Stalling of Fertility Transitions and Socioeconomic Change in the Developing World: Evidence from the Demographic and Health Surveys*

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Introduction

This paper examines fertility decline in the developing world, using data from the Demographic and Health Surveys (DHS) in order to assess the role of socioeconomic change on fertility and stalling of fertility transition. We seek to address the following question: To what extent do differences in the pace of socioeconomic development and in the use of modern contraception account for differences across countries in the pace of fertility transition and the emergence of stalling?

The first substantive part of the paper reviews DHS data on fertility at the national level and also separately for rural and urban places, to assess the current situation of fertility transition early in the second decade of the 21st century. We categorize countries as to whether their recent fertility experience reflects decline or stalling of fertility, and in the latter case we distinguish between early-, mid-, and late-transition stalling.

The second substantive section of the paper examines the linkages between fertility decline and stalling, on the one hand, and changes in contraceptive use and socioeconomic development, on the other. Operationally, we use three indicators of socioeconomic development: changes in women's educational attainment, changes in infant and child mortality, and growth in GDP per capita. We also allow for a time trend in the course of fertility transition, other things equal.

For these multivariate analyses, we examine the magnitude of fertility decline between all pairs of consecutive surveys[1], using data from the 49 nations that have had multiple Demographic and Health Surveys. These data provide direct evidence on fertility transition within individual countries. These countries represent about 58 percent of the population of the developing world (disproportionately covering the least developed countries), and nearly three-fourths of the population of developing nations other than China. Our empirical work analyzes data at three different levels: national, urban/rural, and regional (regions within individual countries). This multilevel focus allows us to assess the robustness of our results.

The concluding section of the paper discusses our empirical findings and their implications for fertility stalling and the future of fertility transition more broadly. The United Nations Population Division has forecasts for fertility up to the middle of this century that typically show continued fertility declines in the developing world. However, our results suggest that for these projections to be realized, it will be necessary to continue improvements in women's schooling and in infant and child mortality, and to enhance access to modern contraception.

Fertility Transition in the Developing World

DHS data on fertility transition in the developing world are provided in Table 1. The table gives national, urban, and rural total fertility rates for each DHS survey in countries where there has been more than one DHS survey.[2] This includes data from 26 countries from sub-Saharan Africa, two countries from North Africa, eight countries from Latin America and the Caribbean, and 13 countries from Asia. Consequently, we have a total of 49 countries from throughout the developing world. The rightmost column of the table displays the current

[1] That is, for example, if a country had surveys in 1995, 2000, and 2005, that country would contribute two observations to the data, one for the initial pair (1995 and 2000) and a second for the subsequent pair (2000 and 2005).

[2] One exception here is the 1999 Nigeria DHS. Concerns about data quality regarding fertility led us to drop that survey. See Ibisomi (2007) for analysis of problems with the Nigeria 1999 DHS data.

fertility trend in each country, identified by the change in the national TFR between the two most recent surveys.

Examination of the table reveals that there are eight countries in which fertility transition is currently stalled. Hence, the vast majority of these 49 countries consists of nations in which, recently, fertility has been declining. At the same time, stalling of fertility decline is comparatively common in sub-Saharan Africa: seven of the 26 countries from sub-Saharan Africa are experiencing stalling. The TFR is declining in all but two of the countries located in the other three regions. The only countries outside of sub-Saharan Africa without declining fertility levels are Armenia and Indonesia. Though Armenia's national TFR has remained the same across the two most recent DHS surveys, this TFR is under the replacement level, and the country can therefore be considered post-transitional rather than stalling. The most recent survey for Indonesia indicates that fertility has stalled there at 2.6 children per woman.

Of the eight countries experiencing a stall in transition, one is late-transition, another is mid-transition, and six are early-transition stalls. We consider a country's fertility transition to be stalled if its TFR failed to decline between the two most recent surveys. We define early-transition stalling as a stall taking place when a country's TFR has not yet dropped below five. A stall that takes place when the TFR is below five and above three is considered mid-transition, and a stall when the TFR is below three and above two is a late-transition stall. By this classification, Indonesia is in the midst of a late-transition stall, Cameroon is experiencing mid-transition stalling, and early-transition stalling can be found in Benin, Guinea, Mozambique, Nigeria, Tanzania, and Zambia.

While recent changes in fertility identify only eight stalled countries, examination of the changes in the TFR across earlier pairs of surveys reveals that a number of other countries have also experienced stalling in the past. In sub-Saharan Africa, Ghana, Kenya, and Rwanda all experienced stalling during the past decade. Four countries in Latin America (Brazil, Colombia, Dominican Republic, and Peru) and two in Asia (Bangladesh and Turkey) also exhibited stalling behavior in the past. In each of these cases, however, a subsequent survey has shown resumption of fertility decline.

Our definition of stalling results in several discrepancies in the countries we considered to be stalled as compared to recent work on the subject. In his paper on fertility transition in developing countries, Bongaarts (2008) defines a stalling country as one that did not experience significant fertility decline between the two most recent surveys. He notes that "a few transitional countries with very small TFR declines (less than about 0.25 births per woman) are considered to have stalled because these declines are too small to be statistically significant" (109). This differs from our definition in that we only consider a country to be experiencing stalling if its TFR has failed to decline across the two most recent surveys, disregarding significance in cases with only small declines. Bongaarts considers Cote d'Ivoire[3], Ethiopia, Nigeria, Zambia, Zimbabwe, and Guatemala to be stalling, whereas in this paper, we classify all of these countries but Nigeria and Zambia as declining.

There are two other causes of differences between our results and those of Bongaarts. The first is our addition of certain surveys that were presumably not available when Bongaarts did his work: Benin 2006, Uganda 2006, and Turkey 2003. Because of these additions, we consider Benin to be stalling while Bongaarts does not, and he considers Uganda and Turkey to be stalling while we do not. The second cause for discrepancy is a difference in the definition

[3] This discrepancy can also be explained by Bongaarts' use of a 2005 Cote d'Ivoire AIS survey, which we did not use.

of a pre-transitional country. Due to lack of historical data, Bongaarts defines a pre-transitional country as one for which the "contraceptive prevalence among married women is 10 percent or less" (2008, 109). We use additional fertility estimates provided by the United Nations Population Division (2007) for historical data and define a pre-transitional country as one for which the estimated TFR has not declined at least 10% from some existent peak. Because of this difference in definitions, we consider Mali and Niger to be pre-transitional countries, whereas Bongaarts characterizes Chad, Guinea, and Mali as pre-transitional. By either definition, none of the countries outside of sub-Saharan Africa is considered pre-transitional, though Yemen continues to have an unusually high TFR for Asia as of 1997.

The discussion above makes it clear that how stalling is defined will determine how many and what countries are identified as stalling. For example, had we used the "significant fertility decline" criterion used by Bongaarts, we would have had a longer list of countries experiencing stalling fertility (and that list would still be heavily dominated by countries from sub-Saharan Africa).[4] As will be seen in our empirical analyses below, however, our goal is to explore the role of socioeconomic changes in contributing to fertility decline. That is, our interest is not in coming up with a definitive list of stalling countries. Rather, we seek to assess if differences across countries in the pace of socioeconomic change help to account for differences in the pace of fertility change. This, in turn, should help account for differences across countries with respect to experiencing stalling, regardless of the precise definition of stalling that is used.

Recent work by Shapiro and Gebreselassie (2008b) notes that most countries in sub-Saharan Africa are still experiencing fertility decline. This decline ranges in pace from modest to substantial. In the other regions that we study in this paper, every country – with the exceptions of Armenia and Indonesia – is also experiencing decline. As with sub-Saharan Africa, these regions contain both countries experiencing modest fertility decline, such as Guatemala and India, and those for which the decline is more considerable, such as Morocco, Brazil, and Yemen. Figure 1 shows, within each region, countries arrayed according to the magnitude of the pace of decline in the TFR per year between the two most recent surveys, in sub-Saharan Africa, Asia and North Africa, and Latin America and the Caribbean.

The pace of decline is clearly slower in sub-Saharan Africa (an average of only .05 per year across all countries) than in Asia and North Africa (average decline of .08 per year) and in Latin America and the Caribbean (.12 per year). Even without the stalling countries, more than 40 percent of the sub-Saharan nations experienced a decline in fertility of less than .05 per year, while only a quarter of the countries in Latin America and the Caribbean and about 30 percent of the countries in Asia and North Africa had fertility declines per year that were as small.

Table 1 also shows the TFRs for urban and rural places separately by country. Past studies showed more rapid fertility decline early on in urban places than in rural ones (see, for example, Shapiro and Tambashe, 2002, 2003). Fertility decline began earlier in urban areas than in rural ones in sub-Saharan Africa, while rural TFRs tended to remain stable or even increase. Even as fertility rates began to decline in rural areas, the decline was smaller than in urban areas. In countries where fertility transition was relatively advanced, the pace of fertility decline in rural areas began to meet or exceed that of the urban areas. This latter case is what

[4] For example, if we considered declines in the TFR between the two most recent surveys of 0.1 or 0.2 as stalling, an additional 11 countries would be characterized as stalled, with five of these countries being in sub-Saharan Africa.

we would expect to see in the regions outside of sub-Saharan Africa, which tend to be ahead of sub-Saharan Africa in terms of fertility transition, and it is indeed what we find by looking at Table 1. India, Indonesia, Kazakhstan, and Pakistan are the only countries outside of sub-Saharan Africa where the urban fertility decline is greater than the rural fertility decline between the two most recent surveys. In all other countries in these regions the rate of rural fertility decline either at least meets or more frequently exceeds the corresponding decline in urban fertility. Often, between earlier surveys, urban fertility decline outpaces that of rural areas, and then in later surveys rural decline catches up to urban decline, exceeding it in most cases.

An additional observation, especially pertinent for sub-Saharan Africa, is that countries showing only a small decline in the TFR between the two most recent surveys often have stalled rural fertility in conjunction with still-declining urban fertility. The opposite is the case among the countries of the other regions – that is, among these countries, there are some that are experiencing urban fertility stall or increase while the national TFR continues to decline. In Guatemala, the TFR declined by 0.1 between the two most recent surveys, while the urban TFR increased by 0.3. In Cambodia, Jordan, and Nepal, the national TFR declined at varying levels while the urban TFR remained the same or increased. As noted earlier, in several cases increases in fertility at the national level between earlier surveys were followed by subsequent declines; this was true for rural and urban areas as well. These mid- and late-transition fluctuations and stalls of fertility rates followed by declines among the earlier surveys in the regions outside of sub-Saharan Africa may offer important insight into the persistence of the current stalling in parts of sub-Saharan Africa.

Factors Contributing to Global Fertility Decline and the Stall of Fertility in Sub-Saharan Africa

As we see in Table 1 and Figure 1, fertility stalling at present is predominantly apparent in sub-Saharan Africa, although it has occurred elsewhere, and there is considerable variation across countries in the pace of fertility decline. Several factors seem to be likely indicators of the magnitude of fertility decline and the likelihood of fertility stall in the developing world. In this section, we narrow the field to a handful of variables that seem to be the strongest candidates for effecting changes in fertility rates and then report the results of our multivariate analyses. Based on previous models and empirical studies of fertility levels and fertility transition, these factors hold the potential to determine differences in fertility behaviors, both in situations of decline and in the fertility stalling that is present. We observe the changes in these factors between pairs of DHS surveys in each country. We then relate the changes in these factors to the corresponding changes in the total fertility rate, in multivariate regressions at the national, urban/rural, and regional levels. We do this using data for all pairs of surveys for each country.

First, we consider the effect that changes in the educational attainment of women of reproductive age have on changes in the TFR. In a considerable number of past works, a general inverse relationship between women's educational attainment and fertility has been established (for example, see Jejeebhoy, 1995; Rutstein, 2002). These authors and others stress the importance of women's education as a contributing factor to fertility decline, particularly in association with marriage, contraceptive use, and infant and child mortality (cf., Shapiro and Gebreselassie, 2008a). A secular trend toward greater educational attainment of women in the developing world (Schultz, 1993) implies an increase over time in the percentage of women

with secondary or higher education and a reduction in the percentage of women with no schooling.

One would anticipate that countries with relatively large increases in the share of women with some secondary schooling or higher would experience larger decreases in the TFR. Countries with smaller decreases or even increases in the proportion of women with no education would correspondingly be linked with smaller declines in fertility or stalling fertility. Conversely, relatively large declines in the percentage of women with no schooling would be expected to result in comparatively large declines in fertility.

Among the 10 countries that are pre-transitional or are experiencing stalls, the average decrease between the two most recent surveys in the percentage of women with no schooling is 2.5 percentage points. In contrast, the average decline among countries with declining TFRs is 6.0 percentage points. By the same token, the average increase in the percentage of women with secondary education or higher is 3.9 in the 10 pre-transition or stalling countries, while the average is 7.1 in all of the declining countries combined. Therefore, countries experiencing declining fertility rates have stronger upward trends in women's educational attainment, while countries with stalling fertility or pre-transitional countries show slower progress in women's education.

Another variable pertinent to fertility behavior is infant and child mortality. Changes in mortality can be a driving factor influencing actual fertility, according to the Easterlin framework for fertility analysis (Easterlin, 1975; Easterlin and Crimmins, 1985). Alterations in mortality are generally reflected in changes in the supply of children and can motivate fertility control. Of the 49 countries that we examine here, 42 experienced declines in infant and child mortality ($_5q_0$) between the two most recent DHS surveys. However, increases in mortality rates are not uncommon. We anticipate that decreases in mortality should contribute to fertility decline.

Earlier work with an infant and child mortality rate lagged 5-9 years found that lagged changes in mortality were more closely related to changes in fertility than were contemporaneous mortality changes (Shapiro and Gebreselassie, 2008a). However, a 5-9 year lag may still be too short a time period for couples to perceive mortality decline and react by reducing fertility.[5] The same perspective has been presented by Mark Montgomery in his paper, "Perceiving Mortality Decline" (2000). Therefore, for all regressions in the analysis below, we use a mortality lag of 0-14 years in order to allow for a longer lag in reaction time. We should note, however, that the average decline in mortality for the stalling and pre-transitional countries, at 24.7, actually exceeded the corresponding figure for the countries with declining fertility, 20.4. This is contrary to our expectations.

Another variable that we examine in relation to TFR decline is growth in real GDP per capita.[6] Historically, indicators of sustained economic growth such as growth in GDP per capita have accompanied fertility transition. There is some literature, however, that suggests that economic difficulties may contribute to crisis-led fertility declines, as was seen in some countries in sub-Saharan Africa during the 1980s and 1990s (e.g., Lesthaeghe, 1989; Eloundou-Enyegue et al., 2000; National Research Council, 1993).

Similar to our treatment of mortality, we have explored the use of a lagged variable when estimating the effect of growth in real GDP per capita on fertility changes. In particular, we have chosen a 3-year lag in the percentage growth in GDP per capita over 5 years, thereby

[5] We thank John Cleland for emphasizing this point.

[6] We use GDP data from the Penn World Tables (Heston et al., 2006).

measuring economic growth over the five-year period immediately preceding the three years during which fertility is measured. This measure of economic growth is inversely related to the magnitude of fertility decline for the group of 49 countries as a whole. Among countries in which fertility is declining, the average growth in lagged GDP per capita over five years is only 15 percent, whereas the average growth in lagged GDP per capita among pre-transition and stalling-fertility countries is almost 35 percent.

Next, we explore the use of modern contraception and its potential link with fertility decline. Increased use of modern contraceptive methods among women in union is typically strongly associated with fertility decline. Among the pre-transition and stalling-fertility countries, the average increase in the use of modern contraception is 3.6 percentage points, compared to 5.8 percentage points in the countries where fertility is declining.

In addition, we include a variable identifying a time trend, which allows for any systematic changes over time in the pace of fertility decline that are not picked up by the other explanatory variables. Such changes may be associated with the observation made by Bongaarts and Watkins (1996) and Bongaarts (2002) that as time goes by, fertility decline occurs at progressively lower levels of socioeconomic development. On the other hand, they may simply reflect unmeasured temporal changes in other variables that also influence the rate of fertility decline. The time trend is the final variable in our set of factors influencing fertility decline.

Data Analyses: Multivariate Regressions

Using all of the explanatory variables discussed above, multivariate equations are estimated to account for the changes in fertility at the national level, across all pairs of surveys. These equations can be found in Table 2. The first column of coefficients in the table controls for our measures of socioeconomic change: changes in women's schooling, in infant and child mortality, and in lagged growth in GDP per capita. More rapid growth in the percentage of women of reproductive age with no schooling is associated with smaller declines in fertility, and the relationship is highly significant. Growth in the percentage of women with at least secondary education is associated with larger declines in fertility, and there is a weakly significant association between the two variables. Hence, for both of the education variables the evidence suggests that increased female schooling contributes to more rapid fertility decline. In addition to increases in female educational attainment, greater decreases in the lagged infant and child mortality rate are significantly associated with more rapid fertility decline. More rapid GDP growth, by contrast, translates into slower fertility decline, other things equal, as we have found previously in similar analyses for sub-Saharan Africa (Shapiro and Gebreselassie, 2008a, 2008b). These results show that socioeconomic development is significantly connected to fertility decline. Overall, the variables account for more than a third of the variation across countries in changes in the TFR.

In the second column of coefficients in Table 2, the variable measuring growth in the use of modern contraception has been added. There is a potential endogeneity issue with this variable, since greater women's education is typically associated with greater use of modern contraception. The positive and significant coefficient for growth in contraceptive use indicates that countries experiencing increased use of modern contraception tend to have larger fertility declines, other things equal. Adding the contraception variable reduces the magnitudes (in absolute value) of the coefficients of the education variables, and the secondary education

variable is no longer significant. The coefficient on changes in mortality also declines a bit in absolute value.

The third equation in the table adds a time trend, and this variable has a negative and significant coefficient, indicating that, other things equal, as time goes by the magnitude of fertility decline diminishes. For the most part other coefficients do not change much in going from the second to the third equation, and overall, 40 percent of the variation in the decline in the TFR is accounted for by the variables in equation 3.

In order to assess the impact of socioeconomic change overall, we have calculated predicted changes in the total fertility rate implied by the second national-level equation in Table 2, under two alternative scenarios. In the first scenario, we assume that each of the explanatory variables in the equation has a mean value representing a level corresponding to the mean plus or minus one standard deviation, so as to show improvement for the variable in question. That is, growth in the percentage of women with at least secondary education, growth in the percentage of women using modern contraception, and growth in GDP per capita are all assumed to be one standard deviation above the mean in the sample, while growth in the percentage of women with no schooling and the increase in the infant and child mortality rate are each assumed to be one standard deviation below their corresponding sample means. In the second scenario, we estimated the effects of socioeconomic deterioration, indicated again by a difference of one standard deviation from the mean, but in the opposite direction as compared to the first scenario.

For the 49 countries taken together, the average decline in the TFR (counting all surveys) was 0.367. In the scenario in which it is assumed that there is socioeconomic improvement, the implied average decline in the TFR is considerably greater, being 0.633. By contrast, the scenario with socioeconomic deterioration implies an average decline in the TFR of .101. These results reflect the fact that the decline-slowing impact of GDP growth on the TFR is substantially outweighed by the decline-accelerating impact of improvements in women's schooling and in infant and child mortality. Overall, then, it appears that socioeconomic improvement will contribute to more rapid fertility decline, while socioeconomic deterioration will lead to slower fertility decline and increase the likelihood of stalling of fertility transition.

At the same time, it should be noted that the negative coefficient on the time trend in the third equation in Table 2 implies, other things (including socioeconomic change) equal, that the magnitude of the decline in fertility between successive surveys will diminish over time. That is, the implication of this negative coefficient is that maintenance of the means of the variables for the actual sample into the coming years would result in progressively smaller declines in the TFR, and in the limit, we would see much more pervasive stalling of fertility than that which has been observed to date.

Table 3 reports results of similar analyses, but here the estimated equations are based on separate observations of urban and rural data for changes between the two most recent surveys. This doubled the number of observations. The results in Table 3 are quite similar to those in Table 2. In the first equation, increased women's schooling and reduced infant and child mortality are associated with more rapid fertility decline, while more rapid GDP growth entails smaller declines in fertility, other things equal. Modern contraception (equation 2) and the time trend (equation 3) are also significantly related to the magnitude of fertility decline, as in Table 2. The estimated coefficients are broadly similar across the two tables, except that mortality decline has a somewhat smaller impact at the urban/rural level while contraceptive

use has a distinctly larger impact. As in the preceding table, the full model (equation 3) accounts for just over 40 percent of the variation in fertility declines.

The third set of multivariate analyses is in Table 4. These equations parallel those in the two preceding tables, but here the units of observation are the regions within countries. This substantially increases the number of observations. Substantively, the results are largely similar to those in the preceding tables, with some differences. As indicated in the first equation, increased women's schooling (as reflected in growth in the percentage of women with at least some secondary education) and more rapid decreases in infant and child mortality appear to contribute to more rapid fertility decline. In contrast to the two preceding tables, in equation 1 growth in GDP per capita is not significantly related to fertility decline.[7] Modern contraception (equation 2) is significantly associated with fertility decline, while the time trend variable (equation 3) is not. In these latter two equations, however, the GDP variable has significant coefficients. Overall, the explanatory power of the independent variables is substantially lower at the regional level than at the more aggregated levels.

Summary and Conclusions

Using Demographic and Health Survey data from 49 developing countries representing a substantial share of the developing world, this paper has documented ongoing fertility transition in the vast majority of these countries. However, seven nations in sub-Saharan Africa are presently experiencing stalls in their fertility transitions. More broadly, there is considerable variation across countries in the pace of fertility decline, and nearly 20 of the countries we examine have most recently experienced either stalling (as we have defined it) or very slow declines in fertility. At the same time, data indicate that another nine countries had previously experienced stalling but subsequently witnessed renewed fertility decline.

We carried out multivariate analyses to assess the degree to which differences in the pace of socioeconomic progress contribute to differences in the speed of fertility transition. Analyzing changes in fertility covered by all pairs of DHS surveys, we find that increased women's schooling, reduced infant and child mortality, and increased use of modern contraception are all associated with more rapid declines in fertility and hence a lower likelihood of stalling. There is also evidence that fertility declines are smaller when GDP growth is more rapid and that these declines diminish in magnitude over time, other things equal.

Sub-Saharan Africa was the last major part of the world to initiate fertility transition. The evidence presented here shows a weaker pace of decline in fertility compared to other regions. As Bongaarts (2008) has suggested, this may well reflect a slower pace of socioeconomic change in Africa as compared to elsewhere in the developing world.

What is the future of fertility transition in the developing world? On the one hand, the predominance of countries with declining fertility and the fact that half a dozen non-African countries have experienced fertility stalls and then subsequently resumed fertility decline suggests that fertility transition will be ongoing. At the same time, our multivariate results suggest that sustaining fertility decline will require continued improvements in women's schooling and in infant and child mortality, as well as increased contraceptive prevalence. And it appears that the region with the highest fertility, sub-Saharan Africa, remains as most vulnerable to stalling of fertility transition.

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[7] It should be noted that the GDP growth variable is based on national data, and hence does not reflect interregional differences in economic growth.

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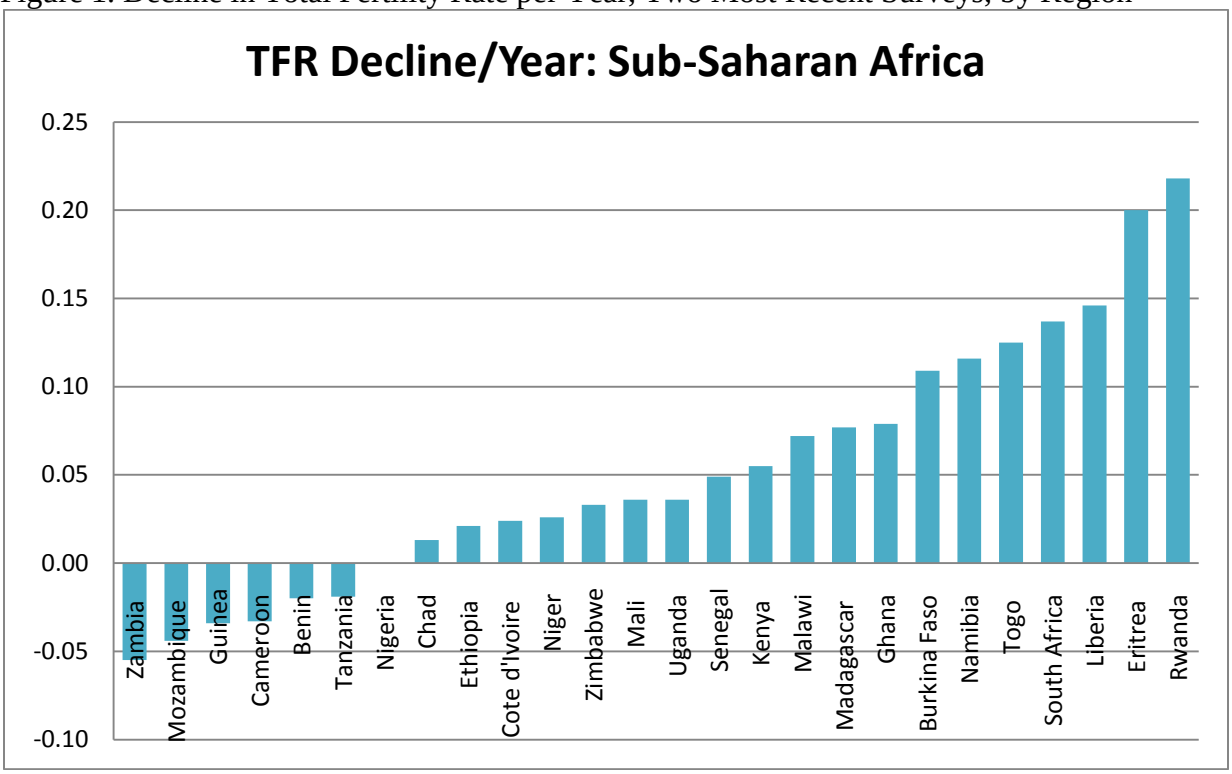
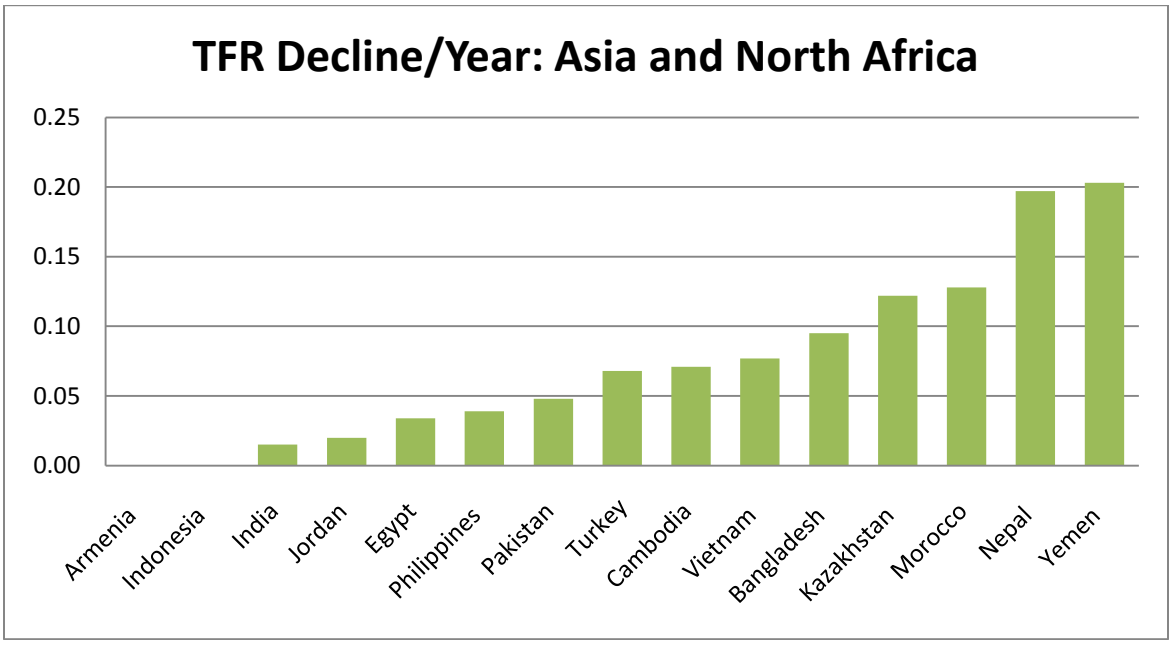
Figure 1. Decline in Total Fertility Rate per Year, Two Most Recent Surveys, by Region





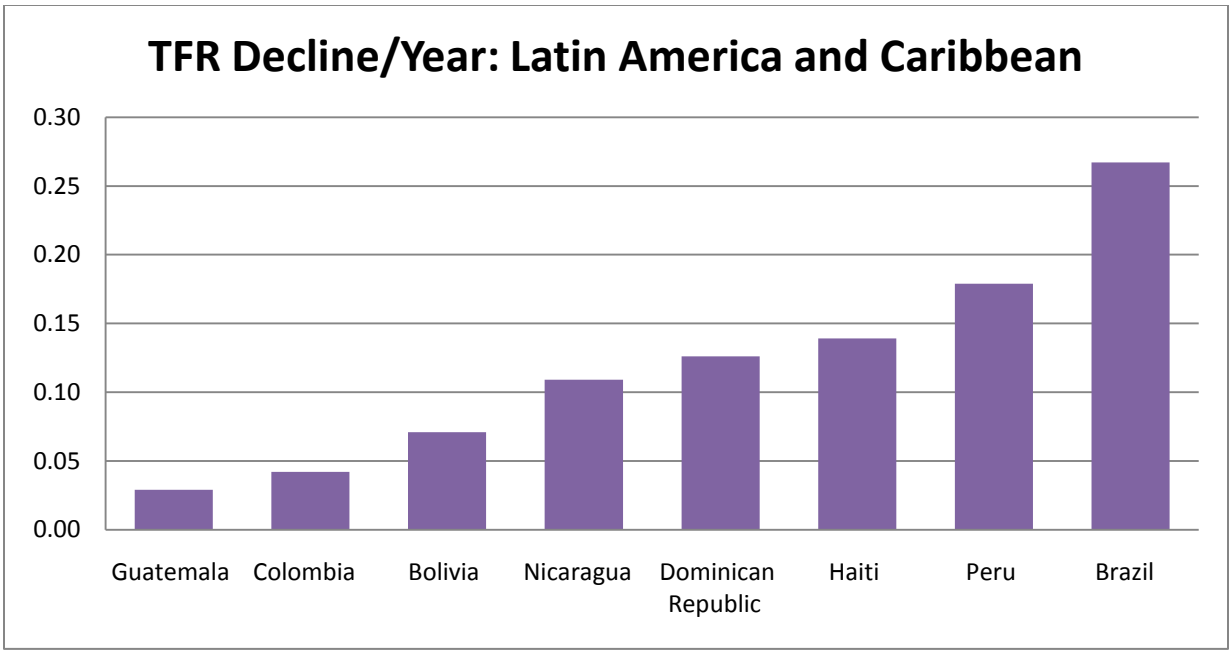

TFR Decline/Year: Latin America and Caribbean
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Guatemala
Colombia
Bolivia
Nicaragua
Dominican Republic
Haiti
Peru
Brazil

Table 1. Total Fertility Rates, National, Urban, and Rural, and Trend: Countries with Multiple Surveys				
Country (year of survey)	**Total Fertility**			**Trend**
	National	**Urban**	**Rural**	
Sub-Saharan Africa				
Benin 1996	6.0	4.9	6.7	
Benin 2001	5.6	4.4	6.4	
Benin 2006	5.7	4.9	6.3	Early-transition stall
Burkina Faso 1992/93	6.5	4.6	7.0	
Burkina Faso 1998/99	6.4	3.9	6.9	
Burkina Faso 2003	5.9	3.4	6.5	Decline
Cameroon 1991	5.8	5.2	6.3	
Cameroon 1998	4.8	3.8	5.4	
Cameroon 2004	5.0	4.0	6.1	Mid-transition stall
Chad 1996/97	6.4	5.9	6.5	
Chad 2004	6.3	5.7	6.5	Decline
Cote d'Ivoire 1994	5.3	4.4	6.0	
Cote d'Ivoire 1998/99	5.2	4.0	6.0	Decline
Eritrea 1995	6.1	4.2	7.0	
Eritrea 2002	4.8	3.5	5.7	Decline
Ethiopia 2000	5.5	3.0	6.0	
Ethiopia 2005	5.4	2.4	6.0	Decline
Ghana 1988	6.4	5.3	7.0	
Ghana 1993	5.2	3.7	6.0	
Ghana 1998	4.4	3.0	5.3	
Ghana 2003	4.4	3.1	5.6	
Ghana 2008	4.0	3.1	4.9	Decline
Guinea 1992*	5.7	5.2	5.9	
Guinea 1999	5.5	4.4	6.1	
Guinea 2005	5.7	4.4	6.3	Early-transition stall
Kenya 1989	6.7	4.5	7.1	
Kenya 1993	5.4	3.4	5.8	
Kenya 1998	4.7	3.1	5.2	
Kenya 2003	4.9	3.3	5.4	
Kenya 2008	4.6	2.8	5.2	Decline
Liberia 1986	6.7	6.0	7.1	
Liberia 2007	5.2	3.8	6.2	Decline
Madagascar 1992	6.1	3.8	6.7	
Madagascar 1997	6.0	4.2	6.7	
Madagascar 2003/2004	5.2	3.7	5.7	
Madagascar 2008-09	4.8	2.9	5.2	Decline
Malawi 1992	6.7	5.5	6.9	
Malawi 2000	6.3	4.5	6.7	
Malawi 2004	6.0	4.2	6.4	Decline

Mali 1987	7.1	6.3	7.4	
Mali 1995/96	6.7	5.4	7.3	
Mali 2001	6.8	5.5	7.3	
Mali 2006	6.6	5.4	7.2	Pre-transition
Mozambique 1997	5.2	4.6	5.3	
Mozambique 2003	5.5	4.4	6.1	Early-transition stall
Namibia 1992	5.4	4.0	6.3	
Namibia 2000	4.2	3.1	5.1	
Namibia 2006/2007	3.6	2.8	4.3	Decline
Niger 1992	7.0	6.4	7.1	
Niger 1998	7.2	5.6	7.6	
Niger 2006	7.0	6.1	7.3	Pre-transition
Nigeria 1990	6.0	5.0	6.3	
Nigeria 2003	5.7	4.9	6.1	
Nigeria 2008	5.7	4.7	6.3	Early-transition stall
Rwanda 1992	6.2	4.5	6.3	
Rwanda 2000	5.8	5.2	5.9	
Rwanda 2005	6.1	4.9	6.3	
Rwanda 2007-08	5.5	4.7	5.7	Decline
Senegal 1992/93	6.0	5.1	6.7	
Senegal 1997	5.7	4.3	6.7	
Senegal 2005	5.3	4.1	6.4	Decline
South Africa 1998	2.9	2.3	3.9	
South Africa 2003	2.1	2.1	2.2	Decline
Tanzania 1992	6.2	5.1	6.6	
Tanzania 1996	5.8	4.1	6.3	
Tanzania 1999	5.6	3.2	6.5	
Tanzania 2004	5.7	3.6	6.5	Early-transition stall
Togo 1988	6.4	4.9	7.3	
Togo 1998	5.2	3.2	6.3	Decline
Uganda 1988	7.4	5.7	7.6	
Uganda 1995	6.9	5.0	7.2	
Uganda 2000/01	6.9	4.0	7.4	
Uganda 2006	6.7	4.4	7.1	Decline
Zambia 1992	6.5	5.8	7.1	
Zambia 1996	6.1	5.1	6.9	
Zambia 2001/02	5.9	4.3	6.9	
Zambia 2007	6.2	4.3	7.5	Early-transition stall
Zimbabwe 1988	5.4	3.8	6.2	
Zimbabwe 1994	4.3	3.1	4.9	
Zimbabwe 1999	4.0	3.0	4.6	
Zimbabwe 2005/06	3.8	2.6	4.6	Decline
North Africa				

Egypt 1988	4.5	3.6	5.6	
Egypt 1992	3.9	2.9	4.9	
Egypt 1995	3.6	3.0	4.2	
Egypt 2000	3.5	3.1	3.9	
Egypt 2005	3.1	2.7	3.4	
Egypt 2008	3.0	2.7	3.2	Decline
Morocco 1987	4.6	3.2	6.0	
Morocco 1992	4.0	2.5	5.5	
Morocco 2003-2004	2.5	2.1	3.0	Decline
Latin America & Caribbean				
Bolivia 1989	5.0	4.0	6.6	
Bolivia 1994	4.8	3.8	6.3	
Bolivia 1998	4.2	3.3	6.4	
Bolivia 2003	3.8	3.1	5.5	Decline
Brazil 1986	3.4	2.8	5.1	
Brazil 1991	3.7	2.8	5.2	
Brazil 1996	2.5	2.3	3.5	Decline
Colombia 1986	3.2	2.6	4.7	
Colombia 1990	2.8	2.5	3.6	
Colombia 1995	3.0	2.5	4.3	
Colombia 2000	2.6	2.3	3.8	
Colombia 2005	2.4	2.1	3.4	Decline
Dominican Republic 1986	3.7	3.1	4.8	
Dominican Republic 1991	3.3	2.8	4.4	
Dominican Republic 1996	3.2	2.8	4.0	
Dominican Republic 1999	2.7	2.5	3.0	
Dominican Republic 2002	3.0	2.8	3.3	
Dominican Republic 2007	2.4	2.3	2.8	Decline
Guatemala 1995	5.1	3.8	6.1	
Guatemala 1998/99	5.0	4.1	5.8	Decline
Haiti 1994/95	4.8	3.3	5.9	
Haiti 2000	4.7	3.4	5.8	
Haiti 2005	3.9	2.7	5.0	Decline
Nicaragua 1997/98	3.6	2.9	5.0	
Nicaragua 2001	3.2	2.6	4.4	Decline
Peru 1986	4.1	3.1	6.3	
Peru 1992	3.5	2.8	6.2	
Peru 1996	3.5	2.8	5.6	
Peru 2000	2.8	2.2	4.3	Decline
Asia				
Armenia 2000	1.7	1.5	2.1	
Armenia 2005	1.7	1.6	1.8	Post-transition

Bangladesh 1993/94	3.4	2.7	3.5	
Bangladesh 1996/97	3.3	2.1	3.4	
Bangladesh 1999/2000	3.3	2.5	3.5	
Bangladesh 2004	3.0	2.5	3.2	
Bangladesh 2007	2.7	2.4	2.8	Decline
Cambodia 2000	3.8	2.8	4.0	
Cambodia 2005	3.4	2.8	3.5	Decline
India 1992/93	3.4	2.7	3.7	
India 1998/99	2.8	2.3	3.1	
India 2005/06	2.7	2.1	3.0	Decline
Indonesia 1987	3.1	2.6	3.4	
Indonesia 1991	3.0	2.6	3.2	
Indonesia 1994	2.9	2.3	3.1	
Indonesia 1997	2.8	2.4	3.0	
Indonesia 2002/2003	2.6	2.4	2.7	
Indonesia 2007	2.6	2.3	2.8	Late-transition stall
Jordan 1990	5.6	5.1	6.8	
Jordan 1997	4.4	4.2	5.0	
Jordan 2002	3.7	3.5	4.2	
Jordan 2007	3.6	3.6	3.7	Decline
Kazakhstan 1995	2.5	2.0	3.1	
Kazakhstan 1999	2.0	1.5	2.7	Decline
Nepal 1996	4.6	2.9	4.8	
Nepal 2001	4.1	2.1	4.4	
Nepal 2006	3.1	2.1	3.3	Decline
Pakistan 1990-91	4.9	4.5	5.1	
Pakistan 2006-07	4.1	3.3	4.5	Decline
Philippines 1993	4.1	3.5	4.8	
Philippines 1998	3.7	3.0	4.7	
Philippines 2003	3.5	3.0	4.3	
Philippines 2008	3.3	2.8	3.8	Decline
Turkey 1993	2.5	2.3	2.9	
Turkey 1998	2.6	2.4	3.1	
Turkey 2003	2.2	2.1	2.7	Decline
Vietnam 1997	2.3	1.6	2.5	
Vietnam 2002	1.9	1.5	2.0	Decline
Yemen 1991/92	7.7	5.6	8.2	
Yemen 1997	6.5	5.0	7.0	Decline

* data from published report.

Table 2. Regression Analysis of the Decline in the Total Fertility Rate Between Pairs of Surveys, National Data

Variable	1	2	3
Increase in percentage of women with no schooling	-0.0275**	-0.0252**	-0.0261**
Increase in percentage of women with at least secondary education	0.0100+	0.0076	0.0069
Increase in infant and child mortality[1]	-0.0049*	-0.0042*	-0.0050*
Percentage growth in GDP per head over five years (three-year lag)	-0.0033*	-0.0035*	-0.0033*
Growth in the percentage of women using modern contraception	-	0.0173*	0.0150+
Time trend	-	-	-0.0152*
Intercept	0.1531*	0.1028	0.2756**
R-squared	0.3435	0.3734	0.4002
Adjusted R-squared	0.3178	0.3424	0.3643
F-ratio	13.34**	12.04**	11.12**

[1] We use the infant and child mortality rate for the period 0-14 years prior to the survey.

Sample size = 107.

Table 3. Regression Analysis of the Decline in the Total Fertility Rate Between Pairs of Surveys, Urban/Rural Data

Variable	1	2	3
Increase in percentage of women with no schooling	-0.0329**	-0.0297**	-0.0302**
Increase in percentage of women with at least secondary education	0.0168**	0.0106+	0.0101+
Increase in infant and child mortality[1]	-0.0034*	-0.0012	-0.0018
Percentage growth in GDP per head over five years (three-year lag)	-0.0032*	-0.0030*	-0.0029*
Growth in the percentage of women using modern contraception	-	0.0367**	0.0346**
Time trend	-	-	-0.0131*
Intercept	0.1451**	0.0304	0.1840*
R-squared	0.2852	0.4010	0.4141
Adjusted R-squared	0.2715	0.3866	0.3971
F-ratio	20.85**	27.85**	24.38**

[1] We use the infant and child mortality rate for the period 0-14 years prior to the survey.

Sample size = 214.

Table 4. Regression Analysis of the Decline in the Total Fertility Rate Between Pairs of Surveys, Regional Data

Variable	1	2	3
Increase in percentage of women with no schooling	-0.0059	-0.0031	-0.0029
Increase in percentage of women with at least secondary education	0.0133**	0.0108**	0.0109**
Increase in infant and child mortality[1]	-0.0031**	-0.0026**	-0.0026**
Percentage growth in GDP per head over five years (three-year lag)	-0.0015	-0.0020*	-0.0019*
Growth in the percentage of women using modern contraception	-	0.0255**	0.0252**
Time trend	-	-	-0.0054
Intercept	0.1988**	0.1064*	0.1730*
R-squared	0.0474	0.1069	0.1084
Adjusted R-squared	0.0426	0.1012	0.1015
F-ratio	9.71**	18.65**	15.76**

[1] We use the infant and child mortality rate for the period 0-14 years prior to the survey.
Sample size = 785.