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Source: *Studies in Family Planning*, Vol. 26, No. 4 (Jul. - Aug., 1995), pp. 187-202

Published by: Population Council

Stable URL: <http://www.jstor.org/stable/2137845>

Accessed: 03/09/2009 06:54

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Women's Education and Fertility: Results from 26 Demographic and Health Surveys

Teresa Castro Martín

This article presents an updated overview of the relationship between women's education and fertility. Data from the Demographic and Health Surveys for 26 countries are examined. The analysis confirms that higher education is consistently associated with lower fertility. However, a considerable diversity exists in the magnitude of the gap between upper and lower educational strata and in the strength of the association. In some of the least-developed countries, education might have a positive impact on fertility at the lower end of the educational range. Yet, compared with patterns documented a decade ago, the fertility-enhancing impact of schooling has become increasingly rare. The study also examines the impact of female education on age at marriage, family-size preference, and contraceptive use. It confirms that education enhances women's ability to make reproductive choices. (STUDIES IN FAMILY PLANNING 1995; 26,4: 187-202)

The relationship between education and fertility has been a recurrent theme in the demographic literature (Holsinger and Kasarda, 1976; Cochrane, 1979 and 1983; Graff, 1979; Jain, 1981; United Nations, 1987; Cleland and Rodríguez, 1988; Jejeebhoy, 1992). Until the mid-1970s, the commonly held view was that fertility fell uniformly with education. This view was consonant with the classic model of the demographic transition, which hypothesized a steady fertility decline concurrent with the process of socioeconomic development. However, an extensive review of the available empirical evidence up to the late 1970s cast some doubt on these long-held assumptions (Cochrane, 1979). The expected inverse association was not found in many poor, mostly illiterate, rural societies. Instead, an inverted U-shaped relationship was documented in several developing countries. The lack of a uniform pattern across regions and countries proved that the negative impact of education on fertility could not be taken for granted and that other contextual factors had to be brought into consideration.

By the 1980s, comparable data for a large number of developing countries participating in the World Fertility Survey (WFS) had become available. Previous problems of data quality, comparability, and sample size were overcome, and the empirical basis for documenting the relationship was greatly enlarged. Cross-national

studies based on WFS data confirmed that education generally exerts a negative influence on fertility. The strength of the association was, nevertheless, found to be contingent on the level of economic development, on social structure, and on cultural milieu (Cochrane, 1983; UNESCO, 1983; United Nations, 1987; Weinberger, 1987; Cleland and Rodríguez, 1988). In some of the poorest societies, modest improvements in female education were shown to raise fertility slightly. But even at low levels of socioeconomic development, where education had a negligible, if not positive, impact on fertility, a negative association emerged after a critical level of schooling, usually the completed primary level, was reached (Lesthaeghe et al., 1985).

A growing awareness of the complexity of the relationship between education and fertility led to a change in the focus of research. Interest shifted from the description of statistical associations to the exploration of the direct and indirect channels through which education influences reproductive behavior (Kasarda, 1979). In the search for mediating mechanisms, attention was primarily focused on the proximate determinants of fertility (Bongaarts, 1978). Education was shown to affect a wide range of behaviors, most of which have a depressing impact on fertility, but some of which have the potential to raise it. This line of research has helped to explain why the pattern of the association between education and fertility is not static over the course of the demographic transition. In societies at the onset of the fertility transition, education is associated with increased fecundity and reduced risk of fetal death, by means of improved nutrition and enhanced maternal health. Education also

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contributes to the erosion of traditional practices, such as prolonged breastfeeding and postpartum abstinence (Lesthaeghe et al., 1981). Other things being equal, these behavioral changes are likely to accelerate the natural pace of childbearing, creating a positive relationship between education and fertility (Nag, 1979). However, this positive effect of education is expected to be short-lived. Once the situation of natural fertility is replaced by a context of at least partially controlled fertility, the fertility-enhancing effects of education are more than offset by the increased use of contraceptives induced by education.

A new set of surveys—the Demographic and Health Surveys (DHS) conducted by Macro International since the late 1980s, approximately a decade after the World Fertility Survey (WFS)—provides the opportunity to re-examine the relationship between education and fertility from a cross-national perspective.¹ Twenty-six countries are included in this analysis. These countries represent a wide variety of settings in terms of socioeconomic development, cultural context, and women's access to educational resources.

Women's Education

Although education has been unanimously endorsed as a fundamental right and as an explicit goal of development, women's access to schooling remains inadequate in a large part of the developing world (Kelly and Elliott, 1982). The long historical neglect of women's educational needs has left a legacy of high illiteracy rates, especially among older, poor, and rural women.² In order to ameliorate this situation, many countries have made considerable efforts during the last decades to expand their educational facilities, to reduce the incidence of illiteracy, to raise school enrollment rates, and to narrow social and gender-based differentials in access to schooling. Substantial progress has been made worldwide, but insufficient education still stands as a major obstacle to women's welfare, perpetuating unequal gender roles within the family, the workplace, and public life.

Table 1 provides a general overview of the educational background of women of reproductive age within the countries under consideration. Two indicators of

Table 1 Percentage distribution of women, by country, according to educational attainment and literacy status, 26 developing countries

Region/country	Years of schooling					Mean number of years of schooling	Literacy		
	0	1-3	4-6	7-9	10+		Cannot read	Reads with difficulty	Reads easily
Sub-Saharan Africa									
Botswana	24	8	17	35	17	5.5	21	13	66
Burundi	80	7	11	1	1	0.9	64	20	17
Ghana	40	6	10	16	28	4.9	52	4	44
Kenya	25	7	20	34	13	5.2	28	18	54
Liberia	63	7	11	9	10	2.6	66	13	21
Mali	85	3	6	4	1	0.9	87	6	8
Senegal	77	4	10	4	5	1.5	80	4	16
Togo	59	10	19	7	5	2.3	67	12	21
Uganda	38	18	26	13	5	3.3	47	15	38
Zimbabwe	14	11	24	35	17	6.0	17	na	83
North Africa									
Egypt ^a	52	14	17	11	6	3.1	68	na	32
Morocco ^a	83	4	7	3	3	1.1	84	4	13
Tunisia ^a	57	8	24	5	7	2.8	61	10	30
Asia									
Indonesia ^a	23	21	39	9	8	4.3	31	18	52
Sri Lanka ^a	11	13	24	30	23	6.3	15	9	75
Thailand ^a	10	5	71	3	12	4.8	13	37	50
Latin America/Caribbean									
Bolivia	18	22	20	15	26	5.9	23	21	57
Brazil ^b	7	22	32	16	23	5.9	12	15	73
Colombia	7	24	31	21	17	5.8	7	14	80
Dominican Republic	6	21	25	21	28	6.8	14	14	72
Ecuador	8	15	33	16	29	7.1	10	13	77
El Salvador	21	25	25	13	16	4.8	22	17	56
Guatemala ^b	42	24	20	6	8	3.1	41	18	41
Mexico	12	17	31	26	14	6.2	12	na	87
Peru	11	18	24	17	30	6.2	16	14	70
Trinidad and Tobago	1	4	23	21	51	8.7	2	9	89

na = not available.

Note: Percentages may not equal 100 because of rounding and missing cases.

^aBased on data for ever-married women.

^bBased on data for women aged 15-44.

Source: DHS individual recode files.

educational attainment are presented: years of schooling³ and literacy status. The countries examined here represent a broad variety of educational situations. The lowest levels of female educational attainment are found in sub-Saharan Africa and North Africa, where a large proportion of women has never attended school and lacks basic literacy skills. More favorable conditions are found in Asia and in Latin America, but even within these regions, some countries, such as Indonesia, Bolivia, El Salvador, and Guatemala, are far from reaching the goal of universal literacy.

Fertility Differentials by Education

The influence of education on fertility is assumed to derive from various dimensions of the educational experience. Schooling provides literacy skills, enables pupils to process a wide range of information, and stimulates cognitive development. Schools are also important agents of socialization (Inkeless, 1973), with a crucial role in shaping attitudes, opinions, and values. Exposure to new

ideas and alternative lifestyles might lead a person to question traditional norms and practices. In addition to promoting cognitive and attitudinal change, education opens up economic opportunities and provides a vehicle for social mobility. All of these educational assets have a pervasive influence on women's lives, shaping both their productive and reproductive roles (Kasarda et al., 1986; Eisemon, 1987; de Vries, 1992).

Table 2 presents total fertility rates for educational subgroups. When women at the upper and lower end of the educational range are contrasted, fertility levels are seen to be substantially lower among the better educated. The pattern of lowest fertility among highly educated strata holds for all societies.⁴ However, the magnitude of the observed differentials varies considerably from country to country. Fertility levels among the least educated and the most educated women, for instance, differ by five children in Peru, but by only one child or less in Indonesia and Sri Lanka. The largest gaps do not correspond to societies at the earliest stages of the fertility transition. In most sub-Saharan African countries, for example, fertility differentials between the upper and

Table 2 Total fertility rates, by country, according to women's education, 26 developing countries

Region/country	TFR	Years of schooling					Difference 0-4/6	Difference 0-10+
		0	1-3	4-6	7-9	10+		
Sub-Saharan Africa								
Botswana	5.0	5.9	5.6	5.1	4.5	3.1	-0.8	-2.8
Burundi	7.0	7.0	7.4	6.7	(6.6)	(4.2)	-0.3	-2.8
Ghana	6.4	7.1	6.6	6.4	6.8	4.9	-0.7	-2.2
Kenya	6.7	7.2	7.5	7.5	6.2	4.6	0.3	-2.6
Liberia	6.6	6.8	7.1	7.5	5.7	4.2	0.7	-2.6
Mali	6.9	7.0	6.9	6.6	5.7	(4.7)	-0.4	-2.3
Senegal	6.6	7.0	6.4	5.5	4.3	3.6	-1.5	-3.4
Togo	6.6	7.2	7.1	6.0	3.9	4.8	-1.2	-2.4
Uganda	7.3	7.7	7.4	7.0	7.2	5.3	-0.7	-2.4
Zimbabwe	5.7	7.3	7.2	6.3	5.0	3.3	-1.0	-4.0
North Africa								
Egypt ^a	4.7	5.7	5.3	4.2	3.4	3.4	-1.5	-2.3
Morocco ^a	4.9	5.5	3.9	2.9	2.4	2.2	-2.6	-3.3
Tunisia ^a	4.4	5.1	4.7	3.7	2.8	2.6	-1.4	-2.5
Asia								
Indonesia ^a	3.4	3.8	4.0	3.6	2.8	2.6	-0.2	-1.2
Sri Lanka ^a	2.8	2.8	3.0	2.9	2.7	2.7	0.1	-0.1
Thailand ^a	2.4	3.5	2.8	2.5	2.1	1.5	-1.0	-2.0
Latin America/Caribbean								
Bolivia	5.1	6.2	6.4	5.3	4.2	2.8	-0.9	-3.4
Brazil ^b	3.7	6.7	5.2	3.4	2.8	2.2	-3.3	-4.5
Colombia	3.3	5.6	4.5	3.6	2.5	1.8	-2.0	-3.8
Dominican Republic	3.8	5.8	5.0	4.4	3.5	2.6	-1.4	-3.2
Ecuador	4.3	6.4	6.3	4.7	3.5	2.6	-1.7	-3.8
El Salvador	4.4	6.0	5.2	3.9	3.5	2.5	-2.1	-3.5
Guatemala ^b	5.6	6.9	5.6	4.2	2.8	2.7	-2.7	4.2
Mexico	4.1	6.4	6.3	4.0	2.7	2.4	-2.4	-4.0
Peru	4.5	7.4	6.1	4.6	3.7	2.5	-2.8	-4.9
Trinidad and Tobago	3.1	(2.3)	4.3	3.6	3.8	2.9	1.3	0.6

() = Based on fewer than 100 cases.

Note: Total fertility rates based on the five-year period prior to the survey.

^aEver-married sample. Estimates for all women are derived by applying a multiplication factor based on information from the household questionnaire.

^bBased on data for women aged 15-44.

Source: DHS individual recode files.

lower educational subgroups are relatively moderate, in the range of two to three children. The countries in the midst of their fertility transition display the largest differentials.

In earlier studies based on WFS data, Latin America stood out as the region displaying the largest fertility differentials by education (United Nations, 1987; Weinberger et al., 1989). The same conclusion can be reached from recent DHS data (Castro Martín and Juárez, 1995). Differentials are of the order of three to five children, suggesting that disparate fertility contexts coexist within the same society. Women with no formal schooling have, on average, six to seven children, whereas highly educated women have fertility levels analogous to those found in the developed world, in the range of two to three children. The existing divergence in reproductive behavior may partly reflect a highly polarized social structure, in which the living standards of the upper social strata contrast sharply with those of the lower strata.

The association between female education and fertility appears weakest in the sub-Saharan African region. In the majority of the countries, the contrast in fertility between women with no formal education and women with four to six years of schooling (who can be assumed to have acquired basic literacy and numeracy skills) reveals no significant impact of education. Except for Senegal, Togo, and Zimbabwe, differentials are less than one child. In some countries, such as Burundi, Kenya, and Liberia, fertility exhibits a slight rise as women increase their educational assets moderately. This curvilinear pattern, in which women with a few years of schooling have higher fertility than women with no formal schooling, has been documented previously in this region (United Nations, 1987; Cochrane and Farid, 1989). Prior studies have attributed this atypical pattern to the dominance of physiological factors in a context of natural fertility. In the absence of conscious birth control, education has the potential of increasing fertility as a result of reduced breastfeeding and postpartum abstinence. However, even in those countries where reproductive levels remain stationary or rise initially as a result of modest educational improvement, fertility eventually declines after a woman advances beyond the primary stage of education.

In the North African region, fertility differentials between the upper and lower educational strata are of the order of two to three children, and the effect of education on fertility is approximately linear. By contrast, the three Asian countries examined display relatively small fertility differentials by education. In these societies, women with no schooling have moderate fertility levels (three to four children), presumably reflecting the pervasive influence of strong family planning programs

across educational strata.⁵ In the Latin American region, the observed association between education and fertility follows a nearly linear pattern and, in most countries, even a limited duration of school attendance (four to six years) has a significant impact on fertility behavior.

The analysis of DHS data produces conclusions similar to those of earlier studies based on WFS data. Female education is confirmed to be a crucial factor in determining fertility levels. Women with advanced education have considerably lower fertility than uneducated women in every society examined. However, a large diversity exists concerning the strength of the relationship. In most countries where a few years of schooling have no apparent effect on fertility, women's educational attainment is, on average, very low. The demographic impact of small amounts of individual schooling appears, therefore, to be insignificant when a society's level of education is deficient, a pattern to be taken into consideration when assessing the effectiveness of individual schooling as a catalyst for fertility change. For a woman, attendance at school for two or three years is an important qualitative change, compared with her having no experience with formal instruction. Yet, women's limited exposure to the school environment in a mostly illiterate society cannot be expected to alter their perceived costs of childbearing or to transform their reproductive norms. As Caldwell (1980) suggests, the proportion of the community receiving some schooling may be a more potent force for change than the average duration of schooling among those few who have attended school.

Nuptiality

Education affects the quantum and tempo of fertility partly through its impact on age at marriage (Smith, 1983).⁶ Because, in most societies, childbearing takes place within the context of a conjugal union, nuptiality patterns are closely linked to fertility patterns (Adlakha et al., 1991). Higher female education has been shown to lead to a postponement of marriage and, thereby, to later family formation.

Table 3 presents the median age at marriage for successive educational groups. In all countries examined, educated women enter marriage at more advanced ages than do their uneducated counterparts. The timing of marriage varies widely across countries, even for women with the same amount of schooling, reflecting the powerful influence of cultural norms and traditions on marital behavior. However, even where the prevailing social system encourages early marriage, such as in the sub-Saharan African and North African regions, consid-

erable differentials in age at marriage according to women's educational attainment can be observed.

In sub-Saharan African countries, the pattern of marriage postponement is particularly evident among women in the upper educational category. The median age at marriage of women with 10 or more years of schooling and women with no formal education differs by more than four years in Kenya, Liberia, Togo, and Zimbabwe, and by more than six years in Senegal and Uganda. Differentials in age at marriage between women in the lowest and uppermost educational categories are also large in North African and Asian countries, ranging from four to seven years. Since women's access to higher levels of schooling is a relatively recent phenomenon in these regions, the pattern of marriage postponement observed in the upper educational strata is likely to capture both educational and cohort effects.⁷ In the Latin American region, such differentials are also remarkably large. In Colombia, the Dominican Republic, Guatemala, Mexico, and Peru, the median age at marriage among women with 10 or more years of schooling

is six to eight years higher than among women with no formal schooling.

Because women's higher educational attainment is associated with later entry into marriage, variation in age at marriage may partly account for observed fertility differentials among educational strata. The transition to marriage usually is assumed to mark the onset of exposure to pregnancy, but in many countries, especially in sub-Saharan Africa, the onset of sexual activity and the reported entry into marriage are largely dissociated (Meekers, 1993). Nevertheless, even when sexual activity precedes marriage, education leads to a postponement of first births (Westoff et al., 1994), a delay that is likely to have an impact on final family size.

Fertility Preferences

Family-size norms play a crucial role in shaping fertility behavior (Lightbourne, 1985; Westoff, 1990). Social norms regarding the number of children considered de-

Table 3 Median age of women at first marriage, by country, according to education, 26 developing countries

Region/country	Total	Years of schooling					Difference 0-10+
		0	1-3	4-6	7-9	10+	
Sub-Saharan Africa							
Botswana	25.3	23.7	22.8	23.6	27.2	26.6	2.9
Burundi	20.0	19.8	20.2	20.3	(21.7)	(22.7)	2.9
Ghana	18.4	17.8	18.0	17.9	18.4	20.0	2.2
Kenya	18.8	17.0	17.3	18.1	19.6	22.2	5.2
Liberia	17.8	16.9	17.6	18.7	19.6	21.7	4.8
Mali	15.7	15.7	15.6	16.0	17.0	(19.3)	3.6
Senegal	16.8	16.2	18.7	20.3	21.3	23.9	7.7
Togo	18.6	17.8	18.7	19.5	21.5	23.4	5.6
Uganda	17.4	16.6	16.9	17.7	18.7	22.6	6.0
Zimbabwe	19.1	17.2	17.7	18.3	19.4	22.4	5.2
North Africa							
Egypt ^a	19.5	17.4	17.8	19.8	22.4	24.2	6.8
Morocco ^a	19.8	18.7	21.9	23.3	26.4	26.1	7.4
Tunisia ^a	22.1	20.6	22.4	22.9	24.7	24.5	3.9
Asia							
Indonesia ^a	18.4	16.2	16.4	18.0	21.7	23.2	7.0
Sri Lanka ^a	22.9	21.0	20.9	21.3	23.1	25.2	4.2
Thailand ^a	20.8	18.8	19.4	20.2	21.6	25.8	7.0
Latin America/Caribbean							
Bolivia	20.6	20.0	19.6	20.0	20.1	23.0	3.0
Brazil	21.3	19.4	19.6	20.5	21.6	25.0	5.5
Colombia	21.2	18.4	19.6	20.6	21.7	26.3	7.9
Dominican Republic	19.2	16.4	17.1	17.8	19.7	23.3	6.9
Ecuador	20.4	18.6	18.7	19.4	20.2	23.5	5.0
El Salvador	19.1	17.8	18.2	18.9	19.8	22.7	4.9
Guatemala	18.8	17.7	18.4	19.8	20.7	23.8	6.1
Mexico	20.3	17.2	18.2	19.7	22.1	24.1	6.9
Peru	21.0	18.7	18.7	19.9	20.6	24.9	6.2
Trinidad and Tobago	19.7	(17.9)	17.7	18.7	19.0	20.8	2.9

() = Based on fewer than 100 cases.

Note: Life-table estimates. Marriage includes consensual unions. based on the information from the household questionnaire.

Source: DHS individual recode files.

^aEver-married sample. Estimates for all women are derived by applying a multiplication factor

sirable constrain the range of choices truly available to individual women. These norms are linked to the economic organization of a society, its cultural setting, and its family structure. In countries where family-size preferences are below fertility levels, a successful implementation of reproductive goals would readily lead to fertility decline. By contrast, in countries where large families are desired, sustained fertility reduction can only be achieved through a transformation of reproductive norms and, by implication, of the socioeconomic conditions that underlie the demand for many children.

Table 4 illustrates the considerable regional variation in women's ideal family size.⁸ The analysis is confined to ever-married women in order to increase comparability with the WFS.⁹ Desired family size is largest in sub-Saharan Africa, ranging from five to seven children. In North Africa, Asia, and Latin America, desired family sizes are considerably smaller, falling within the range of about three to four children.

The ideal number of children a woman reports is usually contingent upon her age and her actual family

size, partly because she may rationalize unplanned births as desired (Lightbourne and MacDonald, 1982). Because age and parity vary greatly across educational groups, the desired family-size distribution presented in Table 4 was standardized by age and by number of living children, using multiple classification analysis (MCA). Although the relationship between education and fertility preferences becomes weaker once it is adjusted, a substantial gap between uneducated and educated women regarding their ideal number of children can still be observed in some countries. Differentials are most pronounced in sub-Saharan Africa, where the ideal family size for women in the lower and upper educational strata differs, on average, by two children. Differentials are smaller in the North African and Asian regions. In Latin America, the gap between uneducated and highly educated women's ideal family size is also narrow. It barely exceeds one child in El Salvador, Guatemala, and Mexico. In the rest of the Latin American countries, differentials by women's education are practically negligible once they are adjusted for age and par-

Table 4 Mean ideal family size, by country, according to women's education, 26 developing countries

Region/country	Total	Years of schooling					Difference 0-10+
		0	1-3	4-6	7-9	10+	
Sub-Saharan Africa							
Botswana	5.4	5.9	5.6	5.3	5.3	4.2	-1.7
Burundi	5.4	5.6	5.1	4.9	(4.2)	(4.1)	-1.5
Ghana*	5.4	6.3	5.4	5.2	4.9	4.5	-1.8
Kenya	4.7	5.3	4.8	4.6	4.4	4.0	-1.2
Liberia*	6.3	6.7	6.0	5.8	5.3	4.6	-2.1
Mali*	6.8	7.0	6.4	6.2	5.0	(4.1)	-2.9
Senegal*	7.0	7.3	(6.8)	5.4	(4.7)	4.6	-2.7
Togo	5.6	6.0	5.2	4.5	4.2	4.0	-2.0
Uganda	6.7	7.2	6.7	6.3	5.9	5.1	-2.1
Zimbabwe	5.3	6.1	5.9	5.6	4.9	4.1	-2.0
North Africa							
Egypt	2.9	3.1	2.8	2.8	2.7	2.7	-0.4
Morocco*	3.7	3.8	3.4	3.1	3.0	3.1	-0.7
Tunisia	3.5	3.7	3.4	1.5	3.1	3.0	-0.7
Asia							
Indonesia*	3.2	3.3	3.4	3.2	3.1	3.1	-0.2
Sri Lanka	3.1	3.3	3.2	3.1	3.0	2.9	-0.4
Thailand	2.8	3.2	2.7	2.8	2.7	2.7	-0.5
Latin America/Caribbean							
Bolivia	2.8	2.6	2.6	2.9	2.8	3.0	0.3
Brazil	3.0	3.0	3.1	2.9	2.9	2.9	-0.2
Colombia	3.0	3.2	3.1	3.0	2.9	2.9	-0.3
Dominican Republic	3.6	3.6	3.7	3.5	3.5	3.5	-0.1
Ecuador	3.2	3.4	3.4	3.3	3.0	3.1	-0.3
El Salvador	3.9	4.3	4.0	3.5	3.3	3.3	-1.0
Guatemala	4.2	4.6	4.0	3.5	3.7	3.4	-1.2
Mexico	3.3	4.0	3.4	3.2	3.0	2.9	-1.2
Peru	2.9	3.0	3.1	2.8	2.8	2.8	-0.2
Trinidad and Tobago	3.1	(3.0)	3.4	3.1	3.0	3.0	0.0

() = Based on fewer than 100 cases.

Notes: Means are based on ever-married women and are adjusted for age differences and number of living children using multiple classification analysis. Number of living children includes current pregnancy. Nonnumeric responses are excluded. *Countries in which more than 10 percent of the respondents gave a nonnumerical response to the desired-number-of-children question.

Source: DHS individual recode files.

ity, suggesting that social diffusion processes may have largely homogenized reproductive norms across educational strata.

According to these data, differentials in desired family size across educational groups are considerably smaller than differentials in actual fertility. Although uneducated women typically have more children than their educated counterparts, their family-size ideals may not be far apart. This feature is clearly manifest in the Latin American region. Whereas the observed fertility among better-educated women is close to their desired family size, the actual fertility of unschooled women is usually twice their stated ideal family size.

Table 5 presents estimates of the level of "wanted" fertility according to women's education. Wanted fertility rates¹⁰ indicate the hypothetical level of fertility that could be expected if women's reproductive preferences were never exceeded (Westoff and Ochoa, 1991). In all countries (except Mali), the wanted fertility rate is below the total fertility rate. Yet, the amount of discrep-

ancy between wanted and actual fertility rates varies greatly across countries. Both rates are relatively close in the sub-Saharan African region, suggesting that even if women were to realize their fertility desires, fertility would still remain high. The main exception is Kenya, with a wanted fertility rate of 4.4 children compared with a total fertility rate of 6.7 children. In Northern Africa, the largest discrepancy can be found in Egypt, where the total fertility rate (4.7 children) is well above the wanted fertility rate (2.9 children). In all Asian countries considered, the estimated wanted fertility rate is around replacement level, and it differs from the observed total fertility rates by one child or less. In the Latin American and Caribbean regions, the gap between wanted and actual fertility rates ranges from less than one child in El Salvador and Trinidad and Tobago to more than two children in Bolivia and Peru.

In all countries except Sri Lanka, increasing female education is accompanied by a decline in wanted fertility. Whereas the discrepancy between wanted and ac-

Table 5 Total fertility rate, by country, and wanted fertility rates, by country, according to women's education, 26 developing countries

Region/ country	TFR	Total want- ed ferti- lity rate	Years of schooling					Difference 0-10+
			0	1-3	4-6	7-9	10+	
Sub-Saharan Africa								
Botswana	5.0	4.1	4.6	4.0	4.7	4.0	3.0	-1.6
Burundi	7.0	5.7	5.7	5.8	4.8	(5.7)	(3.4)	-2.3
Ghana ^a	6.4	5.3	5.9	5.6	5.2	4.8	4.1	-1.8
Kenya	6.7	4.4	5.4	5.0	4.9	4.0	3.4	-2.0
Liberia ^a	6.6	6.3	6.7	6.8	5.7	5.8	3.6	-3.1
Mali ^b	6.9	7.1	7.2	8.5	6.9	5.5	(3.0)	-4.2
Senegal ^a	6.6	5.6	6.1	4.4	3.7	3.0	2.9	-3.2
Togo	6.6	5.1	5.7	4.8	4.4	2.8	3.2	-2.5
Uganda	7.3	6.4	7.1	6.7	5.8	5.4	4.5	-2.6
Zimbabwe	5.7	4.3	5.6	5.7	4.5	3.6	3.4	-2.2
North Africa								
Egypt ^b	4.7	2.9	3.5	3.1	2.2	2.1	2.7	-0.8
Morocco ^{a,b}	4.9	3.3	3.8	2.3	1.8	1.5	1.9	-1.9
Tunisia ^b	4.4	2.9	3.4	3.2	2.7	1.8	1.6	-1.8
Asia								
Indonesia ^{a,b}	3.4	2.4	2.7	2.8	2.6	1.9	2.2	-0.5
Sri Lanka ^b	2.8	2.2	1.8	2.1	2.1	2.0	2.7	0.9
Thailand ^b	2.4	1.8	3.0	1.7	1.9	1.5	1.5	-1.5
Latin America/Caribbean								
Bolivia	5.1	2.7	3.6	3.1	3.1	2.4	2.1	-1.5
Brazil	3.7	2.2	3.0	3.0	2.1	1.7	1.9	-1.1
Colombia	3.3	2.1	2.6	2.5	2.7	2.0	1.6	-1.0
Dominican Republic	3.8	2.6	3.9	3.2	2.9	2.4	2.5	-1.4
Ecuador	4.3	2.9	3.6	4.0	3.2	2.3	2.3	-1.3
El Salvador	4.4	3.9	5.3	4.7	4.0	3.3	2.4	-2.9
Guatemala	5.6	4.5	5.8	4.7	3.1	2.2	2.2	-3.6
Mexico	4.1	2.8	4.3	3.9	3.0	2.2	2.2	-2.1
Peru	4.5	2.3	3.1	2.9	2.3	2.0	2.0	-1.1
Trinidad and Tobago	3.1	2.2	(3.0)	2.4	2.2	2.6	2.1	-0.9

() = Based on fewer than 100 cases.

^aCountries in which more than 10 percent of the respondents gave a nonnumerical response to the desired-number-of-children question. ^bEver-married sample. Estimates of wanted fertility rates for all women are derived by applying a multiplication factor based on information from the DHS household questionnaire.

Source: DHS individual recode files.

tual fertility rates among educated women is typically small, the gap tends to be remarkably large in the lower educational strata. In most Latin American countries, for instance, current fertility exceeds wanted fertility by two or three children among women in the lowest educational stratum. Although fertility goals are relatively homogeneous in the region, clearly the implementation of those goals differs widely across the social hierarchy. Accordingly, a large potential exists for fertility decline among less-educated women if fertility outcomes were to match reproductive ideals.

The finding that better-educated women generally want smaller families than uneducated women suggests that education is linked to a shift in women's attitudes toward childbearing and in their perception of the cost of child rearing. The data further imply that, although women's preferences are important in determining reproductive outcomes, these preferences cannot fully explain observed fertility differentials. Instead, unequal implementation of fertility goals by means of contraceptive use appears to be a major factor behind observed differentials. The gap between ideal and actual reproductive behavior is particularly large among poorly educated women, suggesting that lack of education hinders reproductive choice.

Fertility Regulation

Earlier studies documented extensively the positive association between female education and contraceptive use (United Nations, 1987; Rutenberg et al., 1991). Better-educated women are more likely than others to desire smaller families and hence have a stronger motivation to practice contraception. Educated women are also less prone to have a fatalistic attitude toward life and to accept the unpredictability of unregulated fertility. In many traditional societies, where contraception is not a socially sanctioned practice, education can play an important legitimizing role, enabling women to engage in new patterns of behavior. By enhancing women's position within the family authority structure, education also improves women's control over reproductive choices (Beckman, 1983). Because of their literacy and greater familiarity with formal institutions and health providers, educated women are also better informed about available contraceptive options and sources. Furthermore, once they have made the decision to regulate their fertility, educated women are more likely to use contraceptives effectively, and they have lower rates of discontinuation and failure (Grady et al., 1981).

Most of the literature has focused on the impact of women's education on contraceptive behavior. Less attention has been paid to causal effects in the opposite

direction, but access to fertility regulation can also be seen as a factor contributing to the improvement of women's status in general and women's education in particular. Greater control over the timing of childbearing broadens women's employment options and increases economic returns from education, raising incentives for school continuation. In a more subtle way, reliable fertility regulation and the resulting sense of control over the occurrence and timing of births is likely to provide women with a general feeling of confidence that might expand from the reproductive sphere to other domains of life (Birdsall and Chester, 1987).

Table 6 presents current contraceptive prevalence rates, that is, the proportion of married women of reproductive age who were using traditional or modern methods of contraception at the time of the interview. These rates range from fewer than 10 percent in Burundi, Liberia, Mali, and Uganda to more than 60 percent in Sri Lanka, Thailand, Brazil, and Colombia. In general, contraceptive prevalence is lowest in sub-Saharan Africa, although Zimbabwe, Botswana, and Kenya have reached moderate prevalence levels (United Nations, 1989).¹¹ Levels are also moderate in North Africa, where contraceptive use is reported by one-third to one-half of currently married women, and moderate to high in Asia, where prevalence rates range from 48 percent in Indonesia to 65 percent in Thailand. Latin American rates show substantial variation: In Bolivia and Guatemala, contraceptive prevalence rates are below one-third, whereas in Brazil and Colombia, contraceptive use is reported by about two-thirds of all married women surveyed.

According to the data in Table 6, education exerts a large influence on women's contraceptive practices. Although the magnitude of the contraceptive gap among educational strata varies greatly across societies, the better-educated women surveyed display the highest rates of contraceptive use in every country. Differentials are large even in countries where the overall level of contraceptive use is low. For example, in Burundi, Liberia, Mali, and Uganda, where the national contraceptive prevalence rate is lower than 10 percent, the gap between the upper and lower educational groups exceeds 20 percentage points. Differentials in the North African countries are also sizable: Highly educated women have contraceptive prevalence rates 27 to 38 percentage points higher than uneducated women. Except for Indonesia, differentials in contraceptive use by education are relatively small in the Asian countries examined. In the Latin American region, countries with large differentials in contraceptive prevalence by education, such as Bolivia, Ecuador, Guatemala, Mexico, and Peru, coexist with countries with moderate differentials, such as Colombia and the Dominican Republic.

The relative prevalence of traditional versus modern contraception varies largely across countries, as indicated in Tables 7 and 8. Within the sub-Saharan African region, traditional contraceptive methods prevail over modern methods in half of the countries examined. This pattern contrasts with the situation in the North African region, where the vast majority of women who practice contraception uses modern methods. Modern methods also prevail in the Asian region, with the exception of Sri Lanka, where nearly one-fourth of all married women rely on traditional methods. Contraceptive use in Latin America is also dominated by modern methods, with the exception of Bolivia and Peru, where traditional methods account for half or more of the overall prevalence in contraceptive use.

In most societies, reliance on modern methods of contraception increases significantly with education. In approximately two-thirds of the countries analyzed, modern contraceptive prevalence rates among highly educated women exceed those of uneducated women by more than 20 percentage points. Only in a few countries, including Ghana, Tunisia, and Thailand, are differentials in the use of modern contraceptives by edu-

cation relatively small. One exception to the prevailing pattern is observed in Sri Lanka, where use of modern methods declines with women's education, largely the result of the declining use of sterilization.¹² Although modern methods are usually responsible for the overall rise in contraceptive prevalence induced by education, use of traditional methods increases considerably with education in a number of countries, including Mali, Tunisia, Sri Lanka, Bolivia, Guatemala, and Peru, suggesting that the impact of schooling on women's contraceptive choices may be conditioned by cultural factors.¹³ In all these countries, the increased use of traditional methods among educated women is confined to the practice of periodic abstinence.

Differentials by education tend to lessen as a society's overall level of contraceptive prevalence increases. The social diffusion hypothesis suggests that educational divergence in contraceptive behavior can be expected to be largest in societies at the initial and middle stages of the fertility transition, where the better-educated strata emerge as forerunners in the adoption of birth planning. Differentials are assumed to narrow at the final stages of the transition, as fertility regulation ceases

Table 6 Percentage of currently married women currently using any method of contraception, by country, according to education, 26 developing countries

Region/country	Total	Years of schooling					Difference 0-10+
		0	1-3	4-6	7-9	10+	
Sub-Saharan Africa							
Botswana	33	20	33	29	40	54	33
Burundi	9	8	10	12	(25)	(29)	(22)
Ghana	13	9	9	14	14	21	12
Kenya	27	18	22	28	31	45	26
Liberia	6	3	3	11	22	31	28
Mali	5	3	(8)	7	29	(53)	(49)
Senegal	11	10	8	19	23	41	31
Togo	34	34	34	30	37	49	15
Uganda	5	2	5	6	9	24	22
Zimbabwe	43	32	36	42	47	61	29
North Africa							
Egypt	38	28	40	51	52	55	27
Morocco	36	31	52	60	63	69	38
Tunisia	50	42	43	61	64	69	26
Asia							
Indonesia	48	33	45	51	60	67	34
Sri Lanka	62	54	62	65	62	61	7
Thailand	65	56	59	67	67	66	11
Latin America/Caribbean							
Bolivia	30	12	23	31	43	53	41
Brazil	66	47	59	71	76	73	26
Colombia	65	53	61	65	73	73	20
Dominican Republic	50	38	47	51	49	57	19
Ecuador	44	18	37	43	50	61	43
El Salvador	47	37	42	55	51	64	27
Guatemala	23	10	24	42	60	60	50
Mexico	53	25	44	58	70	69	45
Peru	46	19	33	46	60	67	48
Trinidad and Tobago	53	(32)	42	49	51	58	(26)

() = Based on fewer than 100 cases.

Note: Totals may not add up because of rounding.

Source: DHS individual recode files.

Table 7 Percentage of currently married women currently using traditional methods of contraception, by country, according to education, 26 developing countries

Region/country	Total	Years of schooling					Difference 0-10+
		0	1-3	4-6	7-9	10+	
Sub-Saharan Africa							
Botswana	1	2	1	1	1	2	0
Burundi	8	7	9	9	(15)	(12)	(5)
Ghana	8	5	5	7	7	14	8
Kenya	9	9	7	10	9	13	4
Liberia	1	0	0	1	6	4	4
Mali	3	2	(5)	3	17	(32)	(30)
Senegal	9	9	7	10	8	14	5
Togo	31	32	31	26	30	31	-1
Uganda	2	1	3	3	5	8	7
Zimbabwe	7	8	8	10	5	2	-6
North Africa							
Egypt	2	2	3	3	3	5	4
Morocco	7	6	12	10	11	15	9
Tunisia	9	5	9	14	19	24	19
Asia							
Indonesia	4	1	3	4	7	9	7
Sri Lanka	21	10	17	17	22	31	21
Thailand	2	1	1	1	1	7	6
Latin America/Caribbean							
Bolivia	18	9	16	19	21	28	19
Brazil	10	8	10	10	8	11	4
Colombia	12	10	14	12	10	16	6
Dominican Republic	3	3	2	2	2	7	4
Ecuador	9	3	5	7	11	14	11
El Salvador	3	1	1	3	6	8	7
Guatemala	4	1	4	9	10	16	15
Mexico	8	5	8	7	12	13	8
Peru	23	11	22	22	28	28	17
Trinidad and Tobago	8	(6)	4	7	8	10	(4)

() = Based on fewer than 100 cases.

Notes: Totals may not add up because of rounding. Traditional methods include withdrawal, periodic abstinence, herbs, and folk methods.

Source: DHS individual recode files.

to be an innovative behavior and becomes habitual among most women, regardless of educational background. The data in Table 6 provide some support for this argument. Educational differentials are small in countries with low fertility and high contraceptive prevalence rates, such as Sri Lanka and Thailand. Furthermore, cross-national comparisons reveal that contraceptive use rates among uneducated women in more developed societies are usually higher than contraceptive use rates among highly educated women in less developed societies. This pattern implies that the impact of education, though pervasive, is not identical in every society. It also indicates that other sources aside from the formal schooling system are operating as channels of communication and networks of diffusion of contraceptive knowledge and behavior.

Earlier studies based on WFS data documented that contraceptive use increases monotonically with female education and that even a few years of schooling can have a significant impact on fertility regulation practices (United Nations, 1987). According to DHS data, the pattern of increase in contraceptive use by education is also

found to be nearly linear and monotonic, particularly in countries that have reached moderate levels of contraceptive prevalence, implying that school attendance, however short, prompts a visible change in contraceptive behavior. In some Latin American countries with low prevalence rates, the relative increase in contraceptive use is proportionally larger across lower educational categories (Castro Martín and Njogu, 1994). In Bolivia, Ecuador, and Guatemala, for instance, the proportion of contraceptive users among women with one to three years of schooling is twice as large as that among women who have not attended school. This pattern suggests that, in these societies, breaking the barrier of entrance into the school system represents a crucial step in changing women's attitudes and behavior toward fertility regulation. Yet, in sub-Saharan African countries with low contraceptive prevalence, the opposite pattern is observed: Sizable increases in contraceptive use are confined to the higher educational categories.

A woman's contraceptive needs are closely linked to her stage in the reproductive cycle and, since better-educated women tend to be younger than uneducated

Table 8 Percentage of currently married women currently using modern methods of contraception, by country, according to education, 26 developing countries

Region/country	Total	Years of schooling					Difference 0-10+
		0	1-3	4-6	7-9	10+	
Sub-Saharan Africa							
Botswana	32	19	32	28	39	52	33
Burundi	1	1	1	3	(10)	(18)	(17)
Ghana	5	3	5	7	7	7	4
Kenya	18	10	16	18	23	32	22
Liberia	6	3	3	10	16	27	25
Mali	1	0	(3)	4	12	(20)	(20)
Senegal	2	1	1	9	15	27	26
Togo	3	2	4	4	7	18	16
Uganda	3	1	2	3	4	17	16
Zimbabwe	36	25	27	32	42	60	35
North Africa							
Egypt	36	26	37	48	48	49	23
Morocco	29	25	41	50	52	54	29
Tunisia	40	37	34	47	45	44	7
Asia							
Indonesia	44	31	42	47	53	59	27
Sri Lanka	41	44	45	49	40	30	-14
Thailand	64	55	58	66	66	60	5
Latin America/Caribbean							
Bolivia	12	2	7	12	22	25	23
Brazil	57	40	49	61	68	61	22
Colombia	52	43	47	53	63	57	15
Dominican Republic	47	35	45	49	46	50	16
Ecuador	36	15	31	36	38	47	31
El Salvador	45	36	41	52	46	56	21
Guatemala	19	9	20	33	50	44	35
Mexico	45	20	36	51	58	57	37
Peru	23	8	11	24	33	38	31
Trinidad and Tobago	44	(26)	38	43	44	47	(21)

() = Based on fewer than 100 cases.

Notes: Totals may not add up because of rounding. Modern methods include the pill, the IUD, injection, barrier methods, and sterilization.

Source: DHS individual recode files.

women, their contraceptive prevalence rate is conditioned by their being less likely to have achieved their desired family size. In order to take into account the confounding effect of life-cycle factors, Table 9 presents the results of a multivariate analysis.¹⁴ Once the demographic composition of the various educational groups is controlled, the association between female education and contraceptive use intensifies, confirming that the linkage between parity and contraceptive needs partially masks the actual influence of education on contraceptive behavior. On the other hand, the association becomes attenuated after controlling for socioeconomic factors, but it remains strong, statistically significant (except in the category of one to three years of schooling in nearly half of the countries examined),¹⁵ and generally follows a linear pattern.¹⁶

The multivariate analysis also permits assessment of the importance to contraceptive behavior of a woman's level of education relative to her husband's. The analysis reveals that, although both spouses' educational backgrounds are highly intercorrelated because of homogamy patterns, each variable is significantly related

to fertility regulation on its own. In most countries, the impact of wife's education on contraceptive use is comparatively stronger than that of husband's, presumably reflecting women's disproportionate involvement in the process of family formation, the predominance of female contraceptive methods, and the prevailing orientation of family planning programs toward women. Although usually weaker, the impact of husband's schooling is found to have a significant independent effect, particularly in North African, Asian, and Latin American societies,¹⁷ reflecting men's influence on contraceptive decisions, which is frequently overlooked. Consequently, although investments in women's education are likely to have a greater impact on fertility, each partner's education reinforces the other's, rather than being a substitute for the other's.

Contribution of Education to Fertility Trends

The linkages between female education and fertility have been considered above from a cross-sectional perspec-

Table 9 Logit coefficients of the effect of wife's and husband's education on current contraceptive use, by country, 26 developing countries

Region/country	Wife's years of education				Husband's years of education			
	1-3	4-6	7-9	10+	1-3	4-6	7-9	10+
Sub-Saharan Africa								
Botswana	0.48*	0.34	0.98*	1.29*	0.26	-0.01	0.15	0.88*
Burundi	0.12	0.32	0.63	0.91*	-0.05	0.33	-0.22	1.10*
Ghana	0.04	0.44*	0.64*	1.04*	-0.40	0.42	0.17	0.17
Kenya	0.40*	0.65*	1.07*	1.94*	0.20	0.50*	0.58*	0.64*
Liberia	-0.29	0.99*	1.88*	2.13*	0.86	0.45	0.83*	1.20*
Mali	0.96*	0.29	1.56*	2.82*	-0.42	0.90*	0.79*	0.77*
Senegal	-0.44	0.47*	0.74*	1.69*	0.31	1.04*	0.78	0.77*
Togo	0.28	-0.11	0.35	0.96*	-0.44*	-0.27*	0.18	0.01
Uganda	1.12*	1.26*	1.60*	2.62*	0.38	0.25	0.06	0.77*
Zimbabwe	0.01	0.29*	0.47*	1.53*	0.39	0.23	0.22	0.31
North Africa								
Egypt	0.23*	0.75*	0.73*	1.08*	0.24*	0.44*	0.68*	0.50*
Morocco	0.59*	0.70*	0.77*	1.43*	0.37*	0.57*	0.82*	0.84*
Tunisia	0.10	0.88*	0.82*	1.10*	-0.22	0.06	0.52*	0.44*
Asia								
Indonesia	0.23*	0.47*	0.83*	1.28*	0.09	0.36*	0.48*	0.43*
Sri Lanka	0.32*	0.54*	0.73*	0.87*	0.11	0.32*	0.39*	0.33
Thailand	0.31	0.52*	0.74*	0.59*	0.11	0.56*	0.38*	0.57*
Latin America/Caribbean								
Bolivia	0.71*	1.21*	1.56*	1.90*	0.93*	1.04*	0.94*	1.33*
Brazil	0.45*	1.11*	1.28*	1.05*	0.50*	0.77*	1.09*	0.95*
Colombia	0.30	0.37*	0.51*	0.47*	0.55*	0.73*	0.69*	0.95*
Dominican Republic	0.25*	0.73*	0.79*	1.22*	0.44*	0.64*	0.50*	0.50*
Ecuador	0.92*	1.23*	1.32*	1.72*	0.06	0.23	0.45*	0.66*
El Salvador	0.18	0.45*	0.25	0.64*	0.24	0.47*	0.69*	0.81*
Guatemala	0.93*	1.45*	2.00*	1.72*	0.63*	0.98*	1.17*	1.44*
Mexico	0.50*	1.15*	1.47*	1.47*	0.34*	0.52*	0.73*	1.12*
Peru	0.51*	0.83*	1.15*	1.59*	0.56	0.76*	0.95*	0.86*
Trinidad and Tobago	0.45	0.79*	0.86*	1.43*	-0.25	0.20	0.24	0.24

* p < 0.01

Notes: Based on nonpregnant women currently in union. Contraceptive use includes both traditional and modern methods. Models control for age cohort, number of living children, and rural-urban residence. The omitted category is 0 years of schooling.

Source: DHS individual recode files.

tive. One common assumption is that the causal links detected at the cross-sectional level will also hold from a time-trend perspective. That is, if better-educated women are established to have lower fertility than poorly educated women at a particular time, in the long run, as the female population in a society becomes increasingly educated, the expectation is that overall fertility will decline.

The availability of two surveys, the WFS and the DHS, conducted approximately a decade apart, permits an exploration of the link between education and fertility over time. In some societies, a rapid process of fertility decline has coincided chronologically with a substantial rise in women's education. The comparison of these two data sources permits quantification of the contribution of education to the observed fertility trend. The impact of the changing educational composition of the population is assessed using the decomposition-of-differences technique (Kitagawa, 1955; Weinberger, Lloyd and Blanc, 1989).

Table 10 presents the overall fertility change ob-

served in the intersurvey period disaggregated into three components: rates, education, and interaction. The change "due to rates" is the amount of overall fertility decline that would have occurred, given the actual changes in education-specific rates, if the educational composition had remained as shown in the WFS. The change "due to education" is the amount of overall fertility decline that would have occurred, given the actual improvement in female education, if fertility rates within educational categories had remained as shown in the WFS. The interaction term is zero if education-specific rates changed by the same amount in every educational group, whereas a large interaction term signals that the change across educational groups was uneven. Only selected countries that participated in both surveys and that experienced a fertility reduction above 0.5 percent over the intersurvey period are examined.¹⁸

The results presented in Table 10 illustrate that the contribution of enhanced female education to fertility decline is not uniform. The two sub-Saharan African countries examined experienced only a slight fertility

reduction during the period between surveys. Around three-fourths of this modest decline can be attributed to changes in fertility behavior within educational groups, and a little more than one-tenth to overall improvement in women's education. In the case of Kenya, the average level of female education rose from 3.4 to 5.2 years of schooling in the intersurvey period. However, the peculiar curvilinear pattern previously documented for this country, with fertility declining only after women reach an advanced level of schooling, may explain why the upward shift in the educational composition of the population has played a minor role compared with the change in fertility behavior within educational groups. In Senegal, average female education rose by only six months of schooling in the intersurvey period; hence the slight impact of educational compositional change.

In the Latin American countries examined, except for Peru, the contribution of the rates component to fertility trends is also larger than the educational component, suggesting that fertility behavior within analogous educational categories has changed considerably during the intersurvey period. Changes in fertility rates within educational groups alone, for example, would have led to an overall fertility decline of 1.4 children in Mexico and the Dominican Republic. However, the contribution of an upgraded educational composition is also notable. In most Latin American countries, female education has risen considerably. This trend can be expected to have direct implications for aggregate fertility, since better-educated women, who consistently have lower fertility, currently make up a larger proportion of the population than they have in the past. According to Table 10, the aggregate improvement in female education, other things remaining equal, would have led to a reduction in the total fertility rate ranging from 0.5 children in Ecuador to 0.9 children in the Dominican Republic. In relative terms, for the Latin American countries examined, enhanced women's education accounts for 33 to 60 percent of the overall fertility decline.

Discussion

The position of women within the family and the society has long been recognized as a crucial factor in determining fertility patterns. Among the various dimensions of women's status, education has drawn the most attention not only for pragmatic reasons, such as data availability and ease of measurement, but also because education shapes the domestic and public spheres of women's experience and largely conditions the quality of women's lives. Education and gainful employment (Dasgupta, 1995) are also regarded as more susceptible to improvement through policy intervention than are other facets of women's status that are more deeply rooted in cultural conventions; hence, their appeal as vehicles for women's empowerment and as agents of social change.

The analysis undertaken for this study suggests that women's education does not have identical repercussions in every society, but is conditioned by socioeconomic development, social structure, and cultural context, as well as by a society's stage in the fertility transition. In general, the impact of individual schooling on reproductive behavior is weak in poor, mostly illiterate societies, grows stronger as societies improve their overall education and advance in their fertility transition, and becomes less prominent once a relatively low level of fertility has been reached.¹⁹

A few exceptions to the standard inverse relationship between education and fertility were documented. In some of the least developed countries, education was found to have a positive effect on fertility at the lower end of the educational range. Compared with the empirical patterns documented a decade ago, the fertility-enhancing impact of education has become increasingly rare. In a United Nations comparative study based on WFS data, a curvilinear relationship was found in 14 out of the 38 WFS countries examined (United Nations, 1987). By contrast, that pattern is found in only three of

Table 10 Change in total fertility rates between WFS and DHS attributable to change in the educational composition of the population and to change in rates within educational groups, for selected countries

Region/country	TFR			Change due to			Percent of change due to		
	WFS	DHS	Change	Rates	Education	Interaction	Rates	Education	Interaction
Sub-Saharan Africa									
Kenya	8.2	6.7	-1.5	-1.2	-0.2	-0.1	82	12	6
Senegal	7.2	6.6	-0.6	-0.4	-0.1	-0.1	75	11	14
Latin America/Caribbean									
Colombia	4.7	3.4	-1.3	-0.9	-0.6	0.2	68	43	-10
Dominican Republic	5.7	3.8	-1.9	-1.4	-0.9	0.4	72	47	-19
Ecuador	5.3	4.3	-1.0	-0.7	-0.5	0.1	67	45	-13
Mexico	6.2	4.1	-2.1	-1.4	-0.7	-0.1	66	33	1
Peru	5.6	4.5	-1.1	-0.4	-0.7	-0.1	32	60	8

Sources: For WFS education-specific fertility rates and exposure, Alam and Casterline, 1984 and DHS individual recode files.

the 26 DHS countries (Burundi, Kenya, and Liberia). The slightly higher fertility among women with a few years of schooling should not be interpreted as evidence of a pronatalistic influence of education, but as a by-product of the particular system of relationships between education and the proximate determinants of fertility at the early stages of the fertility transition. The analysis confirmed that even in conditions of precarious development, education does not increase the demand for children.

A related policy debate concerns the most effective strategy for reducing fertility, whether to promote secondary education (Subbarao and Raney, 1993) or to expand a broad-based elementary education (Jain and Nag, 1985). Although in many less developed countries, the impact of schooling on fertility is negligible among women with less than a secondary-school education, the proportion of women who reach such a level is very small. Therefore, expanding educational opportunities throughout the whole society may have a greater impact in the long run (Lockheed and Vespoor, 1991). This study has documented that the impact of individual schooling upon fertility is stronger in communities where the overall educational level is relatively higher, providing a supporting argument for advocating mass literacy and universal primary education. In addition, this study has documented the strong association between female education and contraceptive use. Better-educated women not only have much higher rates of contraceptive use but also are more likely to rely on effective methods than are their uneducated counterparts.

Education should be promoted as a human right and on the basis of social justice. Gender equality in access to schooling need not be justified by reference to its demographic consequences. However, the association between female education and fertility is clear and pervasive enough to warrant policy attention. A large body of research substantiates that women's educational advancement is a powerful agent of social change and a promising catalyst for sustained fertility decline.

Notes

- 1 The research literature based on WFS and DHS data is extensive. Some of the studies are compiled in the *Proceedings of the World Fertility Survey Conference, 1980*, London, 7–11 July, published in Voorburg, Netherlands, by the International Statistical Institute, and in the *Proceedings of the Demographic and Health Surveys World Conference, 1991*, Washington, DC, 5–7 August, published in Columbia, MD by IRD/Macro International.
- 2 In 1990, 34 percent of the adult female population worldwide was estimated to be unable to read and write, and approximately three-quarters of women living in sub-Saharan Africa and south-

ern and western Asia were estimated to be illiterate (UNESCO, 1990).

- 3 Although a standard classification based on years of schooling facilitates cross-national comparability, a perfect equivalence is not feasible because of existing disparities in educational systems and the quality of instruction. The emphasis on years of schooling also ignores learning acquired outside the formal school system.
- 4 Trinidad and Tobago constitutes the only exception, primarily because the category "0 years of schooling," which comprises only 1 percent of the female population, does not constitute a meaningful comparison group.
- 5 Indonesia, Sri Lanka, and Thailand have the highest Family Planning Program Effort Scores among all DHS countries examined (Ross et al., 1992).
- 6 In this analysis, marriage encompasses all socially recognized unions, whether sanctioned by law or not. This broad definition is particularly relevant in the Latin American context, where consensual unions are highly prevalent and a considerable proportion of fertility takes place within these unions (Henriques da Trindade, 1982).
- 7 Differentials could be somewhat overstated in the North African and Asian countries, because estimates for all women from ever-married samples are obtained by applying an inflation factor based on levels of education rather than on years of schooling.
- 8 Although hypothetical questions on ideal or desired family size are subject to significant measurement error, and fertility targets are continuously revised during the process of family building, they provide valuable information on prevailing fertility norms. Respondents who gave a nonnumeric answer were excluded from the analysis. Because these respondents usually desire a large number of children and tend to be poorly educated, the ideal family size for the lower educational strata is likely to be biased downwards.
- 9 In the WFS, only ever-married women were asked about their fertility preferences.
- 10 The wanted fertility rate is calculated exactly like the conventional fertility rate, except that births in excess of the stated ideal family size are excluded from the numerator in the age-specific rates. This measure has also been termed "desired" total fertility rate (Westoff and Ochoa, 1991).
- 11 Togo also displays a moderate level of contraceptive prevalence (34 percent). However, because 90 percent of the observed prevalence is attributable to traditional methods (mainly prolonged abstinence), this level might be classified as low.
- 12 In a number of countries, such as Tunisia, Sri Lanka, and Colombia, a negative correlation exists between women's education and their use of sterilization. However, this association is not consistently observed in all countries (for example, sterilization increases significantly with education in Ecuador, Guatemala, and Mexico).
- 13 The use of traditional methods associated with education may be partly the result of more accurate reporting by educated women.
- 14 Given the dichotomous nature of the dependent variable, current contraceptive use, a logistic regression model is employed (Aldrich and Nelson, 1984). No distinction is made between traditional and modern methods of contraception. The sample analyzed is restricted to nonpregnant women currently in union.
- 15 In Togo and Burundi, only the logit coefficients for 10 or more years of schooling are statistically significant.

- 16 These conclusions were reached by comparing three models: a bivariate model that represents the observed relationship between female education and contraceptive use, a second model that controls for demographic variables (age cohort and number of living children), and a third model that controls for both demographic and socioeconomic variables (husband's education and rural-urban residence). In Table 9, only the third model is shown.
- 17 In Colombia and El Salvador, the influence of husband's education is found to be stronger than wife's education.
- 18 Ghana and Trinidad and Tobago are not included because they experienced no significant fertility decline in the intersurvey period. North African and Asian countries are also excluded because only marital fertility rates and exposure were available in the WFS for educational subgroups.
- 19 Because every society in this study falls within the categories of low or medium development, the entire range of the relationship cannot be examined. Recent studies have documented a positive influence of educational attainment on fertility in some developed countries (Hoem and Hoem, 1989; Kravdal, 1990).

Acknowledgment

Comments from Mary Beth Weinberger are gratefully acknowledged. The opinions expressed in this article are those of the author and do not necessarily reflect the views of the United Nations.

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