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Does sex education influence sexual and reproductive behavior of women? Evidence from Mexico*

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Abstract

This article examines the influence of sex education on sexual and reproductive behavior in Mexican women. Exposure to in-school sex education is identified and duration-hazard models are estimated to assess its effects on initiation of sexual activity and use of contraception methods, and timing of first and second pregnancies. Results consistently reveal that women exposed to sex education begin using contraception methods earlier. Most evidence indicates that exposed women initiate sexual activity earlier. Findings suggest that timing of first pregnancy is not affected and that second pregnancy is postponed. Overall, outcomes from this study support the idea that sex education contributes to promote preventive sexual health.

Jel Classification

I28; J13; J15

Keywords

Sex education; female sexual health; reproductive behavior

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> "[T]he value of capital associated with sexual behavior…involves resources that are both capabilities and habits that are embedded or become part of the person's pattern of behavior" Robert T. Michael (2004)

1. INTRODUCTION

During the last decades important demographic transitions occurred in Mexico, including decreases in the population growth and fertility rates. The annual population growth rate dropped from 3.4, in the period of 1960-70, to 1.0 in 2000-05; and, the global fertility rate dropped from 5.7, in 1976, to 2.1, in 2007 (INEGIa and INEGIb). Evidence indicates that younger Mexican women are postponing first birth when compared to older generations (Miranda, 2006). These findings also suggest a possible relationship between first birth delay and exposure to family planning programs campaigns of the 1970s. To what extend can demographic changes be atttibuted to population policies? This article examines the effects of sex education policies on women's sexual and reproductive behavior in Mexico.

Sex education programs in Mexico started in the 1970s[1]. The Mexican government launched several initiatives to promote birth control and family planning, including information campaigns in health facilities and the mass media, as well as direct education in schools. In-school sex education was implemented from the fifth grade of elementary level through secondary level.

According to supporters, sex education is expected to translate into better sexual and reproductive health practices including pregnancy control and prevention of AIDS and other sexually transmitted diseases (Oettinger, 1999; Rodríguez, 2001). Opponents, however, argue that sex education encourages sexual activity thus increasing unwanted pregnancies, particularly among younger [unmarried] people (Oettinger, 1999). Previous studies analyzing sex education—in-school courses, family planning promotion, and AIDS education—among teenagers in the US have found mixed effects on sex activity, but more uniform (increasing) effects on the use of contraception methods (Oettinger, 1999; Averett et al., 2002; and Tremblay and Ling, 2005). Evidence has also suggested some positive influence in underage pregnancies in the US and the UK (Oettinger, 1999 and Paton, 2002).

The objective of this paper is to examine possible effects in-school sex education on various components of individual sexual and reproductive behavior. The analysis consists of two parts. First, exposure to in-school sex education must be identified using schooling histories

[1] For example, the United Nations founded the Fund for Population Activities (UNFPA) in 1969.

since information on real exposure is not available. Second, duration-hazard models are used to estimate the effects of exposure to sex education on initiation of sexual activity and use of contraception methods, and timing of first and second pregnancies. Results support the idea that sex education slightly influences the sexual and reproductive behavior of women, but that it may contribute to promote sexual health to some extent. Evidence suggests that Mexican women exposed to sex education may initiate sexual activity earlier without accelerating first pregnancy. It also indicates that they tend to use contraception methods earlier and to postpone second pregnancy. The following section presents a historical account of the population policies implemented since 1970s in Mexico with an emphasis on the sex education program. The empirical analysis is in section 3, results are addressed in section 4, and section 5 concludes.

2. SEX EDUCATION AND RELATED POLICIES IN MEXICO

During the 1970s, the Mexican government launched several initiatives to promote birth control and family planning with the strategic objective of reducing population growth pressure. Initiatives included sexual education in schools as part of the natural science curricula at the elementary and secondary levels; family planning and birth control programs in public health institutions; and the creation of the Mexican National Council of Population (CONAPO) for demographic planning and research. The Federal Constitution (CPEUM) and the General Population Law (LGP) were modified to incorporate the principles supporting the new population policies[2,3]. Birth control, at the beginning, was promoted by the government under 'conservative values', i.e. the use of contraception methods and the development of a new perception regarding sexuality always emphasized the role of the family [wedlock] as the [only] acceptable space for sexual practices (Garcia, 2001).

In 1974, sexual education was included in the contents of the textbooks at the elementary level, beginning in fifth, and throughout the secondary level. Textbooks containing the sex education programs were published by the *Secretaría de Educación Pública*, SEP (Ministry of Education), and were, and still are, free for all students in both public and private schools but, while mandatory in public schools, their use is discretionary in the latter (Torres, 2002)[4]. Textbooks curricula evolved with years to progressively incorporate new issues (Rodriguez,

[2] The General Population Law was first promulgated in 1936 and explicitly promoted fertility and population growth (Palma, 2005 and Sánchez, 1997). All acronyms are in Spanish.
[3] See table A1 in appendix.
[4] Between 8 and 11% of Mexican schools were private in the 1970s (SEPa).

2001). The first curriculum included menstrual functioning, changes due to puberty and adolescence, and reproductive processes for fifth grade, and birth control, contraceptive use, and prevention of sexually transmitted diseases for secondary level. Since 1987, with the AIDS epidemic an emphasis was put on prevention in the secondary courses. Beginning in 1994-1998, from fifth grade on, the program has added the formation of values: gender-equality issues, sexual and reproductive rights, sexual relationships, love, and sexual violence, among others.

While, since its implementation in the 1970s, the sex education program was subject to some resistance from conservative groups, none of the claims had important consequences regarding the publication or distribution of sex education contents (Monsiváis, 2006). However, a strong debate has emerged in recent years. Not only have conservative associations and institutions opposed to the new contents first issued in 2006, but also several state governments have limited, hindered, and even banned the distribution of the textbooks[5,6]. Thus, under this sociopolitical context, the insights offered by the present and other related studies become more important for orienting public policies.

Besides sex education programs other population policies were launched during the 1970s[7]. Between 1972 and 1973, public health facilities with large coverage incorporated family planning and birth control programs[8]. In 1973, a new Sanitary Code eliminated the prohibition on contraceptives sales and advertising, and between 1973 and 1976 the politics, organization, and agenda were set to integrate family planning into the health services. The government founded the CONAPO in 1974, and, in 1977, the first National Program for Family Planning (PNPF). Many important strategies were initiated, among which was the Family Planning Communication Program, with the purpose to "inform, make aware, and generate changes in attitudes with respect to reproductive behavior"[9], and an expansion strategy to reach rural communities (population size: 500-2500). It was not until 1984 that family planning was

[5] Specifically, the debate is about the first-grade secondary biology textbook.
[6] States whose governments have reacted against the textbook are Querétaro, San Luis Potosí, Aguascalientes, Yucatán, Sonora, Guanajuato, Baja California, and Michoacán
[7] The next brief historical account of the sexual/reproductive programs of the health sector is based on Palma and Rivera (1996) unless otherwise noted.
[8] Large coverage institutions: Instituto Mexicano del Seguro Social (Mexican Social Security Institute, IMSS), Secretaría de Salud y Asistencia (Health Ministry, SSA); and Instituto de Seguridad y Servicios Sociales para los Trabajadores del Estado (Social Security for Government Workers, ISSSTE). Before the public initiatives of the 1970s two private organizations were founded with the objectives of providing family planning services (Asociación Pro Salud Materna, in 1958), doing research, providing education and supplying medical services for family planning (Fundación para Estudios de la Población, A.C., in 1965—now Fundación Mexicana para la Planeación Familiar, Mexfam). Also, in 1968, previous to other and more general public initiatives, the Instituto Nacional de la Nutrición Salvador Zubirán (Nacional Nutrition Institution, INNSZ) started a research program and the provision of family planning services. Acronyms are in Spanish.
[9] CONAPO.

included in the General Health Law (LGS) under similar principles as those in the LGP. During 1980s other approaches were adopted as more results of social (surveys) and medical (contraceptive methods and techniques) research were obtained. Also, policies for the prevention of AIDS were developed, like the creation of the National Council of AIDS (now CENSIDA). In the 1990s, the PNPF emphasis was set on specific population groups (teenagers, rural, and men) and it continued to provide planning services, information, and education.

3. EMPIRICAL ANALYSIS

3.1. Identifying exposure to sex education

This study draws data from the first wave of the Mexican Family Life Survey (MxFLS) collected in 2002 (see section 3.3 for details). A crucial shortcoming is that information on actual exposure to sex education is not available in the survey. However, it does contain extensive data on schooling histories, which allows constructing a variable of potential exposure to sex education. Sex education in Mexican schools begins at the elementary level in 5th grade of elementary school and continues through all three grades at the secondary level. Given that the program was universally implemented since 1974[10], some surveyed women were not exposed to in-school sex education during their lives either because they never attained 5th grade or because they finished secondary school before 1974. Women who attended, ever since, any of the school grades in which sex education is taught are those who were potentially exposed to the program.

To identify whether a woman was exposed to sex education programs, I use specific calendar-years/school-grades and a variable indicating whether a woman attended the targeted school grades (fifth and sixth grades of elementary school and first, second, and, third grades of secondary school) starting in 1974. Using these two variables, I am able to calculate the number of years a woman would be expected to have been exposed to the sex education programs[11].

A reasonable concern arises regarding how 'accurately' sex education programs are taught, particularly at the introductory phases when it is new to everyone. One may think of teachers and schools not prepared to deal with the topic, or even parents opposing to their children learning 'about sex' at school. And, even if self-reported information on actual exposure was available, whether the program was actually properly followed by schools and accurately

[10] Free textbooks are distributed to all Mexican schools since the 1950s (SEPb).
[11] Hereafter, I will refer to potential exposure only as exposure in order to ease text presentation.

presented by teachers or not is an unobserved fact. Additionally, how an individual is really affected by any course learned at school, in this case, by the sex education would also be difficult to grasp even if actual exposure was observed. However, evidence could suggest that the in-school sex education programs are fairly well addressed. According to the 2000 Mexican Youth Survey (Rodriguez, 2001), 34.1% of young Mexicans believed that they received important sexual health information in school[12]. In any case, in the next subsection, I discuss how control variables are included to account for these sources of heterogeneity.

3.2. Econometric models

I assess female sexual and reproductive behavior as timing of various key events related to sexual and reproductive aspects of a woman's life. The empirical analysis consists in estimating duration models[13]. Left-hand variables are durations to first sexual encounter, first use of contraception methods and first pregnancy, and between first and second pregnancies. Data on timings of important sexual and reproductive events for women in fertile ages are available from the reproductive health questionnaire. Durations to first sexual encounter and first pregnancy are calculated with respect to age of menarche; duration to second pregnancy is computed with respect to age of first pregnancy; and, durations to first use of temporary contraception methods—pills, emergency pills, and other hormonal methods, intra-uterine device, and masculine condom—are measured with respect to age of first sexual encounter.

Let $x(t)$ and z be vectors containing time-varying and time invariant covariates, respectively. The conditional proportional hazard of an event occurring is:

$$\lambda[t; x(t), z, \beta, \upsilon] = \upsilon\kappa[x(t), z, \beta]\lambda_0(t) \tag{1}$$

where t denotes duration, $\lambda_0(t)$ is the baseline hazard, and υ is unobserved heterogeneity. It is assumed that unobserved heterogeneity enters multiplicatively into the hazard function; that it is independent of observed covariates and of starting and censoring times; and, that its distribution is known up to a finite number of parameters (Wooldridge, 2002).

If $\kappa[x(t), z] = \exp\left[x(t)\beta_{x(t)} + z\beta_z\right]$ then

[12] 24.4 % of young people believed that they got it from parents, 19.4% from own learning, 9.7% from friends, 5.9% from media, and 4% other and church.

[13] The use of duration models to assess sexual and reproductive behavior follows from Oettinger (1999) and Miranda (2006).

$$\lambda\left[t; x(t), z, \beta_{x(t)}, \beta_z\right] = \lambda_0(t)\exp\left[x(t)\beta_{x(t)} + z\beta_z\right]\upsilon \quad (2)$$

where the *i*th coefficient in either vector $\beta_{x(t)}$ or β_z may be interpreted as the proportion by which the hazard changes due to a one unit increase in the *i*th covariate. Since the emphasis of the analysis is on how the hazards of events occurring change with exposure to sex education programs, baseline hazards do not need to be estimated. Cox's proportional hazard models allow to obtaining estimates of β without specifying $\lambda_0(t)$. Also, because the objective here is to estimate the effects of observed covariates on mean durations rather than to test duration dependence, unobserved heterogeneity need not be estimated under the independence assumption. Later on, however, I make use of parametric approaches for analyzing results in terms of duration and dealing with possible bias due to right-censoring[14].

Time varying, $x(t)$, is exposure to sex education. Since sex education contents is introduced in fifth grade of elementary school and continues until third grade of secondary school, the maximum number of years of exposure is five. For example, if a woman attained only elementary school and she attended fifth and sixth year after 1974, say she attended fifth grade in 1980 and sixth grade in 1981; her exposure would be one year in 1980 and two years in 1981, provided that she completed both school grades.

Vector z contains controls for observed heterogeneity, including variation due to background characteristics. A set of variables indicating completed education allows to isolating the effect of exposure from that of schooling itself. Also, it is important to distinguish whether a woman attended a private school, because official textbooks are compulsory only for public schools, although private schools may do choose to use them. Thus, a private school indicator and its interaction with exposure to sex education are included.

Sexual and reproductive behavior may have been affected by changes in social attitudes toward sex and parenthood during the last decades. I include five-year birth cohorts to account for this variation across generations. Mexican indigenous population distinguishes from non-indigenous people in several socioeconomic aspects; they are poorer, less educated, and, less likely to access health services. For example, while 22.7% of the population (15 years or older)

[14] It is worth noting that Miranda (2006) explicitly takes into account childless women, i.e. women who may be sterile or dislike children, by including a mass point. However, in the MxFLS sample of women, only 2.5% (1.4%) have long durations to first pregnancy, more than 20 years (25 years). Moreover, since these are women in fertile ages, one should not assume that all of them will definitely remain childless, except perhaps those over 45 who represent 0.5% of the sample. Possibly a group closest to the childless category would be that with long durations and no sexual intercourse ever, which only represents 1.8% (1%) of women with durations of more than 20 years (25 years). It seems, then, that the presence of childless women would not originate any (significant) biases.

had not completed elementary school by 2005, this percentage is of 55.2% in the case of indigenous population; or else, in 2000, average income of an indigenous household (indigenous household head) was less than half than that of a non-indigenous household and one-third in the case of households whose head was not bilingual (INEGIc). Given these dissimilarities, it is likely that indigenous women behave differently than non-indigenous women regarding their sexual and reproductive decisions, so I include an indicator of whether a woman self-identified as indigenous. Marital status is included in the case of duration to first sexual encounter and first contraception use, but not in the pregnancies regressions because it may be endogenous. Variables of state of residence and population size of community control for additional heterogeneity due to regional variation.

In equation (1) it is assumed that υ is independent of covariates, but what if unobserved heterogeneity is actually correlated with observables? If other factors, such as family and community, influence a woman's access to sex education programs, how she processes knowledge from sex education contents or even her attitude towards sex and maternity. For example, if the probability of a woman dropping out of school, potentially limiting her exposure to sex education, is correlated with her parents' low schooling. Or else, if parental schooling, which likely shapes child upbringing, also affects her beliefs about sex and maternity. Variation in community environment could be a problem, if, as suggested by evidence (see figures A1 and A2), population less developed communities tend to have less schooling and higher fertility rates. To address these possible drawbacks, vector z also includes background characteristics, attained education of parents and availability of basic services in the community where a woman lived at age 12[15].

Finally, public initiatives in the 1970s also involved the promotion of birth control and family planning in the health sector, as described in section 2. Thus, a woman could have as well been exposed to this information in health facilities. Data on actual exposure to promotion in health facilities is not available; except for those who were most recently pregnant, i.e. practically all of them this occurred after 1972, year in which the launch of in-health facilities promotion began. But, since pregnancy history is available, it is possible to observe whether a woman had her first child was born before or after 1972 and whether the delivery was in a public health facility. I include these variables and an interaction term between them in the second pregnancy analysis.

[15] Community characteristics are main source of drinkable water and main type of sanitary service.

3.3. Data

The MxFLS contains a Reproductive Health Questionnaire (RHQ), applied to all women of fertile age (14-49 years old) within each household. MxFLS sample size is 8,500 households, representative at all national, regional, and urban-rural levels. The RHQ gathered information on history of pregnancies, contraception, and sexual health. The original cross section sample is converted into a panel-type database expanding each observation by the corresponding woman's age. In the panel dataset each observation is a woman-year and the 'history' of each woman is described by time-varying characteristics, such as durations until failures and exposure to sex education. Time-invariant characteristics, such as cohort and completed schooling, remain constant across woman-year observations. Total sample of women in fertile age is 8,743; 2,034 of the original sample are women between 14 and 19 years old. I exclude teenagers because they are more likely to still attend school at the time of the survey and the highest level of schooling would not be a good control for completed education in their case. The number of observations after excluding teenagers is 6,709 and this is the sample I refer to hereafter.

Table 1 presents summary statistics of selected characteristic of these women[16]. Average exposure to the 1974 in-school program was 2.6 years, most women in sample (66.7%) were exposed for at least one year, and 38.7% of the sample was exposed to sex education for 5 years. Average schooling is 7.3 years, 54.0% of the women attained less than secondary schooling, 27.9% completed secondary school, and 18.0% attained high school or a higher level. Relatively few women attended a private school, 7.1%. Average duration from menarche to initiation of sexual activity is 7.4 years and 85.6% of the women had initiated sexual activity by 2002. As for contraception practices, average duration from initiation of sexual activity until first use of temporary methods is 7 years and 70.9% of the women who had had sex by 2002 had also started using temporary methods by that time. Most women, 81.4%, had been pregnant at least once by 2002 and average duration from menarche to first pregnancy is 8.5 years. Among women who had a first pregnancy, 84.9% had been pregnant a second time, with an average duration between pregnancies of 3.3 years. On average these women were 33.1 years in 2002, 11.5% were born in 1953-57; 14.8%, in 1958-62; 16.7%, in 1963-67; 19.2%, in 1968-72; 18.2%, in 1973-77; and, 19.6%, in 1978-82. Regarding origin, 11.1% of the women report to be indigenous. According to marital status women distribute as follows: 20.3% are single; 5.5%, separated; 58.2%, married; 2.5, divorced; 1.6%, widows; and 11.9% live in consensual union.

[16] Additional statistics are available under request.

Table 1. Summary statistics of selected variables

Variable	Mean	Std. Dev.
Exposure variables		
Exposure-1974 (years)	2.6	2.2
At least one year (%)	66.7	47.0
5 years (%)	38.7	49.0
Sexual and reproductive indicators		
Duration to first sexual encounter (years)	7.4	5.0
% of women who initiated sexual activity	85.6	35.0
Duration to first pregnancy (years)	8.5	5.4
% of women who had a pregnancy	81.4	39.0
Duration to second pregnancy (years)	3.3	3.4
% of women who had a second pregnancy	84.9	35.8
Duration to first temporary contraception (years)	7.0	8.2
% of women who had used contraception	70.9	45.4
Education		
Years of schooling	7.3	3.9
Less than secondary school (%)	54.0	50.0
Secondary school completed (%)	27.9	45.0
High school or higher (%)	18.0	38.0
Attend private school (%)	7.1	26.0
Age	33.1	8.4
Birth cohorts (%)		
1953-57	11.5	32.0
1958-62	14.8	36.0
1963-67	16.7	37.0
1968-72	19.2	39.0
1973-77	18.2	39.0
1978-82	19.6	40.0
Indigenous (%)	11.1	31.0
Marital status (%)		
Single	20.3	40.0
Separated	5.5	23.0
Married	58.2	49.0
Divorced	2.5	16.0
Widow	1.6	13.0
Union	11.9	32.0
Total sample	6,709	

4. RESULTS

Table 2 presents results of the Cox's proportional hazard estimation. Columns (1) thru (4) present coefficient estimates ($\beta_{\xi(t)}$, β_{ζ}) of models for first sexual encounter, first pregnancy, second pregnancy, and use of temporary contraception methods, respectively. According to evidence, exposure to sex education has relatively small effects on female sexual and reproductive behavior. However, results are consistent with Oettinger's findings, in the sense that neither supporters nor opponents to sex education are completely right. On the one hand, exposure to sex education increases the hazard of first sexual intercourse by 4.5%. It does not affect the hazard of first pregnancy, but it does decrease the hazard of second pregnancy by 2.7%. On the other hand, an additional year of exposure to the sex education program increases the hazard of using temporary contraception methods by 5.6% only for women who attended public schools. Thus, associated to sex education there is earlier initiation to sexual activity, with no evidence of increasing hazard of first pregnancy, and better sexual health practices in terms of earlier initiation to temporary contraception methods. Also, exposure to sex education influencing longer duration between first and second pregnancies, together with an earlier initiation to temporary contraception methods, could be interpreted as more conscious decisions about family planning.

Remaining covariates in table 2 are attained education, type of school, indigenous origin, and birth cohorts. Hazards of first and second pregnancies are smaller and hazard of using temporary contraception methods is larger for more educated women. The hazard of first pregnancy also decreases for women who attended a private school. Also, note that signs of estimated coefficients of completed education and attendance to private school are negative in the case of initiation of sexual activity. More educated women and those who attended a private school delay first sexual encounter. If these women have high prospects of education investment they also face larger opportunity costs of 'unwanted' consequences of sexual activity. These larger opportunity costs could induce either postponement first sexual intercourse, if a woman perceives that the risk of pregnancy is high, or early use contraception methods to delay pregnancy, if she decided to be sexually active. For indigenous women the hazard of first sexual encounter is larger and the hazard of first contraception use is smaller, which is an expected result as discussed above. Outcomes also vary across generations as expected, younger women tend to initiate sexual activity earlier, delay pregnancies, and use contraception methods earlier. But, the hazards of first and second pregnancies only decrease significantly for women who were 20-25 years old in 2002. In the case of first sexual encounter, the increase in hazard is observed

for women born since the early 1970s. All generations relative to the oldest one (1953-1957) seem to use temporary contraception methods earlier and this is more so the younger the cohort.

Table 2. Cox proportional hazard models, selected coefficients [a]

	(1) First sexual encounter	(2) First pregnancy	(3) Second pregnancy	(4) First use of contraception
Exposure to program in school	0.045	0.010	-0.027	0.056
	(0.013)***	(0.014)	(0.014)*	(0.016)***
Completed secondary school [b]	-0.428	-0.303	-0.078	0.155
	(0.047)***	(0.050)***	(0.055)	(0.060)**
Completed high school [b]	-0.757	-0.847	-0.290	0.182
	(0.051)***	(0.057)***	(0.062)***	(0.070)***
Private school [c]	-0.094	-0.165	-0.009	0.097
	(0.049)*	(0.055)***	(0.069)	(0.070)
Woman is indigenous	0.101	0.065	-0.020	-0.317
	(0.049)**	(0.056)	(0.048)	(0.058)***
Cohort dummies [d]	0.052	0.104	0.111	0.251
1958-62	(0.050)	(0.050)**	(0.056)**	(0.060)***
	0.046	0.042	0.191	0.242
1963-67	(0.058)	(0.060)	(0.062)***	(0.066)***
	0.026	-0.020	0.101	0.428
1968-72	(0.059)	(0.063)	(0.063)	(0.068)***
	0.148	-0.042	0.030	0.606
1973-77	(0.060)**	(0.065)	(0.066)	(0.070)***
	0.361	-0.182	-0.244	0.703
1978-82	(0.063)***	(0.070)***	(0.079)***	(0.075)***
Observations	51,111	58,338	19,573	43,471
Pseudo R-squared	0.03	0.01	0.00	0.02
Log-pseudo likelihood	-41,653.67	-40,812.79	-29,713.86	-30,148.36
Wald X^2	1,616.01	923.77	313.44	1,281.22

Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%
[a] Other controls include: education of parents, characteristics of community where woman reside at age 12, current state of residence, population size of current community of residence, and marital status in the cases of columns (1) and (4).
[b] Schooling baseline: attained education less than secondary.
[c] Indicates whether a woman attended a private school during the highest level of attained education.
[d] Cohort baseline: women born between 1953 and 1957.

Time interpretation of results

For interpreting these results in terms of duration rather than hazard, an estimation of the baseline hazard is first needed. A possible way to estimating $\lambda_0(t)$ is to undertake parametric estimations of equation (2), which requires distributional assumptions on duration (*t*). I also make use of parametric estimations to account for right-censoring and, thus, contrast previous findings.

First, I estimate equation (2) using a Weibull specification without considering unobserved heterogeneity. I compare estimated coefficients of exposure to sex education program with those obtained through the Cox procedure. Estimates are in table 3, column (1) and column (2) contain results of the Cox and Weibull approaches, respectively. All estimates increase when the Weibull assumption is imposed, particularly in the cases of first and second pregnancies and first contraception method. The effect of exposure to the sex education program on the hazard of first pregnancy becomes three times larger and statistically significant at 10%. In the case of second pregnancy, the estimated coefficient also increases but losses statistical significance. And the effect on the hazard of use of contraception temporary methods increases by almost 20% continuing to be strongly statistically significant. These large differences in estimates may be attributed to the fact that there are women who have not enter pregnancy (either for the first or the second time) or have not used contraception methods by 2002, i.e. women whose durations are censored and this right-censoring was not accounted for by the Cox estimation.

If the Weibull model is taking care of this issue by doing a proper adjustment then the implications about the effects of sex education programs could be opposite to those derived from the Cox estimation in the case of hazard of pregnancy. Weibull results suggest that exposure sex education is not 'innocuous', that it would, for example, be associated with an (small and weakly significant) increase in the hazard of first pregnancy. Nonetheless, problably the most important implication is that, when right-censoring is accounted for, outcomes show to be consistent across specifications in the cases of initiation to sexual activity and first use of temporary contraception methods but conflicting in for first and second pregnancies.

Table 3 Hazard and duration estimations, Cox and Weibull models

	Hazard		Duration (Weibull)		
	(1)	(2)	(3)	(4)	(5)
	Cox	Weibull	Estimated effect on duration	Average duration (years)	Estimated effect on average duration (months)
First sexual encounter	0.045	0.049	-0.024	7.4	-2.1
	(0.013)***	(0.016)***	(0.008)***		
First pregnancy	0.010	0.033	-0.019	8.5	-1.9
	(0.014)	(0.018)*	(0.010)*		
Second pregnancy	-0.027	-0.016	0.012	3.3	0.5
	(0.014)*	(0.021)	(0.015)		
First temporary contraception method	0.056	0.067	-0.065	7.0	-5.5
	(0.016)***	(0.020)***	(0.020)***		

See notes in table 2.
Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Next, I am interested in interpreting how exposure to sex education affects duration. Such interpretation can be made from columns (3)-(5). An additional year of exposure to sex education is associated with a decrease of 2.4% in the timing to first sexual encounter, which translates into, approximately, 2.1 months for the average woman. Duration to first pregnancy would diminish by 1.9% or 1.9 months for the average woman. Timing to first temporary contraception method would fall by 6.5%, implying that the average women exposed to sex education starts using contraception methods 5.5 months earlier. Evidence suggests that overall effects of exposure to sex education on sexual and reproductive behavior are rather small. However, it also reveals that the estimated coefficient of temporary contraception methods is 2.7 times larger than that of initiation to sexual activity and 3.4 times larger than the estimate of first pregnancy. Thus, some support is found for the idea that sex education improves sexual health by (positively) influencing preventive care more than encourages sexual activity.

Finally, a further robustness check could be done by explicitly modeling unobserved heterogeneity[17]. I repeat Weibull estimations by including unobserved heterogeneity under the assumption that it has a Gamma distribution. Estimation results are presented in table 4. Results are again consistent in the direction of effects on first sexual encounter and on first temporary contraception method. However, in the case of the latter, the estimate falls by 40% in comparison to that in column (3) of table 3. Interestingly, the estimated effects on duration to first pregnancy disappear not only statistically but also economically. And, the estimated effect on timing of second pregnancy doubles and becomes statistically significant (at 5% level). Additionally, column (2) contains estimation results of a lognormal model with a Gamma distribution for unobserved heterogeneity. Basic results are stable with respect to those obtained under the Weibull assumption. But, unexpectedly, the estimated effect on timing to initiation of sexual activity that disappears. This outcome is puzzling because it is this estimated effect which had shown to be the most stable both in sign and magnitude. On the other hand, evidence seems to support advocates of sex education, women exposed to sex education would use temporary contraception methods earlier without changing initiation to sexual activity or first pregnancy, and they postpone second pregnancy.

[17] Also, note that if unobserved heterogeneity is ignored in the Weibull model, the effects of covariates on expected duration could be biased (Wooldridge, 2002).

Table 4. Estimation with unobserved heterogeneity, Weibull and Lognormal models.

	Duration	
	(1)	(2)
	Weibull	Lognormal
First sexual encounter	-0.020	-0.009
	(0.007)***	(0.008)
First pregnancy	0.007	0.011
	(0.008)	(0.008)
Second pregnancy	0.025	0.023
	(0.011)**	(0.011)**
First temporary contraception method	-0.038	-0.035
	(0.015)***	(0.014)**

See notes in table 2.
Unobserved heterogeneity is modeled under a Gamma distributional asssumption.
Robust standard errors in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

5. CONCLUSIONS

Aggregated outcomes of fertility and population growth rates have dropped in the last decades in Mexico, indicating changes in sexual and reproductive behavior. In this study, I look at these behavioral changes by analyzing individual data. The role of public policies is addressed specifically considering the case of sex education program first launched in the 1970s. Since it was introduced, in 1974, the in-school sex education program has been upgraded to keep up with social and cultural changes. However, a disagreement has been recently developing in some Mexican states about the scope of the sex education contents. This controversy could provoke enough political and social pressure to modify or discard the program based upon ideological agendas rather than empirical evidence. This paper offers some clues on whether and how sex education contributes to change sexual and reproductive behavior among Mexican women.

I use duration-hazard models to analyze the effects of sex education on several aspects of female sexual and reproductive behavior, initiation of sexual activity, first and second pregnancies, and first use of temporary contraception methods. Magnitudes of estimates lead to think that effects could be quite small. However, evidence broadly suggests that exposure to sex education could be associated with early sexual intercourse without affecting first pregnancy. It also consistently reveals that sex education is positively related with an early use of temporary contraception methods and that may contribute to postponement of second pregnancy. In general, outcomes provided here support the idea that sex education contributes to sexual health by promoting ‘more conscious’ decisions. Yet, more complete studies should as well include the behavior of men. Moreover, given that analyses presented here use potential instead of actual exposure to sex education, results should be taken with caution.

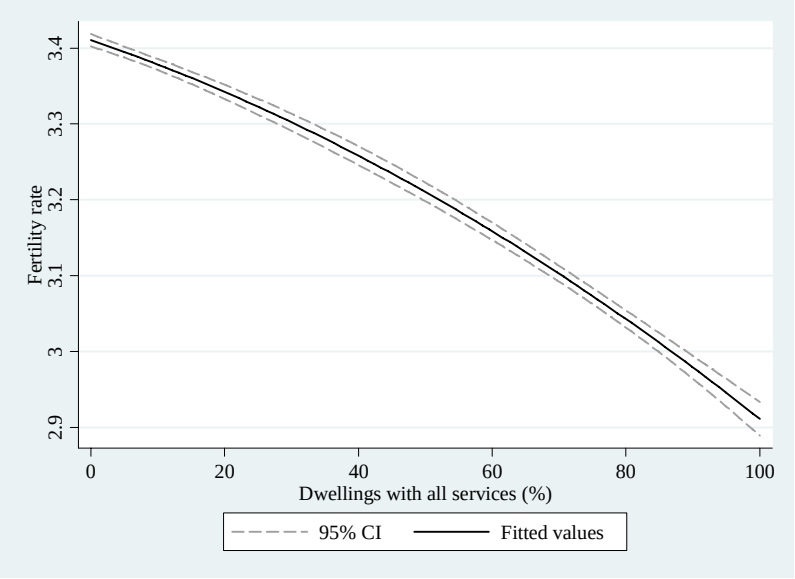
APPENDIX

Table A1. Excerpts of the Federal Constitution and the General Law of Population regarding policies implemented in the 1970s

"Every individual has the right to freely, responsibly, and well-informed decide on the number and timing of her/his children." (CPEUM, Title First. Chapter I. Article 4. Modification published in 1974).
"…carry out family planning programs through public education and public health services, and supervise that such programs and those managed by private organizations are respectful of the human rights and family dignity…" (LGP, Chapter I. Article 3. Part II. Modified in 1973).
"…influence the population dynamics through education, public health, professional and technical training, and children protection systems…" (LGP, Chapter I. Article 3. Part IV. Modified in 1973).

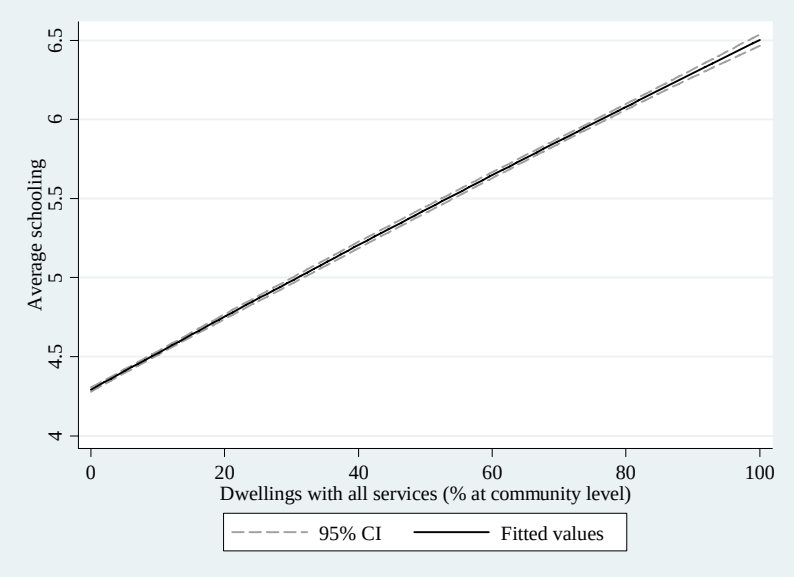
Source: Own translation from CPEUM and LGP available online.

Figure A1. Fertility rate and access to services



Source: Own estimations of simple quadratic regressions. Data was drawn from community level information of the II Conteo de Población y Vivienda 2005 (INEGId).

Figure A2. Schooling and access to services



Source: Own estimations of simple quadratic regressions. Data was drawn from community level information of the II Conteo de Población y Vivienda 2005 (INEGId).

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INEGIa Información Estadística. Tasa de crecimiento media anual de la población, 1950 a 2005. Online at http://www.ingei.gob.mx/

INEGIb Información Estadística. Tasa global de fecundidad, 1976 a 2007. Online at http://www.ingei.gob.mx/

INEGIc Consulta Interactiva de Datos. Online at http://www.inegi.gob.mx/inegi/default.aspx?s=est&c=10252

INEGId II Conteo de Población y Vivienda 2005, principales resultados por localidad 2005 (ITER). Online at http://www.inegi.gob.mx/est/contenidos/espanol/sistemas/conteo2005/localidad/iter/default.asp?s=est&c=10395

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