or mid-1990s, before stalling. The level of stalling varied from 4.7 births per woman in Kenya to 2.5 births per woman in Turkey. An analysis of trends in the determinants of fertility revealed a systematic pattern of leveling off or near leveling in a number of determinants, including contraceptive use, the demand for contraception, and wanted fertility. The stalling countries did not experience significant increases in unwanted fertility or in the unmet need for contraception during the late 1990s, and program effort scores improved slightly except in the Dominican Republic. These findings suggest no major deterioration in contraceptive access during the stall, but levels of unmet need and unwanted fertility are relatively high and improvements in access to family planning methods would therefore be desirable. No significant link was found between the presence of a stall and trends in socioeconomic development, but at the onset of the stall the level of fertility was low relative to the level of development in all but one of the stalling countries.

Since the 1960s many developing countries have experienced rapid fertility declines. By 2000, a number of these countries had reached the replacement level of 2.1 births per woman, and it is widely expected that countries that are still in transition will continue their declines until fertility drops to or even below replacement. This assumption has been incorporated into population projections made by the United Nations and the World Bank. However, estimates from recent surveys indicate that fertility in the 1990s in a number of countries declined less rapidly than projected earlier, and in a few cases fertility stalled in mid-transition. This surprising development has implications for future population growth, because this growth is sensitive to minor variations in fertility trends.

An extensive literature on fertility transitions and their causes exists, but stalling is a neglected issue. There has been little research on the topic even though a few earlier studies discussed past stalls in fertility (Gendell 1985) or leveling off in contraceptive use (Ross et al. 2004). The objective of this study is to examine the causes of stalling in seven mid-transitional countries in which fertility did not decline between two successive Demographic and Health Surveys (DHS). I analyze the roles of different levels of explanatory variables, including the proximate determinants (e.g., use of contraception, marriage), the demand for contraception and reproductive preferences (e.g., wanted fertility), socioeconomic factors, and access to family planning methods. I conclude with a brief discussion of policy options to end ongoing stalls in fertility.

ANALYTIC FRAMEWORK

The empirical analysis of the causes of stalling fertility is guided by the analytic framework summarized in Figure 1. This framework summarizes the main factors that determine fertility and the chain of causation that links these determinants. A full explanation of the framework and a discussion of the large literature on the different relationships are beyond the scope of this study, but the main forces driving the fertility transition can be summarized briefly as follows.

Socioeconomic development is considered the main cause of a decline over time in the benefits of children and a rise in their costs. These changes in the cost/benefit ratio lead parents to want fewer children, and mortality decline raises child survival so that families need fewer births to achieve the desired number of surviving children. These trends in turn raise the demand for birth control (i.e., contraception and induced abortion), and, to the extent this demand is satisfied, lower fertility results. Family planning programs facilitate this transition by reducing the cost of birth control (broadly defined to include social costs), thus raising the level of implementation of the demand for contraception and reducing the unmet need for contraception. Higher levels of socioeconomic development also reduce the cost of birth control.

This study offers a comprehensive explanation of recent stalls in fertility by analyzing as many determinants as is possible with available data from DHS surveys. Trends in the various determinants in the seven stalling countries are examined and compared with trends in non-stalling countries. The discussion below follows the general outline of the analytic

framework, starting with fertility and the use of contraception. Considerable attention is then given to the demand for contraception and to reproductive preferences. Because DHS surveys do not collect information on the costs and benefits of children and the cost of birth control, these items cannot be measured directly. The last section of the study discusses the role of socioeconomic factors, including real GDP per capita, child survival, and level of education, as well as the role of family planning programs as measured by a program effort index.

DATA

The primary sources of data are DHS surveys conducted in many developing countries since 1985. The present analysis focuses on the following 38 countries in which more than one nationally representative survey is available to estimate trends in fertility and their determinants:

-*Asia*: Bangladesh, India, Indonesia, Kazakhstan, Nepal, Philippines, Vietnam.

-*Latin America*: Bolivia, Brazil, Colombia, Dominican Republic, Guatemala, Haiti, Peru.

-*Near East/North Africa*: Egypt, Jordan, Morocco, Turkey, Yemen.

-*Sub-Saharan Africa*: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Kenya, Madagascar, Malawi, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, Tanzania, Togo, Uganda, Zambia, Zimbabwe.

Custom tabulations of various measures were obtained from each survey with the STAT compiler program available at the DHS web site: www.measuredhs.com. In a few countries with very recent surveys, estimates were taken from published first country reports.

RECENT FERTILITY TRENDS

To identify recent stalls in fertility, I examined the fertility trajectories of all 38 countries to determine intervals between successive DHS surveys during which fertility failed to decline.[1] This search for stalls turned up 14 cases in which fertility as measured by the total fertility rate (TFR) remained unchanged or rose between surveys. Not all of these cases are relevant for this study because the absence of significant change in fertility or minor fluctuations (including a slight rise) in fertility are not surprising in countries that have not yet entered the transition. In contrast, a stall in fertility after the transition is underway has been rare in the past.

For present purposes a country is considered to have stalled if its fertility (TFR) failed to decline between two DHS surveys while the country is in mid-transition. A country is considered mid-transitional if its TFR is between 2.5 and 5 births per woman at the time of the most recent survey. By this definition, 20 DHS countries were mid-transitional and seven of these countries had experienced a stall. The onset of the stalls varied among countries:

Bangladesh, 1996/97

Colombia, 1990

Dominican Republic, 1999

Ghana, 1998

Kenya, 1998

Peru, 1992

Turkey, 1993

Figure 2 plots the fertility estimates from successive surveys in these seven countries, starting with the World Fertility Survey in the late 1970s and proceeding to the three or four most recent DHS surveys.[2] For simplicity, I use the labels WFS, DHS-1, DHS0, and DHS1 in all figures to refer, respectively, to the WFS, the DHS before the stall onset, the DHS at the onset of the stall, and the DHS at the end of the observed stall. The surveys DHS0 and DHS1 therefore mark the beginning and end of the observed period of stalling. For five countries DHS1 is the latest survey, but for two countries, Colombia and Peru, an additional survey (labeled DHS2) is available. The WFS surveys occurred in the late 1970s, and the average years were 1991 for DHS-1, 1995 for DHS0, and 1999 for DHS1.

In each of the seven countries fertility declined during the 1980s but stalled in the 1990s. The level of fertility at the stalling onset varies considerably among countries, from a high of 4.7 births per woman in Kenya to a low of 2.5 in Turkey. During the stall the average annual change in fertility in the seven countries was a slightly positive 0.03 births per year. In contrast, the remaining 13 non-stalling mid-transitional countries experienced an average annual change of –0.08 in the late 1990s, i.e., a decline at a rate of nearly 1 birth per decade.[3] This difference is highly significant ($p<0.001$). In Colombia and Peru fertility fell slightly in the period following the stall, but no such observations are available for the other five countries. (A just-released preliminary report from the Bangladesh DHS survey in 2004 indicates that fertility also fell slightly, from 3.3 in 1999/2000 to 3.1 in 2004. The results from this survey are not included in this study because the full country report was not available by July 2005.)

The process used here for selecting stalling countries does not identify all countries with stalled fertility in the 1990s or before. Only observations from DHS surveys were used and stalls may have occurred in earlier years in some countries. Fertility could also have stalled in countries that have only one DHS survey or none. In addition, the strict criteria for stalling applied here do not identify countries that have come very close to stalling. For example, DHS surveys indicated that Egypt's TFR declined by only 0.1 births per woman (from 3.6 to 3.5) between 1995 and 2000. Nevertheless, the seven countries selected for analysis here constitute a large enough sample to provide valuable insights into the stalling process.

Before proceeding it is necessary to comment on potential measurement errors in fertility trends. Fertility estimates from DHS surveys contain inaccuracies due to sampling, design, data collection, and reporting errors. Sample sizes in the DHS are large—usually several thousand respondents; as a result, sampling errors in the TFR of mid-transitional

countries are relatively small with typical standard errors around 0.1 births per woman. In well-implemented surveys non-sampling errors should also be small, but their magnitude is not easily measured. The sampling error in the difference between two successively measured TFRs is larger than the error in a single TFR estimate (by approximately the square root of 2). Estimates of fertility declines therefore may contain non-trivial errors, and a country identified as stalling may actually be experiencing a slow change in fertility while other countries with observed slow declines may be stalling. In addition, trends in fertility measures other than the total fertility rate (e.g., parity progression ratios) could lead to a somewhat different assessment of which countries are stalling and which ones are not. I have used the total fertility rate here because it is the most widely accepted measure of fertility.

USE OF CONTRACEPTION AND OTHER PROXIMATE DETERMINANTS OF FERTILITY

Previous research has established that a rise in contraceptive use is the main proximate cause of a decline in fertility (Bongaarts and Potter 1983). In pre-transitional societies fertility is high and deliberate use of contraception to limit family size is rare, while in countries at the end of their transition fertility is low and the large majority of couples practice some form of contraception. This strong correlation between contraceptive prevalence and fertility is confirmed in Figure 3, which plots the relationship between the TFR and contraceptive prevalence (among women in union) for the 38 countries included in this study (estimates at onset of stall or for next-to-last DHS in non-stalling countries). The seven stalling countries, indicated with circles, seem to have no unusual features that distinguish them from the non-stalling countries included in this figure.

In view of this well-established relationship, one would expect that countries with stalling fertility also experience a leveling off in contraceptive use. Figure 4 plots trends in contraceptive prevalence from successive surveys, from the WFS in the late 1970s to the latest DHS. During the 1980s (between the WFS and DHS-1) the trend is clearly upward, but during the 1990s the pace of increase drops sharply and in most countries the change in prevalence during the stalling interval is slower than in earlier periods. The average annual rate of increase in contraceptive prevalence in the seven stalling countries is 0.8 percent per year, which is significantly less than the pace in the non-stalling mid-transitional countries, where prevalence rose, on average, at a rate of 1.4 percent per year ($p<0.02$).

Given the measurement errors in both the TFR and the prevalence estimates, the very small increases in prevalence are roughly consistent with the absence of fertility change in the Dominican Republic, Ghana, Kenya, and Turkey, but the rise in prevalence in Bangladesh, Colombia, and Peru is not as small as one might expect. This result may be attributable to measurement error, but another plausible partial explanation is related to the role of other proximate determinants. Fertility is directly determined by a set of behavioral and biological variables called the proximate determinants. Contraceptive use is the most important of these, but others include proportions married, contraceptive effectiveness, incidence of induced abortion, postpartum infecundability, and frequency of intercourse. Over the course of the fertility transition changes in some of these determinants have

negative effects on fertility (e.g., increases in age at marriage) while changes in others have positive effects (e.g., declines in the duration of postpartum insusceptibility). These effects usually offset one another at least partially, and their net impact is usually relatively small compared with the effect of rising contraceptive use (Bongaarts and Potter 1983). However, the net effect of these other factors is not necessarily zero. A full analysis of the effects of these other proximate determinants is not possible, because data are not available for some of them. To illustrate the potential role of one key proximate determinant, I briefly discuss the role of trends in age at marriage.

Table 1 presents the median age at first marriage at the time of the onset of the stall (DHS0) and at the time of the next survey (DHS1) for the seven countries. These medians are estimated from current marital status data observed at each of the two surveys. The last column shows the trend during the stalling interval. The median age at first marriage rose in Bangladesh and Ghana, showed no change in Kenya, and declined in the other four countries. These observations are largely consistent with the findings of the National Research Council (2005), which concluded that the proportion of young women who are married has declined in recent decades in most regions of the world, with the exception of Latin America.

Other things being equal, a decline in the median age at marriage is expected to increase fertility for two reasons. First, earlier marriage raises the number of reproductive years spent within marriage and hence the exposure to the risk of childbearing. Second, a change in the timing of marriage is usually associated with a change in the timing of births, which in turn leads to a temporary inflation or deflation of period fertility called a "tempo effect." The fertility-enhancing effect that results from a decline in the age at childbearing ends when changes in the timing of childbearing end (Bongaarts and Feeney 1998; Bongaarts 1999). These two effects seem to operate as expected in Colombia, Dominican Republic, and Turkey, where a decline in the median age at marriage was accompanied by slight increases in fertility, but a decline in marriage age had no apparent effect on fertility in Peru. One reason for the absence of a rise in Peru's fertility is that an increase in contraceptive use offset the effect of earlier marriage. Similar offsetting effects operate in Colombia, Dominican Republic, and Turkey, where small increases in contraceptive use attenuated the fertility-enhancing effect of declining age at marriage. In addition, trends in other proximate determinants play a role in determining the trend in fertility.

This brief discussion of the roles of nuptiality and contraceptive use illustrates the multiple ways in which trends in proximate determinants can have fertility-enhancing or fertility-inhibiting effects. The absence of a common trend in nuptiality among stalling countries is consistent with the conclusion of Gendell (1985), who found few commonalities in trends in the proximate determinants of fertility during stalls in the 1970s in Costa Rica, Korea, and Sri Lanka. Although a rise in contraceptive use is the dominant proximate cause of fertility transition, trends in these other factors can play a significant role in determining observed fertility trends during stalls.

DEMAND AND UNMET NEED FOR CONTRACEPTION TO LIMIT FAMILY SIZE

Increases in contraceptive use are driven by a rising demand for contraception. However, observed levels of use always fall somewhat short of demand. Couples whose demand is not satisfied have an "unmet need" for contraception (Westoff and Ochoa 1991; Westoff and Bankole 1995). While the measurement of current use is straightforward, the estimation of demand or unmet need is complex and controversial. The analysis in this section focuses on the demand for contraception to limit rather than to space births, for several reasons: a) The DHS method for estimating the demand for spacing probably contains a substantial upward bias that is not easily corrected (Bongaarts 1991); DHS estimates of demand for limiting do not suffer from this bias. b) As will be demonstrated below, the analysis of the relationship between demand for contraception and fertility preferences is simplified by focusing on use and fertility among those women who have reached their desired family size. c) Measurements of demand for limiting births are available for WFS surveys, thus permitting an examination of long-range trends. The prevalence of contraception for limiting is a strong predictor of fertility because it is as highly correlated with the TFR as is the overall prevalence of contraception (data not shown).

Figure 5 plots estimates of demand for contraception by prevalence of contraceptive use to limit fertility for 38 countries. The strong correlation between these two measures is evident, as is the fact that actual use falls short of demand in all cases. On average, unmet need for limiting (i.e., the difference between demand and use) equals 9.4 percent. The seven stalling countries show no features that distinguish them from the non-stallers in this figure, which implies that their level of unmet need is not significantly higher or lower than expected.

Trends in contraceptive demand and use for limiting fertility are provided in Figure 6. Figures 6a and 6b show that demand and use rose rapidly in the 1980s (WFS to DHS-1) but then slowed considerably just before and after the onset of the stall. In six countries demand and use changed little during the stall period. The exception is Colombia, where these measures declined before the stall and rose after the stall onset, leaving their values at DHS1 close to those at DHS-1. As shown in Figure 6c the unmet need for contraception to limit fertility (i.e., estimated as the difference between demand and use) changed little during the stalling period except in Colombia and Peru, where unmet need continued a decline that started earlier. Trends in this variable exhibit no consistent pattern in the 1980s. During the period between WFS and DHS-1 unmet need for limiting dropped in Bangladesh, Colombia, Dominican Republic, Peru, and Turkey. This is as expected from the corresponding large increase in the satisfaction of demand. In contrast, unmet need in Ghana and Kenya rose during the 1980s. The explanation for this finding in these two countries is that demand for contraception was very low ca. 1980 (8% in Ghana and 12% in Kenya), so that even with a very low level of satisfaction of demand, unmet need remained low. The unmet need for spacing births (data not shown) also showed little change between the two most recent DHS surveys in Bangladesh, Colombia, Dominican Republic, Kenya,

Peru, and Turkey (data for Ghana show implausible fluctuations since the 1993 DHS survey[4]).

These results confirm that stalling fertility is typically accompanied by the near stalling of demand for, the use of, the satisfaction of demand for, and the unmet need for contraception to limit family size. The main exceptions to this generalization are Colombia and Peru, where unmet need continued to decline during the stall.

As expected, a clear difference exists between stalling and non-stalling mid-transitional countries in the pace of change in demand and use (see Table 2). The average annual increase in contraceptive use for limiting is considerably higher in stalling than in non-stalling countries: 0.48 vs. 1.26 percent of couples per year ($p=0.03$). A similar difference is observed in the rate of increase in contraceptive demand for limiting: 0.22 in the stalling vs. 1.03 percent per year in the non-stalling countries ($p=0.03$), but there was no significant difference in the trend in unmet need. The very slight increase in contraceptive demand and use in stalling countries is probably partly attributable to the offsetting effect of other proximate determinants as discussed above.

FERTILITY PREFERENCES

Moving further back in the chain of causation summarized in Figure 1, I discuss next the role of fertility preferences. Several indicators are available to examine this topic, each of which provides a particular insight:

Desired family size

Desired or ideal family size is one of the most widely used indicators of preferences. It is relatively easy to interpret, but some care needs to be taken with conventional estimates because they may contain biases due to rationalization and non-response. To avoid these biases, I rely on a different but closely related preference measure, the wanted TFR.

Wanted fertility

The wanted total fertility rate (WTFR) is calculated with the same standard procedure used to calculate the TFR from age-specific fertility rates, but to obtain the WTFR births in excess of desired family size are excluded from the numerators of these rates (Bankole and Westoff 1995). Differences between ideal family size and the WTFR are generally small and can be due to a variety of factors (Bongaarts 2001).

Figure 7 plots country-specific estimates of the relationship between the TFR and WTFR in the mid-1990s. These two measures are highly correlated, which is consistent with the key role played by fertility preferences in the analytic framework. Given this correlation, one would expect wanted fertility to have leveled off in the countries in which fertility has stalled. Figure 8 confirms this. Interestingly, wanted fertility rose slightly during the stalls in all seven countries, at an average annual rate of 0.04 births per woman. In contrast, in the non-stalling mid-transitional countries wanted fertility declined at an average pace of –0.05 children per woman per year ($p<0.001$).

Unwanted fertility

The unwanted total fertility rate (UTFR) is estimated as the difference between the observed TFR and the wanted total fertility rate.[5] On average for the 38 countries, unwanted fertility equaled 1.0 births per woman, which represents 20 percent of the average TFR of 4.9 births per woman. The direct cause of unwanted childbearing is an unmet need for contraception to limit family size. Empirical estimates of these two measures are strongly correlated (r=0.7), and on average a 1 percent increase in unmet need for limiting raises unwanted fertility by 0.09 births per woman.

Figure 9 plots trends in unwanted fertility for the seven stalling countries. At the onset of the stall the UTFR ranged from 1.5 births per woman in Peru to 0.7 births per woman in Colombia and the Dominican Republic. The UTFR is more or less stable in the stalling period except for a small decline in Peru. This trend in Peru is as expected from the decline in unmet need (see Figure 6c).

A surprising finding in Figure 9 is that unwanted fertility rose sharply from very low levels during the 1980s in Ghana and Kenya (and from a somewhat higher level in Bangladesh). This rise occurred despite a rapid increase in contraceptive use during this period as shown in Figure 6b. The explanation for this finding is straightforward (Bongaarts 1997a): Kenya and Ghana were still in the early stage of the fertility transition ca. 1980. Unwanted fertility is typically low at the beginning of this transition because desired family size is high. Consequently, women need most of their reproductive lives after marriage to bear the large number of children they wish to have. Women who reach their desired family size have little reproductive time left during which unwanted births can occur even if contraceptive use is low. Unwanted fertility is low because exposure to the risk of unwanted childbearing is limited. However, this exposure rises once desired family size declines during the onset of the transition to lower fertility. Unwanted fertility can then increase if a significant proportion of women who want no more children do not practice effective contraception.

The main conclusion from this examination of fertility preferences is that wanted and unwanted fertility show little or no change during the stalls. The levels of unwanted fertility and unmet need for contraception are substantial, but there is no evidence that they rose significantly while fertility stalled.

SOCIOECONOMIC DETERMINANTS OF FERTILITY TRANSITION

The role of socioeconomic factors in bringing about a fertility transition remains controversial. Despite decades of research there is little agreement on how and under what conditions social and economic changes affect reproductive behavior. I present a brief review of the main findings from past research before commenting on the relevance of current trends for stalling.

Key findings from past research

Notestein (1953) formulated what is now generally called classical demographic transition theory. According to this highly influential statement of the causes of fertility

decline, fertility is high in traditional agricultural societies to offset high mortality and thus to ensure population survival. As a society develops (modernizes), socioeconomic changes such as industrialization, urbanization, rising education, and investments in public health lead to a decline in mortality and to a change in the costs and benefits of children. The rise in child survival together with the rising cost and declining economic value of children is considered to be the fundamental driving force of the fertility transition. The desire for smaller families leads in turn to a demand for birth control and hence to lower actual fertility. (Elaborations and variants of this theory can be found in Becker 1991; Bulatao and Lee 1983; Caldwell 1982; Easterlin 1975.)

In the 1970s a team of researchers led by Ansley Coale set out to test this theory in Europe. This study used province-level data from European countries for the period 1870-1960, during which fertility transitions occurred in most of Europe. Two main conclusions emerged from this work (Watkins 1986, 1987): 1) socioeconomic conditions were only weakly predictive of fertility decline, and transitions started at widely differing levels of development; and 2) once a region or a country had started a fertility decline, neighboring regions with the same language or culture followed after short delays even if they were less developed. These unexpected findings were not predicted by classical transition theory.

A similar absence of a tight link between development indicators and fertility decline has been documented in recent studies of this topic in contemporary developing countries (Bongaarts and Watkins 1996; Cleland and Wilson 1987; Watkins 1987). Although a highly significant correlation exists between a number of development indicators and fertility, the transition onset and the pace of decline in the early phases of the transition are poorly predicted by these indicators.

The most widely accepted explanation for these unexpected findings is the role played by diffusion and social interaction processes. An extensive literature exists on this topic (Bongaarts and Watkins 1996; Caldwell 2001; Casterline 2001a, 2001b; Cleland 2001a, 2001b; Cleland and Wilson 1987; Knodel and van de Walle 1979; Kohler 2001; Montgomery and Casterline 1996; National Research Council 2001; Watkins 1986, 1987). Diffusion refers to the spread of information, ideas, and behaviors among individuals, communities, and countries; social interaction refers to the process whereby the reproductive attitudes and behaviors of individuals influence one another. These two processes, which can either retard or accelerate fertility declines, are believed to be the source of resistance to the adoption of birth control behavior in pre-transitional societies. This resistance keeps fertility more or less unchanged even as the country begins to develop and the demand for children declines. However, once this obstacle is overcome fertility can decline very rapidly (and largely independently from socioeconomic indicators) as pent-up demand for birth control is increasingly satisfied and the cost of birth control (broadly defined to include social costs) declines. This explanation is consistent with the rapid fertility declines that have occurred in many developing countries in recent decades, even in some countries with low levels of development. In many countries family planning programs have facilitated the diffusion of knowledge about contraception and provided access to contraceptive methods.

A review of the literature on the fertility transition by Hirschman (1994) concluded: "The dilemma is that there is no consensus on an alternative theory to replace demographic transition theory…. So the debates continue with a plethora of contending theoretical frameworks, none of which has gained wide adherence" (p. 214). This unsatisfactory state of affairs largely continues until today despite further efforts by a number of researchers. In particular, more recent research argues again for a tighter association between socioeconomic change and fertility decline. For example, Potter et al. (2002) undertook a detailed analysis of the fertility transition in Brazil and found "strong and consistent relationships between the decline in fertility and measurable changes in social and economic circumstances" (p. 739). Galloway et al. (1994, 1998) questioned some of the conclusions of the historical study of Europe. Bongaarts (2002) examined alternative explanations for fertility trends in developing countries since 1960 and concluded that the classical and the diffusion perspectives are both important, but that their roles change over the course of the transition. Specifically he noted that "...diffusion/social interaction are important in the early phases of the transition. Once this process has largely run its course, fertility late in the transition becomes more closely tied to level of socioeconomic development." This conclusion has implications for the stalling phenomenon, as discussed next.

Leveling off in development and stalling fertility

If the conclusion about the central role of development in the later stages of the transition is correct, then one would expect (1) a high level of correlation between fertility and various indicators of social and economic development and (2) a leveling off in these indicators in countries where fertility has stalled. I examine these propositions with data from the 38 countries included in this study, using the following socioeconomic indicators:

- Real GDP per capita ($ in 1996 constant prices) from Heston et al. 2002.
- Child survival, as measured in the DHS by the proportion of births surviving to age 5.
- The proportion schooled, measured in the DHS by the average proportion of women aged 15-49 who have more than zero years of schooling.

Figures 10a, 10b, and 10c plot the relationship between the TFR and each of these three indicators for the 38 countries. The correlations are statistically significant and fairly strong for GDP per capita (r=0.84) and for child survival (r=0.79) but considerably weaker for proportion schooled (r=0.61). The seven stalling countries are not outliers in any of these associations, although Bangladesh has a rather low level of GDP per capita for its relatively low level of fertility.

Trends in the three development indicators during the fertility stall for the seven countries are summarized in Table 3. All three development measures leveled off in Ghana and Kenya. In Colombia, Dominican Republic, and Peru two of the three indicators leveled off, but these two countries score much higher on the development measures than Ghana and Kenya. In Bangladesh, Peru, and Turkey development according to these three

indicators is still proceeding, although Turkey has reached much higher levels than Bangladesh. These trends indicate no significant link between progress in development and stalling fertility, but they paint a discouraging picture of the situation in Ghana and Kenya and raise the question whether lack of progress in different dimensions of development is a contributing factor to the stalling fertility in these two countries. A comparison of the average pace of change in socioeconomic variables in stalling and non-stalling mid-transitional countries revealed no significant differences.

An interesting feature of Figures 10a, b, and c is that the seven stalling countries fall, with two exceptions, below the regression lines (the exceptions are Peru in 10a and Kenya in 10b and 10c). This indicates that these countries at the time of the onset of the stall have lower fertility than expected from their level of development. If, over time, fertility returns to the level associated with the level of development, then this deviation from the regression would increase the risk of a stall following the time the deviation occurred. This conclusion presumably holds regardless of the cause of the deviation.

ROLE OF FAMILY PLANNING PROGRAMS

Since the 1960s governments of many developing countries have implemented voluntary family planning and reproductive health programs. These programs provide information about and access to contraception to permit women and men to take control of their reproductive lives and avoid unwanted pregnancies. The choice of voluntary family planning programs as the principal policy instrument is based largely on the documentation of a substantial unsatisfied demand for contraception. When questioned in surveys, large proportions of married women in the developing world report that they do not want a pregnancy soon. Some of these women want no more children because they have already achieved their desired family size, while others want to wait before having the next wanted pregnancy. A substantial proportion of these women are not protected from the risk of pregnancy by practicing effective contraception (including sterilization) and, as a result, unintended pregnancies are common. In the mid-1990s, 36 percent of all pregnancies in the developing world were unplanned and 20 percent of all pregnancies ended in abortion (Alan Guttmacher Institute 1999). The existence of an unmet need for contraception, first documented in the 1960s, convinced policymakers that family planning programs were needed and would be acceptable and effective.

The impact of family planning programs on reproductive behavior

While wide agreement exists on the desirability and rationale for family planning and reproductive health programs, there has been considerable debate and disagreement about their impact on fertility. The most trenchant critique of these programs is provided by Pritchett (1994), who concludes that to achieve low fertility, "...it is fertility desires and *not* contraceptive access that matter (Pritchett 1994: 39, emphasis in the original). A rebuttal of this view is provided by Bongaarts (1994, 1997b), who summarizes the evidence for a significant fertility-inhibiting effect of family planning programs and estimates that a

strong program can reduce fertility by approximately one birth per woman below the level that would have been observed without the program (see also Tsui 2001).

The issues addressed in this controversy are complex, and here I note only the main reasons why it has proven difficult to measure the fertility impact of family planning programs.

-*Lack of a robust indicator of program strength*. The main available measure is a "program effort" index developed by Lapham and Mauldin (1972) that has been estimated for various years from 1982 to 1999 (Mauldin and Ross 1991; Ross 2002; Ross and Stover 2001). Although unique and widely used, this measure has weaknesses, in particular its reliance on a few informants per country who provide mostly subjective assessments of various dimensions of a country's family planning program.

-*The nonlinear relation between program effort on one hand and unwanted fertility and unmet need for limiting on the other.* There is only a weak correlation in cross-country studies between program effort score and the level of unmet need for limiting or unwanted fertility. Pritchett's critique relied heavily on this point: if "…improved family planning programs were driving fertility declines, they should be accompanied by a reduction in excess fertility. This is not the case" (Pritchett 1994:34). As noted by Bongaarts (1994), there is a serious flaw in this argument: In countries with high desired family size, unwanted fertility is low regardless of the strength of the program because women need most of their reproductive lives to achieve their desired family size, and little reproductive time remains to bear unwanted children.

- *Lack of experiments*. The most direct and convincing evidence of the impact of well-designed family planning services is provided by controlled experiments. Unfortunately, these experiments are expensive and time consuming and too few of them have been conducted. A highly influential example of a large experiment is the one conducted in the Matlab district of rural Bangladesh (Cleland et al. 1994). When this experiment began in the late 1970s, Bangladesh was one of the poorest and least developed countries, and there was considerable skepticism that reproductive behavior could be changed in such a setting. Comprehensive family planning and reproductive health services were provided in the treatment area of the experiment. A wide choice of methods was offered, the quality of referral and follow-up was improved, and a new cadre of well-trained women replaced traditional birth attendants as service providers. The results of these improvements in the quality of services were immediate and pronounced, with contraceptive use rising sharply. No such change was observed in the comparison area. The differences between these two areas in contraceptive use and fertility have been maintained over time. The success of the Matlab experiment demonstrated that appropriately designed services can reduce unmet need for contraception even in traditional settings. A broadly similar experiment conducted recently in northern Ghana also shows a clear effect on reproductive behavior (Debpuur et al. 2002; Phillips et al. 2003). These experiments leave no doubt that well-designed programs can have an impact on contraceptive use and fertility.

The role of family planning programs in stalling fertility

A plausible hypothesis for one of the causes of stalling fertility is that program effort has faltered. If this were the case one would expect the program effort score to have declined and unwanted fertility and unmet need to have risen in the late 1990s.

The last column of Table 3 indicates the status of program effort for the period corresponding closely to the stalling period (i.e., 1989 to 1994 in Colombia and Peru and 1994 to 1999 in the other five countries). In all countries except the Dominican Republic, program effort rose during the stall, continuing an upward trend from the 1980s. In addition, there are no significant differences between trends in program effort scores of stalling and non-stalling mid-transitional countries in the late 1990s. This evidence suggests no systematic erosion of program effort in the 1990s when fertility stalled.

As shown earlier in Figures 6c and 9 the stalling countries did not experience general increases in the unmet need for limiting or in unwanted fertility during the late 1990s. This finding also suggests no major deterioration in the supply environment compared to earlier levels. A possible exception to this generalization is Kenya, where unwanted fertility rose slightly, but this increase was not statistically significant. A diversion of resources from the country's family planning program to interventions to halt the AIDS epidemic may be contributing to this trend if one exists. The lack of an upward trend in unmet need of course does not mean that access to family planning services is adequate, because levels of satisfaction of demand for contraception are low in some countries, particularly Ghana and Kenya.

POLICY OPTIONS

Two general options are available to policymakers in countries where fertility has stalled at an undesirable level: strengthen the family planning program or encourage social and economic development. The former is aimed primarily at reducing unplanned pregnancy and the latter at reducing the demand for children. A decision on which of these options should be emphasized requires an analysis of several key indicators.

Family planning program

A first step in any policy assessment is to examine the level of unmet need for contraception (Casterline and Sinding 2000). The unmet need for contraception (limiting plus spacing) at the time of the latest available survey in the seven countries ranges widely, with relatively low levels in Colombia (6.1%), Dominican Republic (10.9%), Peru (10.2%), and Turkey (10.1%), an intermediate level in Bangladesh (15.3%), and high levels in Ghana (34.0%) and Kenya (24.5%). These results indicate that even in the lowest-scoring countries some demand is left unsatisfied. The reason is presumably that nonuse can be caused not only by lack of access or lack of information, but also by other factors, such as fear of side effects of contraception and lack of support from husbands, that are not readily addressed by programs. Improving family planning services can reduce unmet need and raise the level of contraceptive prevalence in all of these countries, but in particular in Ghana and Kenya. This would, in turn, reduce the incidence of unwanted pregnancies.

In countries with high levels of demand satisfaction, unwanted fertility typically equals only about 0.5 births per women. This finding gives an indication of the improvements that are possible. For example, unwanted fertility in Kenya (1.3 births per woman) and Bangladesh (1.1 births per woman) could probably be reduced by more than half. In contrast, in the Dominican Republic and Turkey unwanted fertility is already fairly low (0.7 births per woman) and the potential for further reductions is smaller.

Development

As noted, development is considered the main policy option available to reduce high desired family size. In the stalling countries wanted fertility falls into two clusters (see Figure 8). In the first, comprising Bangladesh, Colombia, Dominican Republic, Peru, and Turkey, wanted fertility is close to 2 births per woman. This group of countries has nearly completed its transition in fertility preferences, and unwanted fertility is the main reason fertility substantially exceeds replacement. The second cluster consists of two countries in which wanted fertility is still high: Ghana and Kenya with, respectively, 3.7 and 3.6 wanted births per woman. Ghana and Kenya are also the two countries in which the trends in all three development indicators have leveled off. Further socioeconomic development is likely to be essential in order for these two countries to reduce preferences and to complete their fertility transition to near the replacement level.

Even if fertility preferences and fertility resume their downward trend in stalled countries, there is no guarantee that their TFRs will drop below replacement level. The assumption of below-replacement fertility as the ultimate standard for all countries is widely accepted among demographers and is built into the most recent population projections made by the United Nations (2005). This view is based on the fertility trajectories followed by developing countries that have already completed the fertility transition in the past few decades. Most of these countries currently have fertility below replacement and in some cases below 1.5 births per woman (e.g., Hong Kong, Korea, Singapore, Taiwan). While it may seem reasonable to assume that countries that are still in transition will follow a similar trajectory in the future, this conclusion is by no means certain. It is quite possible that countries differ substantially in their fertility response to development. If that is the case then countries that have completed their transitions not only have experienced development more rapidly than average, but they are also a select group because their fertility is more responsive than average to changes in development. It is difficult to prove that such heterogeneity among countries exists, but the countries that have not yet finished their transitions could well be less responsive than average to improvements in development. This in turn could imply that these countries will stay above replacement for some time even if fertility drops below current levels.

Finally, a brief comment on the issue of which dimension of development is most important for fertility decline. It is widely believed that fertility is most responsive to improvements in human development, in particular in female education and child survival (Bongaarts 2001; Caldwell 1980; Jejeebhoy 1995; Sen 1999). This conclusion is strongly supported by the fact that replacement fertility has been achieved in some very poor societies such as Sri Lanka and the state of Kerala in India. Although poor, these

populations have high levels of literacy and female empowerment and low infant and child mortality. It is premature, however, to conclude that standards of living as measured by real GDP per capita have no impact. Kenya is an example of a country where fertility has stalled at near five births per woman despite relatively high levels of literacy and schooling. It would be surprising if Kenya's low and deteriorating living standards were not partly responsible for this stall in fertility.

CONCLUSION

The past record of fertility trends in developing countries that have completed their fertility transitions indicates that once a fertility decline is underway it often continues without significant interruption until the replacement level of around two births per woman is reached. (The experience of developed countries and their post-World War II baby booms is more complex.) Earlier stalls in mid-transition have been rare (e.g., in Argentina, Chile, and Costa Rica). This historical trend has led many analysts to assume that the same pattern of uninterrupted transition will be observed in developing countries in which the transition is underway. An examination of fertility trends since the late 1980s in countries with multiple DHS surveys reveals, however, that fertility as measured by the total fertility rate stalled in mid-transition in seven countries: Bangladesh, Colombia, Dominican Republic, Ghana, Kenya, Peru, and Turkey. In each of these countries fertility was high (>6 births per woman) in the 1950s and then declined to fewer than 5 births per woman in the early or mid-1990s, before entering a stall during the 1990s. The level of stalling varied from 4.7 births per woman in Kenya to 2.5 births per woman in Turkey. The duration of the stall could not be determined in four of these countries because it was still ongoing at the time of the most recent survey. An analysis of trends in the determinants of fertility in these seven countries leads to three conclusions.

First, fertility stalls are accompanied by a leveling off or sharp deceleration in the trends in contraceptive use and the demand for contraception, and by a leveling off in fertility preferences as measured by the wanted total fertility rate.

Second, there is no common trend in socioeconomic determinants during fertility stalls. In some stalling countries (Kenya and Ghana) development indicators changed little, while in others socioeconomic development continued at a fairly rapid pace. However, the level of fertility relative to the level of development seems to play a role as a cause of stalls. At the onset of six out of the seven stalls, fertility was lower than expected for the level of development. It is not clear why countries have reached this low fertility relative to its socioeconomic predictors, but once this is the case fertility can subsequently be expected to move closer to the predicted level, thus making a stall more likely. If this conclusion is borne out by future research, then it is also probable that the duration of a stall will depend on the pace of development following the stall onset. That is, stalls will be of shorter duration in countries where development proceeds rapidly than in countries where development has leveled off as well. This topic can be examined further when data on the duration of ongoing stalls become available.

Third, little support is found for the hypothesis that declining access to contraception is a main cause of stalling fertility. Several variables, including the family program effort score and the level of unmet need and unwanted fertility, shed light on this issue. Program effort scores rose during all stalls except in the Dominican Republic. In addition, measures of unmet need and unwanted fertility showed no significant recent upward trend in the stalling countries, although Kenya experienced slight increases.

In contrast to the near absence of change in the stalling countries, the non-stalling mid-transitional countries experienced substantial changes in fertility and its various determinants and these changes were all in the expected direction. That is, fertility and fertility preferences declined, while contraceptive use, the demand for contraception, and socioeconomic development indicators generally rose during the period between the two most recent DHS surveys.

Any policy response to address stalling fertility should be tailored to the circumstances of the individual country and in particular its levels of wanted and unwanted childbearing. Levels of unwanted fertility or unmet need for contraception are crucial indicators of the need to provide additional family planning services. A country in which unwanted fertility is higher than a few tenths of a birth can especially benefit from further investments in family planning programs. It is difficult, however, to remove all unwanted childbearing because reasons other than access (e.g., fear of side effects and lack of spousal support) also play a role. Improvements in family planning services are most needed in countries such as Bangladesh, Ghana, Kenya, and Peru with the highest levels of unmet need and unwanted fertility.

Investments in family planning can reduce unwanted fertility but their effect on desired family size is apparently weak or non-existent (Freedman 1997). The implication of this finding is that countries in which wanted fertility has stalled well above the replacement level will need declines in preferences to complete their fertility transition. Such declines are usually achieved by improvements in socioeconomic conditions. Among the seven stalled countries, Kenya and Ghana have relatively high wanted fertility levels (3.6 and 3.7 births per woman, respectively), and their levels of development as measured by real GDP per capita, child survival, and proportion schooled are low and have leveled off. In these two countries improvements in development will almost certainly be needed for desired family size and actual fertility to fall substantially below current levels. In contrast, in Bangladesh, Colombia, Dominican Republic, Peru, and Turkey wanted fertility has already dropped to about two births per woman and any further declines in overall fertility are likely to come from reductions in unwanted fertility.

NOTES

1 The 1999 survey for Nigeria has been excluded because its TFR estimate of 4.7 seems implausibly low compared with the estimates from surveys in 1990 and 2003.

2 The years for DHS surveys plotted in Figure 2 are as follows: Bangladesh, 1993/94, 1996/97, 1999/2000; Colombia, 1986, 1990, 1995, 2000; Dominican Republic, 1996, 1999, 2002; Ghana 1993, 1998, 2003; Kenya, 1993, 1998, 2003; Peru, 1986, 1992, 1996, 2000; Turkey, 1993, 1998.

3 To estimate the average fertility decline for non-stalling mid-transitional countries, I used the intervals between the next-to-last and last DHS surveys. The average years in which these surveys took place were respectively 1994 and 2000.

4 The unmet need for spacing among married women in the Ghana DHS surveys is reported as 24.7% in 1993, 11.4 % in 1998, and 21.7 % in 2003. This large fluctuation in unmet need is likely due in part to measurement error.

5 The measurement of unwanted fertility based on births that occur after the desired family size is reached leads potentially to an overestimate in countries where women have a gender preference for offspring. If, in specifying a family size preference, a woman also has a particular composition of boys or girls in mind, then her wanted fertility may exceed her desired family size. For example, if a woman wants a two-child family, including at least one son, she may decide to have a third (wanted) child if her first two children are girls. In the DHS procedure this third child would be considered unwanted.

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Table 1: Trend in the median age at first marriage at survey at onset of fertility stall and survey after onset of stall in seven countries

	Median age at first marriage (current status)		Trend during stall
	Survey at stall onset (DHS0)	Survey after onset (DHS1)	
Bangladesh	17.5	17.8	+
Colombia	22.3	21.5	-
Dom. Republic	20.7	20.2	-
Ghana	20.6	21.6	+
Kenya	20.9	20.9	0
Peru	23.4	22.2	-
Turkey	21.6	21.3	-

Source: DHS, based on interpolation of proportions ever married by 5-year age groups

Table 2: Average annual change in use of and demand for contraception for limiting family size and change in unmet need in mid-transitional countries

	Average annual change (%/year)		
	Contraceptive use for limiting	Contraceptive demand for limiting	Unmet need for limiting
Stalling countries (N=7)	0.48	0.22	0.25
Non-stalling countries (N=13)	1.26	1.03	1.23
Significance	*	*	NS

* $p<0.05$ (1-tailed t-test)

Table 3: Leveling off in real GDP per capita, child survival, proportion schooled, and family planning program effort score during fertility stalls in seven countries

	GDP per capita	Survival to age 5	Proportion schooled	Family planning effort score
Bangladesh				
Colombia	Leveled off	Leveled off		
Dominican Rep.		Leveled off	Leveled off	Leveled off
Ghana	Leveled off	Leveled off	Leveled off	
Kenya	Leveled off	Leveled off	Leveled off	
Peru				
Turkey				

Figure 1: Analytic framework for the determinants of fertility

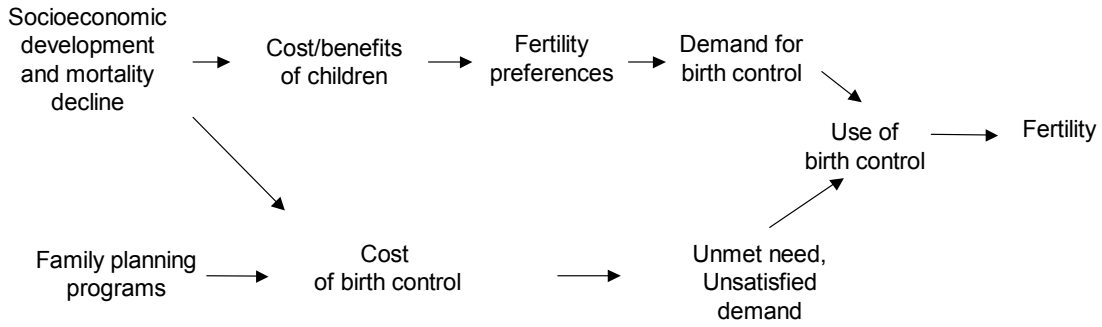


Figure 2: Trend in the total fertility rate for countries with stalled fertility

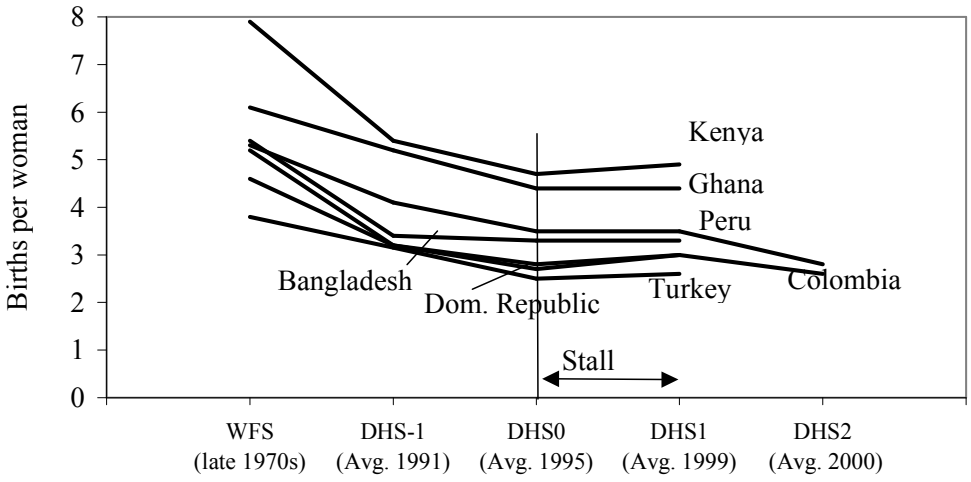


Figure 3: Relationship between the total fertility rate and contraceptive prevalence, 38 DHS countries (circles for countries with stalls)

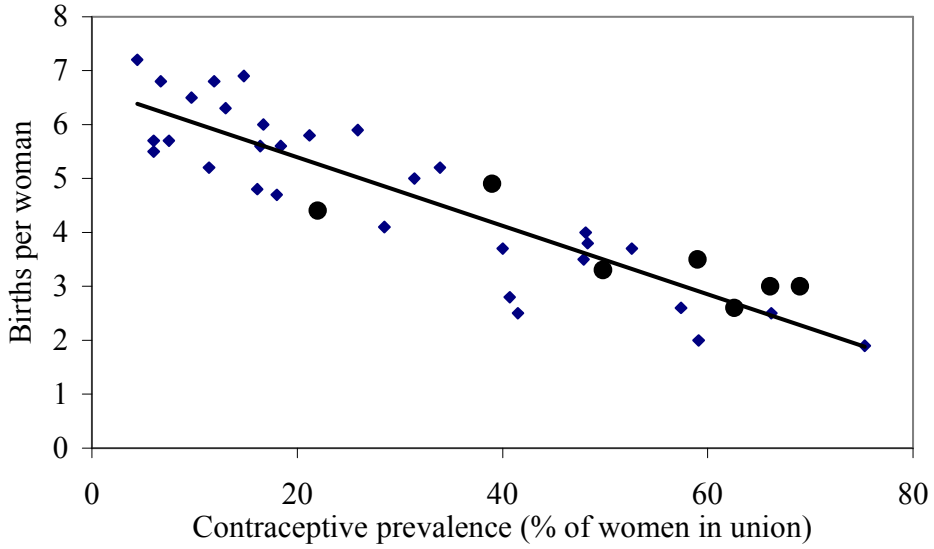


Figure 4: Trend in contraceptive prevalence in countries with a fertility stall

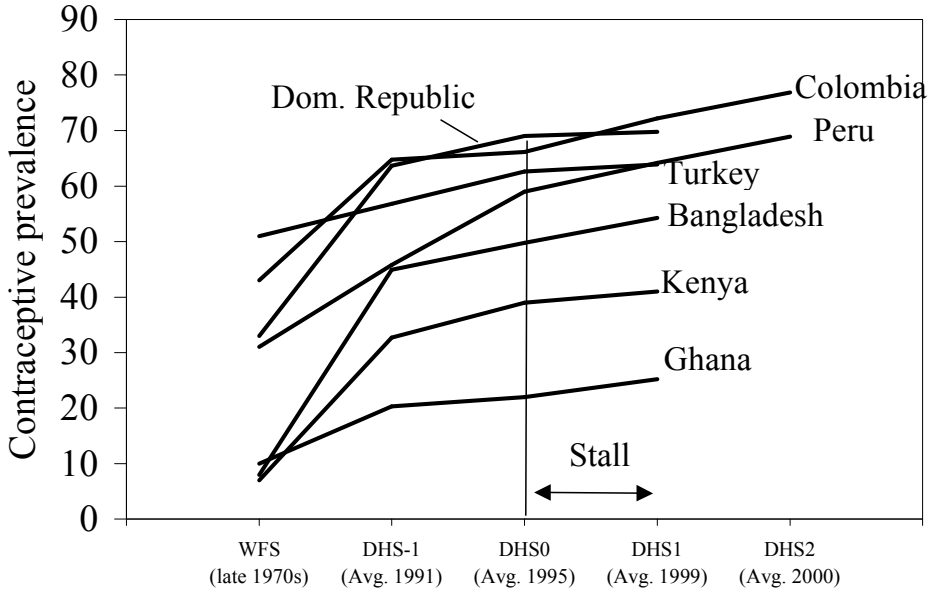


Figure 5: Relationship between the demand for contraception and current use to limit fertility, 38 DHS countries (circles indicate stalling countries)

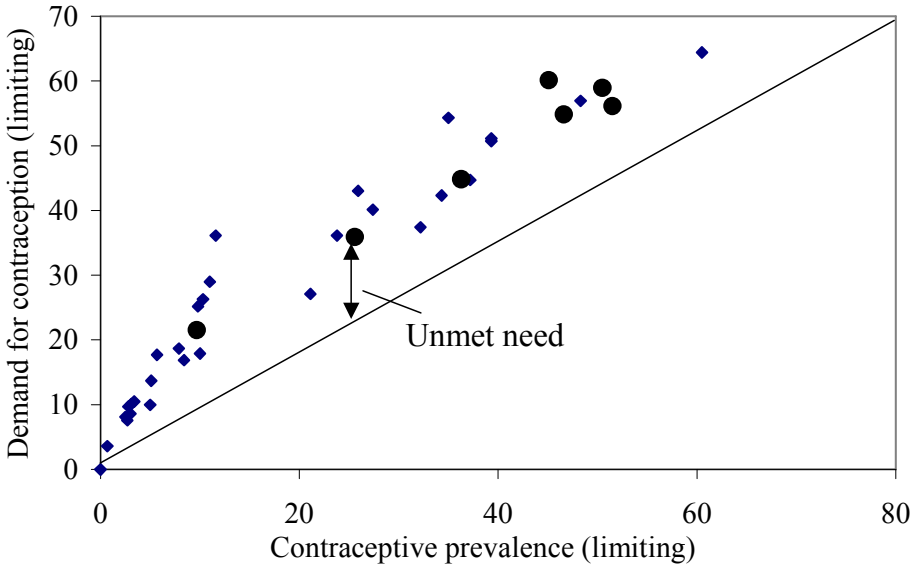


Figure 6a: Trend in the demand for contraception to limit fertility

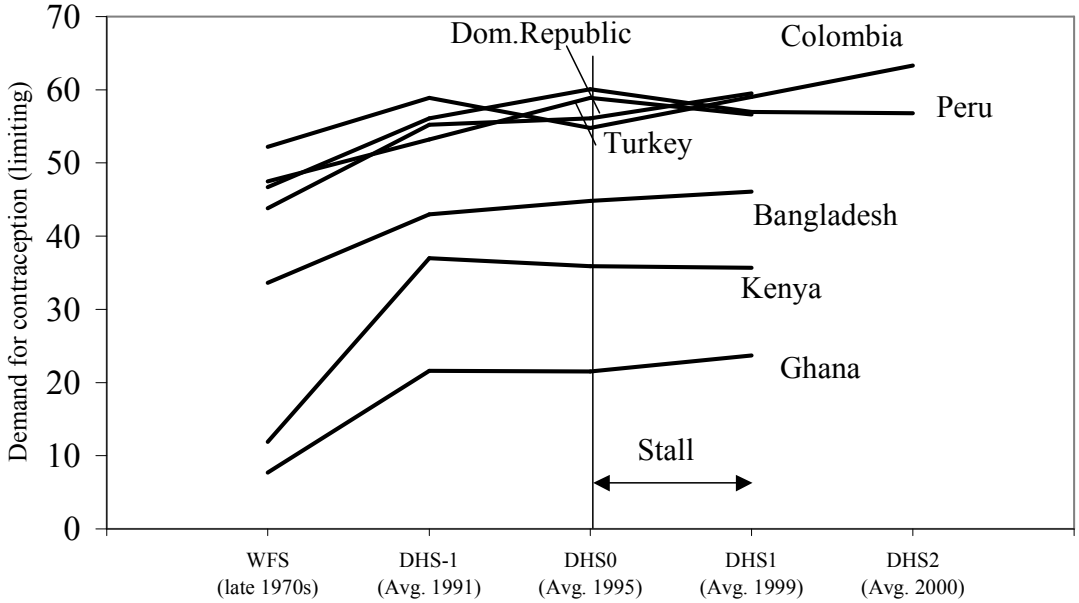


Figure 6b: Trend in current use of contraception to limit fertility

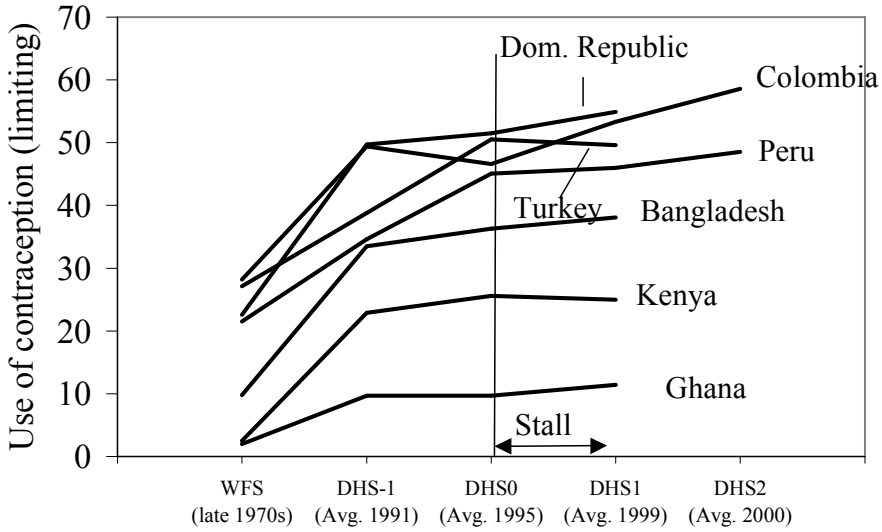


Figure 6c: Trend in unmet need for contraception to limit fertility

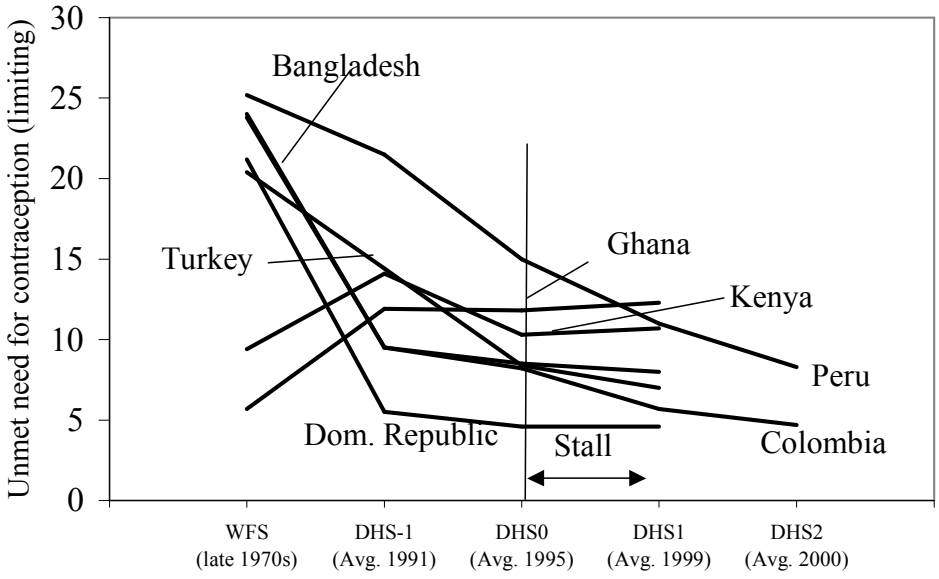


Figure 7: Relationship between the total fertility rate and the wanted total fertility rate, 38 countries (circles for countries with stalls)

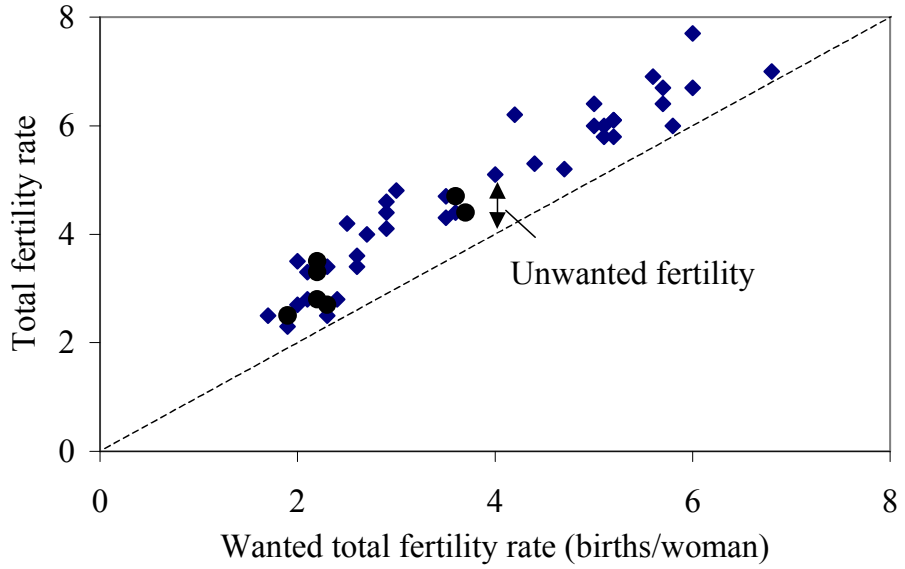


Figure 8: Trend in the wanted total fertility rate for countries with stalled fertility

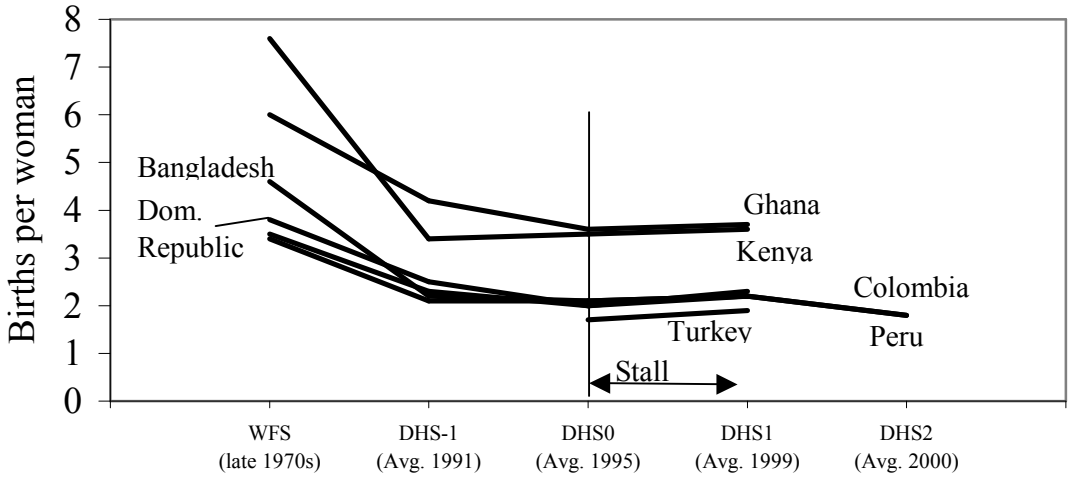


Figure 9: Trend in the unwanted total fertility rate for countries with stalled fertility

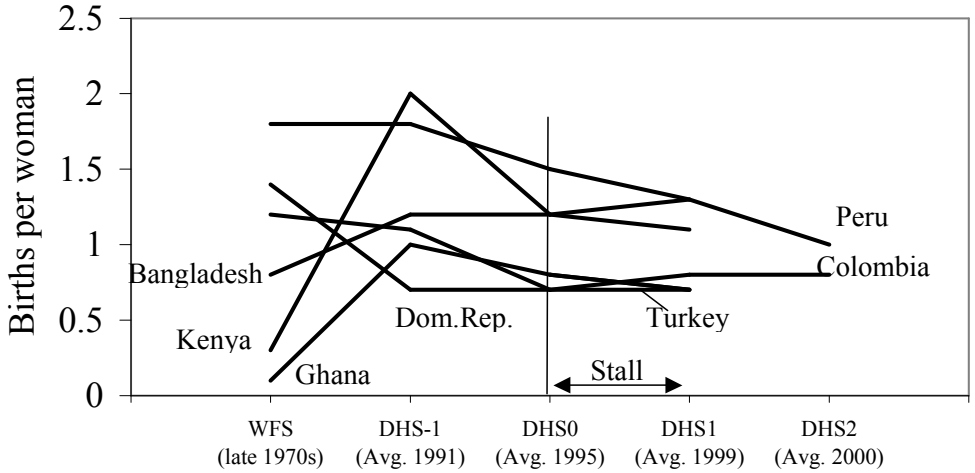


Figure 10a: Relationship between the total fertility rate and real GDP per capita ($) for 38 countries (circles for stalling countries)

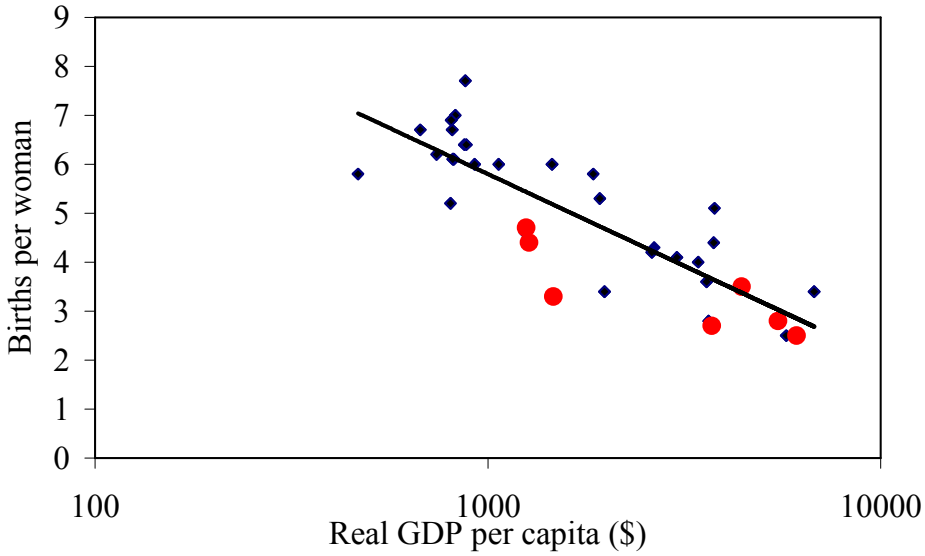


Figure 10b: Relationship between the total fertility rate and proportion of births surviving to age 5 for 38 countries (circles for stalling countries)

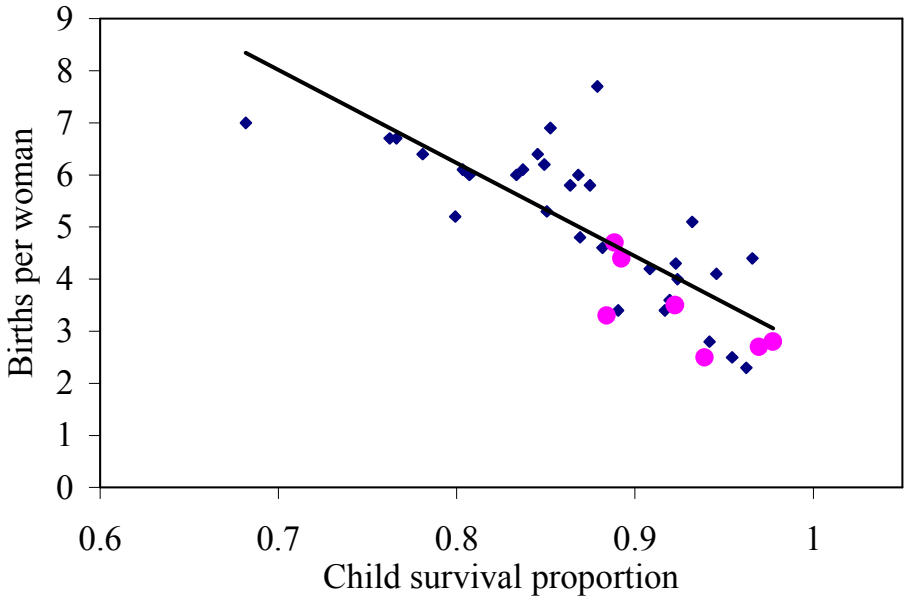
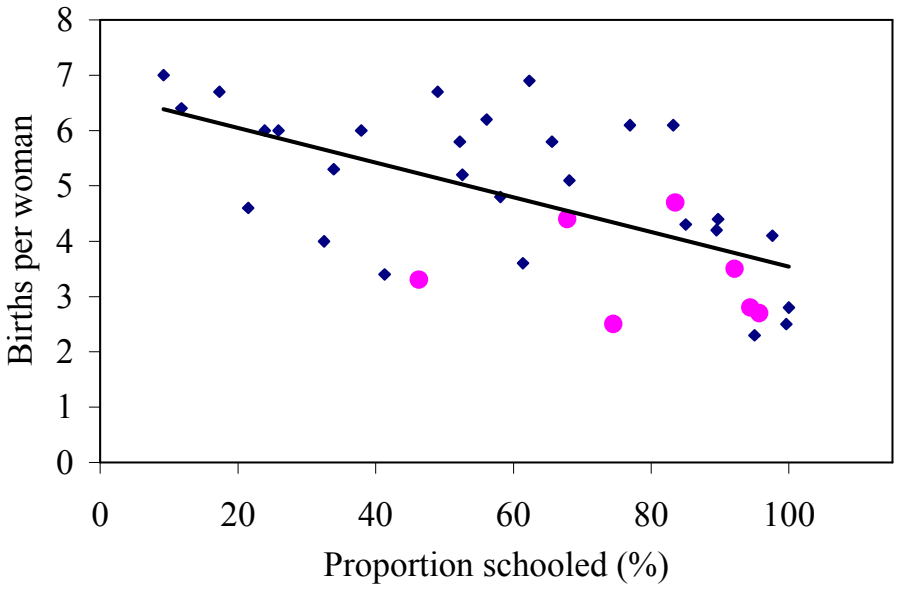


Figure 10c: Relationship between the total fertility rate and proportion schooled among women aged 15-49 for 38 countries (circles for stalling countries)



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