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Broken Promises: Abstinence Pledging and Sexual and Reproductive Health

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Approximately 12% of girls and young women in the United States pledge abstinence. Yet most break their pledges, engaging in first intercourse before marriage. The extant literature reports few differences between pledge breakers and nonpledgers in sexually transmitted infections and nonmarital pregnancies. The present research maintains that previous studies may have obscured important differences in exposure risk and hypothesizes that female pledge breakers who have higher exposure risk are more likely to experience human papillomavirus (HPV) and nonmarital pregnancies. To test this hypothesis, this study uses the National Longitudinal Study of Adolescent to Adult Health, logistic regression, and event history modeling. The results show that, after accounting for differences in exposure risk, pledge breakers have higher risk of HPV and nonmarital pregnancy. As a set, the results are consistent with the argument that pledgers use condoms and contraceptives less consistently and highlight unintended consequences of abstinence promotion.

Key Words: Adolescent sexuality, emerging adulthood, marriage, pregnancy, sex education, sexual health.

Nonmarital pregnancies and sexually transmitted infections (STIs) represent significant threats to the sexual and reproductive health of adolescents and young adults. In the United States, approximately 75% of pregnancies among women aged 15–24 are nonmarital; of those, three quarters are unintended (Zolna & Lindberg, 2012). Fifteen- to 24-year-olds also represent half of new sexually transmitted infections, with human papillomavirus (HPV) accounting for more than 70% of new cases (Satterwhite et al., 2013). Given these statistics, identifying individual and institutional factors promoting nonmarital pregnancies and STIs, such as HPV, is an important concern.

A key institutional practice in the 1990s and 2000s purportedly targeting nonmarital pregnancies and STIs was the promotion of abstinence from sexual intercourse until marriage. Abstinence-only programming was delivered primarily two forms. First, the delivery of abstinence-only sex education (AOSE) was vastly expanded through $1.5 billion in federal funds during the George W. Bush administration (SIECUS, 2015). A second intervention, promoted by religious and nonprofit groups and AOSE programs, was the use of "virginity pledges" (Bearman & Brückner, 2001). Pledging typically involves public declarations by adolescents to remain abstinent until marriage (Bearman & Brückner 2001; Williams, 2011). Under the Obama administration, abstinence-only programming has been largely displaced in national policy making designed to reduce nonmarital pregnancies and STIs among U.S. teens and young adults (Joseph, 2012), but its use remains widespread at the state and local levels. Currently, 25 states still require that abstinence be stressed in sex education, and 19 states mandate content promoting sexual behavior only within marriages (Boonstra, 2014). On the basis of the 2006–2010 National Survey of Family Growth (NSFG), 12% and 7% of female and male respondents under age 25, respectively, reported pledging to remain a virgin until marriage (Brewster, Valle, & Harker Tillman, 2013).

A key question centers on the possibility that abstinence-promotion efforts have perverse unintended consequences on the sexual and reproductive health of teenagers and young adults. Might they actually increase risks of nonmarital pregnancies and STIs? In this research, we examine whether virginity pledging is associated with increased risks of nonmarital pregnancies and HPV among sexually active girls and young women. Although the extant literature has found little evidence of worse sexual and reproductive health outcomes for pledge breakers than for sexually active nonpledgers (e.g., Adamczyk & Felson, 2008; Brückner & Bearman, 2005; Ford et al., 2005), none of this research has accounted for the fact that the two groups may have different levels of exposure risk for pregnancy and HPV. This research addresses this critical gap by comparing pledgers and nonpledgers who have similar exposure risks. Our results on pledge breaking not only shed light on the health outcomes of millions of pledge breakers but also highlight, more generally, the potential consequences of abstinence beliefs and abstinence-only promotion efforts, which are common at the state and local policy-making levels and may return as federal policy in the near future.

This article is organized as follows: We first review the literature on pledging and health outcomes. To develop our theoretical expectations, we then draw on Swidler's (1986) notion of cultural lag, or the idea that individuals find it difficult to abandon familiar strategies of action, scripts, or repertoires even when the associated underlying cultural beliefs are no longer relevant for the individual. While not completely protective, condoms are an important means by which youth can reduce their risks of pregnancy and STIs, including HPV (Centers for Disease Control, CDC, 2014a, 2014b). Because of cultural-lag effects, we argue that pledge breakers are less likely to practice safe sex, thereby increasing their risks of getting pregnant and contracting HPV over nonpledgers with similar exposure risk. Because data on condom-use consistency tend to be relationship specific or limited to one-year periods and may contain substantial measurement error, we examine health outcomes directly linked to inconsistent condom use: nonmarital pregnancy and STIs. HPV is the most prevalent STI and is untreatable, which allows for assessment of its relationships with sexual activity. We use HPV test results from a representative sample of sexually active young women. We test our expectations empirically, using the National Longitudinal Study of Adolescent to Adult Health (Add Health), by examining whether pledge status among sexually active female respondents is associated with HPV acquisition and nonmarital pregnancy.

Background

Research on the health implications of pledging has focused on both sexual behavior and health outcomes, such as nonmarital pregnancy and STIs. Pledgers, on average, are more likely to delay sexual involvement, have fewer sex partners, and marry earlier (Bearman & Brückner, 2001; Brückner & Bearman, 2005; Meier, 2007; Uecker, 2008). Observed associations between pledging and more limited sexual behavior, however, may reflect selection effects—that is, the tendency for individuals prone to eschewing nonmarital sexual behavior to select into pledging—as opposed to indicating any causal effect (Rosenbaum, 2009; but see Martino, Elliott, Collins, Kanouse, & Berry, 2008). Bearman and Brückner (2001) and Rosenbaum (2009) also found that pledge breakers tend to use condoms less consistently than nonpledgers, whereas Martino et al. (2008) observed no difference. It is worth noting that the previously mentioned discrepancies between Rosenbaum (2009) and Martino et al. (2008), both of which employed propensity-scoring techniques, may reflect the fact that the latter used substantially fewer variables to match pledgers and nonpledgers. Nevertheless, the majority of pledge takers eventually break their pledges, having sexual intercourse while unmarried (Brückner & Bearman, 2005), which highlights the need for more research on subsequent health outcomes.

Currently, there is little evidence that pledge breakers have worse health outcomes than nonpledgers. Specifically, the extant literature reports no differences in the prevalence of *Chlamydia trachomatis*, *Neisseria gonorrhoeae*, *Trichomonas vaginalis*, and HPV between sexually active pledgers and nonpledgers (Brückner & Bearman, 2005; Ford et al., 2005;

Rosenbaum, 2009); however, the former have slightly lower odds of nonmarital pregnancies (Adamczyk & Felson, 2008). This null finding may reflect, one the one hand, the fact that pledge breakers exhibited fewer sexual risk factors, such as early sexual debut and high numbers of sex partners, and on the other hand, that they were more likely to be inconsistent users of condoms. To the best of our knowledge, however, no study to date has reported increased risks of STIs and nonmarital pregnancies among pledge breakers.

So why might pledge breakers have increased risks of negative health outcomes? In addition to the already mentioned research showing less consistent condom use among pledgers, randomized and quasi-randomized controlled studies report some adverse effects of AOSE on sexual and reproductive health: one out of seven trials found increased risk of STIs, and one out of eight found increased risk of pregnancy (Underhill, Montgomery, & Operario, 2007). We also argue that researchers have failed to identify health disparities between sexually active pledge breakers and nonpledgers because prior research has not adequately accounted for differences in exposure risk. Whether as a result of taking an abstinence pledge or selectivity, pledgers tend to have fewer sex partners and to delay sex longer (Brückner & Bearman, 2005). Consequently, studies showing no health disparities between pledge breakers and nonpledgers may reflect the fact that the former tends to have lower exposure risk. Indeed, given the likelihood that sexually active pledgers may be less consistent users of condoms, they should have increased risks for STIs and nonmarital pregnancies than nonpledgers with similar exposure profiles. We test this expectation here.

Conceptual approach

We draw on theories of culture to develop expectations between abstinence beliefs and sexual and reproductive health. Since the introduction of Swidler's (1986) tool-kit conception of culture, it has become a truism that culture matters. Researchers have sought to advance the field in several ways, including arguing for, among other things, the importance of cognition (e.g., Vaisey, 2009), the interplay between culture and structure (for a review, see Pachucki & Breiger, 2010), the effects of cultural heterogeneity (e.g., Harding, 2007), and patterns of cultural persistence (e.g., Kirk & Papachristos, 2011; Tavory & Swidler, 2009). The issue of cultural lag or persistence highlights how skills, habits, repertoires, and strategies for action are causal for maintaining patterns of behavior in the absence of the ideas or beliefs that originally motivated them. It not only suggests a conception of culture as a set of skills or repertoires but also directs attention to the social contexts under which cultural persistence occurs. Importantly, Tavory and Swidler (2009) show that cultural meanings attributed to condom use caused individuals to refrain from adopting them, even when they were at risk for acquiring human immunodeficiency virus (HIV). However, this qualitative finding has not been replicated using more generalizable samples, such as population-based data.

We follow Tavory and Swidler (2009) and argue that pledgers are slow to adapt their scripting of sexual behavior interactions once they become sexually active. Abstinence programming generally promotes three specific beliefs: (a) the importance of abstaining from sex until marriage, (b) the ineffectiveness of contraceptives, and (c) a "biblical" conception of marriage (Uecker, 2008). Because abstinence beliefs are typically associated with increased distrust of the efficacy of contraceptives, pledge breakers will be less likely to become proactive about managing their increased risks for STIs and pregnancy through the adoption of condoms or other forms of contraception after becoming sexually active. Thus, we hypothesize that pledge breakers are more likely than nonpledgers to acquire HPV and to experience a nonmarital pregnancy once exposure risk has been accounted for.

How do we compare sexually active pledgers and nonpledgers with similar exposure risk? To identify key factors of exposure risk, we draw on a formal model of STI infection risk (Laumann, Gagnon, Michael, & Michaels, 1994). Specifically, the probability of acquiring an HPV infection from a randomly chosen sex partner is as follows:

$$P_{hpv} = P_i(1 - (1 - P_a)^{nPnc}), \tag{1}$$

where P_{hpv} is the probability of being infected with HPV, P_a is the probability of acquiring an infection from a single act of unprotected vaginal intercourse; n is the number of sex acts with a specific partner; P_{nc} is the probability of sex without a condom; and P_i is the probability of having sex with an infected partner. Here, the quantity $(1 - P_a)^{nPnc}$ yields the probability of not being infected after nP_{nc} acts of unprotected sex with a specific partner. We assume, for simplicity, that the probability of infection is 0 with condoms. On the basis of this model, exposure risk for HPV increases with (a) the number of unprotected sex acts, conditional on having sex with a partner who has HPV, and (b) and the probability of partnering with an infected partner.

This research focuses on exposure risk chiefly linked to the number of sex partners, which influences the probability of partnering with an infected partner. Unfortunately, the count of unprotected sex acts across multiple partners is difficult to measure; thus, we cannot empirically examine this issue. Nevertheless, the quantity nP_{nc} is primarily consequential when an STI has a low probability of infection. In contrast, HPV is quite contagious, so our omission of this dimension of exposure risk matters less than for other STIs. The assumption that the probability of partnering with an infected partner is the same across pledgers and nonpledgers is also likely too strong; we take up the limitations of the random-mixing assumption in the discussion. Thus, comparing pledge breakers to nonpledgers with similar numbers of prior sex partners should enable us to examine whether the former have increased risk of HPV.

For nonmarital pregnancies, we assume the probability of nonmarital pregnancy, P_{np}, is a function of the probability of conception from a single unprotected act of vaginal intercourse, P_c; number of sex acts, n; and probability of sex without contraceptives, P_{nocon}. For simplicity, we assume that P_c is constant—when in fact it varies by age and over time—and that the probability of conception with contraception is 0. As such, the probability of nonmarital pregnancy is as follows:

$$P_{np} = 1 - (1 - P_c)^{nPnocon} \quad (2)$$

Here, the quantity $(1 - P_c)^{nPnocon}$ captures the probability of not conceiving after the number of sex acts without contraception nP_{nocon}. The equation indicates that probabilities of nonmarital pregnancy are related primarily to the number of unprotected sex acts that an individual engages in. Similar to the HPV model, we lack information about the number of sex acts over multiple years and across different partners, so we control for differences in exposure time, where the beginning of exposure risk starts at the age of first sexual intercourse. This will allow us to examine whether pledgers have increased risk for nonmarital pregnancy as a result of inconsistent use of contraception. Taken together, by comparing pledge breakers and nonpledgers with similar exposure risk in terms of prior sex partners and time since first sexual intercourse, we will be able to estimate whether pledge breakers have increased risks of HPV and nonmarital pregnancies as a result of lower likelihoods of condom and contraceptive use, respectively.

Method

Data were drawn from Add Health, a nationally representative, longitudinal study of adolescents, originally in Grades 7–12, with four waves of data collection (1994–2008). This study utilized Waves 1 and 3; the latter included measures for both HPV test results (women only) and event history data on fertility. In 1994 and 1995, 20,745 adolescents were interviewed for the in-home portion of Wave 1, which solicited information on respondents' demographic characteristics, health, and health related behaviors, as well as contextual data on their families, neighborhoods, schools, social networks, and romantic relationships (79% response rate). In 2001 and 2002, 15,197 respondents were reinterviewed for Wave 3 (76% response rate) when they were young adults. Add Health collected the timing of pregnancy events, if any, for all sexually active female respondents, but HPV tests only for a subsample of them, so we employed two analytical samples. Men were not included in this study because they were not tested for HPV and their knowledge of their partners' pregnancies were likely to be incomplete.

For the HPV analysis, our analytical sample was based on subsample of sexually active women (n = 3,741) who had urine specimens tested for HPV at Wave 3. Seven thousand female respondents at Wave 3 were randomly selected for inclusion into this sample, with 90% providing urine samples. From this subsample, HPV tests were administered to the urine samples of the sexually active women (Manhart et al., 2006). In total, therefore, HPV test results were available for 3,583 sexually active women, and sampling weights allowing for nationally representative estimates of sexually active women were available for 3,369 respondents. Listwise deletion due to missing data on other variables reduced the analytical sample by about 3% to 3,254 women. It is important to note that this analytical sample is essentially cross-sectional in nature, since the timing of HPV acquisition is unknown.

For the nonmarital pregnancy sample, event history data for pregnancies at Wave 3 allowed us to more fully exploit the longitudinal data available. We focused on a cohort of female seventh and eighth graders at Wave 1 who never had first vaginal intercourse; this minimized left truncation and left censoring in the data. Of 2,238 girls in these grades, 16.1% had experienced first sexual intercourse, 2.3% had become pregnant, and less than .01% had married before Wave 1. Seventeen percent of these girls who did not become sexually active by Wave 3 were treated as fully censored on the right. After excluding left-truncated, left-censored, and fully right-censored cases, the resulting sample size was 1,395 respondents. Listwise deletion of observations with missing data further reduced the sample size by 4% to 1,335 women. Table 1 provides unweighted descriptive statistics of dependent and independent measures.

Measures

Dependent Measures

HPV status. A dichotomous variable indicated a positive or negative test result for HPV in each respondent's urine specimen, collected at Wave 3.

Nonmarital pregnancy or marriage. This dependent variable assessed the timing and type of the first family formation event (i.e., nonmarital pregnancy or marriage). At Wave 3, respondents were asked about their marital status and, if they were married, the month and year of their weddings. For each sex partner between Waves 1 and 3, respondents were asked whether they had become pregnant. A follow-up question asked about pregnancy outcomes and dates of pregnancy resolution. To estimate the timing of pregnancy, we took the pregnancy resolution date and subtracted 9 months for live births and 5 months for other outcomes, including abortions, miscarriages, and stillbirths. The timing of the first family formation event was based on the date of first pregnancy or first marriage, whichever came first. Women who experienced neither event were treated as right censored at Wave 3.

Independent Measures

Pledge status. To determine pledge status, we employed the following Wave 1 question: "Have you ever taken a public or written pledge to remain a virgin until marriage?" The resulting measure was binary, with respondents receiving a value of 1 if they had taken a virginity pledge, and 0 otherwise.

Logged number of sex partners. On the basis of our conceptual framework, sexual experience with multiple partners was a key exposure risk for HPV acquisition. Consequently, we employed the logged number of sex partners at Wave 3. At Wave 3, respondents who reported ever having vaginal intercourse were asked the following question: "With how many partners have you ever had vaginal intercourse, even if only once?" Because of the skew of this variable, we transformed this variable by its natural log. This variable was employed in the HPV analysis but not the pregnancy model, since including time-invariant measures of time-varying processes yields misspecified event history models (Yamaguchi, 1991).

Timing of sexual debut. Age of sexual debut was based on a Wave 3 question about the reported age of first vaginal intercourse. For the nonmarital pregnancy analysis, the number of years since sexual debut was used as our exposure measure of the risk period. The beginning of the risk period was based on respondents' reported of age of first vaginal intercourse, which was reported in years at Wave 3. The exit year was based on respondents' reports of the date and outcome of their first pregnancies, the formation of their first marriage, or the Wave 3 interview date, whichever came first. In the HPV model, respondents' age of sexual debut was included as a control.

Sociodemographic and personal controls. On the basis of prior research on pledging outcomes, we included several Wave 1 controls for sociodemographic and personal characteristics, including age, race/ethnicity, parental education, family structure, religious affiliation, religiosity, educational performance, and depressive symptoms (Adamczyk & Felson, 2008; Bearman & Brückner, 2001). Race/ethnicity was a four-item measure consisting of the following categories: White, African American, Latina, and other. Parents' education was a categorical measure of the highest level of education attained by the respondents' residential or nonresidential parent(s). This five-item measure contained the following categories: less than high school, high school graduation or equivalent, some college, graduation from a four-year college, and postgraduate degree. Family structure was assessed using a four-item measure that distinguished households in the following categories: two biological parents, stepparents, single mothers, and other. Through the question "What is your religion?" we employed a five-item measure to distinguish the following religious affiliations: (a) "mainline" Protestant (Congregational, Episcopal, Lutheran, Methodist, Presbyterian, and United Church of Christ), (b) "other" Protestant (Adventist, African Methodist Episcopal, African Methodist Episcopal Zion, Christian Methodist Episcopal, Assemblies of God, Baptist, Christian Church–Disciples of Christ, Holiness, Jehovah's Witness, Latter Day Saints–Mormon, National Baptist, Pentecostal, and "other" Protestant), (c) Catholic or Orthodox Christian, (d) other (Christian Science, Friends–Quaker, Baha'i, Buddhist, Hindu, Muslim, Jewish, Unitarian, and "other"), and (e) no religion.

We measured religiosity with a summated scale of two 4-point items from Wave 1 assessing the frequency of religious attendance and youth group participation (ranging from 1 = *never* to 4 = *once a week or more*; $\alpha = .75$). To tap educational performance, we calculated mean grade point average (GPA) using respondents' self-reported grades at Wave 1 in mathematics, science, English, and history. Dropouts, who are likely to have had low educational performance, were coded as receiving D or below, and a student who was not graded with letter grades in a given course, such as a pass-fail system, were coded as having received a B. Depression was a summated scale of the following 17 items from Wave 1 assessed on four-point scales (ranging from 1 = *never or rarely* to 4 = *most of the time or all the time*; α = .87): whether in the previous week the respondent was bothered by things that normally were of no concern, experienced poor appetite, could not shake the blues, had trouble concentrating, talked less than usual, enjoyed life, had a hard time starting things, or felt depressed, felt that people were unfriendly, felt too tired to do things, felt like a failure, felt fearful, felt happy, felt lonely, felt sad, felt unliked, or felt like life was not worth living. The items for "enjoyed life" and "happy" were reversed coded.

School-level controls. Finally, we included two school-level measures in the analyses. First, because pledge taking was a measured success criterion of AOSE during the Bush administration, we employ a school-level measure of virginity pledging as a proxy for respondents' exposure to AOSE; this measure was also identified in prior research as an important predictor of pledging (Bearman & Brückner 2001). We constructed this measure as the percentage of students in each school who took virginity pledges. Second, to assess possible school-level community support for pledging, we also included a measure of the percentage of students in each school who self-identified as being an evangelical Christian. For the nonmarital pregnancy analysis, we limited both of these measures only to seventh and eighth graders.

Models

On the basis of the availability of the data, we employed two complementary modeling strategies. For the HPV analysis, we lacked timing information about when women became infected with HPV, so we employed cross-sectional methods in the form of logistic regression and assessed differences in exposure risk based on the number of sex partners. For nonmarital pregnancies, we had specific dates about age of first intercourse and month and year of first pregnancies or marriages; as such, we employed a competing-risks event history model and assessed exposure in terms of duration of sexual activity. Both models used listwise deletion, but it is worth noting that versions employing multiple imputation generated similar results (results available on request).

For the HPV analysis, we estimated a logistic regression model of HPV status at Wave 3 among sexually active women, age 18 or older. To the best of our knowledge, no population-based studies have biomarker information about the timing of HPV acquisition. To assess exposure in this model, we utilized an interaction term consisting of respondents' pledge status multiplied by number of partners reported at Wave 3; this allowed us to estimate the likelihood of infection at different levels of exposure (i.e., for different numbers of partners). We employed weights specific to the HPV subsample, so the results are generalizable to sexually active young women in the United States and based on biomarker results.

Our modeling of nonmarital pregnancy, in contrast, allowed us to more rigorously specify temporal ordering by drawing on a defined risk period between the age of first sexual intercourse and the timing of first nonmarital pregnancy. Waves 1 and 3 constituted the beginning and end dates, respectively, of the observation period, and entry into the risk set was based on the timing of first sexual intercourse. It also allowed us to test our hypothesis about increased risks for pledge breakers on an entirely different health outcome. For the nonmarital pregnancy analysis, we utilized the event history data available to sequence pledging, sexual activity, nonmarital pregnancies, as well as the competing event of marriage. There is some left censoring in the data—instances in which female youth reported sexual debut before Wave 1—which we sought to minimize by focusing on the youngest cohorts (i.e., seventh and eighth graders) who had low proportions of sexual activity.

A key advantage of our event history model is that we also accounted for entry into marriage, which is a competing risk of nonmarital pregnancy. To examine the timing of nonmarital pregnancy and marriage, we employed a discrete-time, competing-hazard model (Box-Steffensmeier & Jones 2004), which rendered maximum-likelihood estimates for the independent variables on hazards of first family-formation events. Discrete-time models are appropriate for handling duration data, such as ours, reported in discrete-time intervals and censored on the right. The competing-hazards specification allowed for examining multiple types of outcomes: no family-formation event, nonmarital pregnancy, or marriage. To handle competing events, we utilized discrete-time, multinomial-logit models, which required constructing person-year data and creating a three-category dependent variable to reflect the two destination states, in addition to a category for women who did not experience a pregnancy or marriage during the risk period. Following Yamaguchi (1991), we controlled for sample selectivity due to censoring by introducing controls for age at entry into the risk period and age cohort. We did not include measures for number of partners or recent condom use, as time-invariant measures of time-varying processes yield misspecified event history models (Yamaguchi, 1991). We examined several specifications of duration dependence, including linear, quadratic, natural log, and temporal dummies.

Results

Table 1 examines group differences across the variables used in this research. Pledgers accounted for 23% of respondents (307 of 1,335 respondents) in the nonmarital analysis, which was limited to seventh and eighth graders at Wave 1 who had not experienced first sexual intercourse at that time, whereas only 15% (494 of 3,254 respondents) of seventh through 12th graders had pledged at Wave 1 in the HPV analysis. The longitudinal data also allowed us to examine the percentage of adolescents who never had sex. Specifically, we observed no "pledge effect" among seventh and eighth graders who were not sexually active at Wave 1: approximately the same percentage of pledgers and nonpledgers—81% and 83% ($p > .05$), respectively—experienced first sexual intercourse by Wave 3 (results available on request). In terms of dependent variables, the portion infected by HPV was approximately the same, at 26%–27% for pledgers and nonpledgers ($p>.05$), whereas a greater percentage of pledgers than nonpledgers, experienced a nonmarital pregnancy between Waves 1 and 3 (31% vs. 24%, $p < .05$).

There were several significant differences in the HPV subsample, including lower age, higher grades, and less depressive symptoms for pledgers. In addition, pledgers were more likely to be Latinas, raised by two biological parents, and to have parents with lower educational attainment. Pledgers also exhibited higher levels of religiosity ($p < .001$), and a larger proportion of them were affiliated with non-mainline Protestant denominations ($p < .001$). They had fewer sex partners (mean of 4 vs. 6, $p < .001$), experienced sexual debut later (mean of 17.3 vs. 16.3, $p < .001$), and attended schools with higher proportions of pledgers ($p < .001$) and evangelicals ($p < .001$) in the student body.

Our analytical sample for nonmarital pregnancy, which took advantage of the longitudinal data in Add Health, showed fewer differences. Compared to nonpledgers, pledgers were still more likely to be non-White and come from families with less schooling, but the two groups do not vary much across other demographic measures. We still observed that pledgers were more likely to be embedded in religious social contexts (i.e., religiosity, "other" Protestant affiliations, and going to schools with other pledgers and evangelicals). Notably, there was no difference in age of sexual debut between pledgers and nonpledgers. Thus, consistent with the extant literature, this descriptive analysis suggested that pledgers tend to be embedded in more religious social contexts and, at least in the cross-sectional data, appear to engage in delayed sexual activity and have fewer sex partners. However, the longitudinal data suggested, at least descriptively, that virginity pledges are not effective for delaying sexual debut.

HPV Analysis

Figure 1 shows that the overall prevalence of HPV among sexually active pledgers (i.e., pledge breakers) and nonpledgers was the same, both at approximately 27%. In contrast, the percentage of pledgers who were HPV positive was larger than nonpledgers among those with at least two sex partners. According to Pearson chi-square tests, however, the only statistically significant difference was for women with six to 10 partners (51 vs. 33 percent for pledgers and nonpledgers, respectively; $p < .05$). At even higher levels of sexual experience—11 or more prior sex partners—the prevalence of HPV was lower for nonpledgers than for those with six to 10 prior sex partners, but the relatively small number of women with more than 10 prior sex partners makes this estimate less reliable, and the difference is not statistically significant. Descriptive analysis of Figure 1 suggests that the association between pledging and STI status likely depends on the number of prior sex partners. We included number of prior sex partners and tested whether the association between pledging and HPV status depended on number of prior partners.

We next examined whether the pledging disadvantage, shown in Figure 1, remained after introducing controls. Table 2 presents a logistic regression of HPV status on pledge status and controls (Model 1) and then adds in subsequent models number of prior sex partners (Model 2) and an interaction term (Model 3) as predictors. We examined alternative functional forms for the number of partners, including linear, quadratic, natural log, categorical, and binary specifications, and found the log transformation to be the best fitting according to the Bayesian and Akaike information criteria (results available on request). As such, in the models presented here, we employed the natural log of number of sex partners. Based on Wald tests, Model 3 provided the best fit to the data.

Across all three models the main effect for pledge status was nonsignificant. The variable logged numbers of prior sex partners, our measure of exposure risk, was significant in both Models 2 and 3 ($p < .001$). Importantly, the interaction between these two variables, presented in Model 3 was positive and significant ($p < .05$), which indicates increasing odds of HPV for pledge breakers as number of sex partners increases. Figure 2 presents predicted probabilities of HPV infection by pledging status and number of prior sex partners to show this interactive relationship. This figure assumes mean values for the continuous variables (e.g., depression, parents' education, grade point average, religiosity) and modal values for categorical variables (e.g., White, two biological parents, other Protestant). For both pledge breakers and nonpledgers, the probability of HPV infection increased with more sexual partnering experiences. For example, the probability of infection for a nonpledger with six prior sex partners was approximately .32. Among pledge breakers, however, the risk of infection increased more quickly. A pledge breaker with six prior sex partners had a risk of infection of about .40, which was the same level of risk for a nonpledger with 15 partners.

Figure 2 also presents differences in probabilities between pledgers and nonpledgers, along with 95% confidence intervals. The figure shows that this difference becomes significant at six or more sex partners. Thus, the risk of HPV infection increased at a significantly faster rate for pledgers as exposure risk increased. This result supports our hypothesis that pledge breakers have increased risk of HPV than nonpledgers with similar exposure risk. Our results also show that this disparity was fairly large and significant at higher levels of prior sex partners. It is worth noting, however, that a negative binomial regression of the number of sex partners on pledge status and control variables showed that abstinence pledgers accumulated partners at a slower rate (results available on request). Thus, pledge breakers accumulated partners at a slower rate than nonpledgers but experienced a greater risk of contracting HPV for each additional partner.

Table 2 also shows that several sociodemographic and personal controls were associated with the likelihood of HPV acquisition. Model 3 shows that age was associated with a lower likelihood of HPV. We suspect that this variable was an important control for selectivity into the sample, since older Wave 1 pledgers were more likely to be selected on sexual activity (i.e., a greater proportion of older adolescents engaged in sexual activity) than younger cohorts who were mostly sexually inactive at Wave 1. Those raised in other family structures, including being raised by relatives, have lower odds ($e^{-.57} = .56$, $p < .01$) of HPV infection. There were also racial disparities: the odds of being infected with HPV for African Americans, compared to White respondents, was 1.37 times ($e^{.32}$, $p < .05$) higher. It is worth noting that the odds ratio for Latinas was similar to that of African American women but not statistically significant. Finally, the variable depressive symptoms was associated with an increased likelihood of HPV acquisition ($e^{.24} = 1.27$, $p < .05$).

Nonmarital Pregnancy Analysis

Figure 3 presents Kaplan-Meier estimates for the transition to nonmarital pregnancy. Entry into the risk period was defined as age of first sex, and observations with no pregnancy were right censored at Wave 3. These results show that approximately 30% of pledgers, but only 18% of nonpledgers, experienced a nonmarital pregnancy within six years after first sexual intercourse. The log rank test for equality of the survivor function indicated that pledge breakers had higher risks for transitioning to nonmarital pregnancy compared to nonpledgers ($\chi^2 = 14.61$; $p < .000$). Thus, the pledging disadvantage was not only statistically significant but also substantial in size compared to nonpledgers with similar levels of sexual experience (i.e., years since sexual debut), and large disparities were present at higher levels of exposure risk.

Next, we examined whether pledging also increased the risk of nonmarital pregnancy in multivariable analyses. Table 3 presents estimates from the discrete-time, competing-risks model of nonmarital pregnancy and marriage. In terms of duration dependence, the logged specification of time yielded the best goodness of fit in comparison to linear, quadratic, and temporal-dummy specifications (results available on request). We also tested a model with an interaction between pledging and logged exposure time, which was nonsignificant, and the model presented in Table 3 was more parsimonious (results available on request).

Consistent with the Kaplan-Meier estimates, Table 3 indicates that pledging was associated with an increase in the risk of nonmarital pregnancy by slightly more than 50% (HR = 1.51, $p < .05$), controlling for logged years since sexual debut (exposure risk) and other covariates. This finding is consistent with our hypothesis that once differences in exposure risk are accounted for, pledge breakers actually have increased risks of negative health outcomes. Logged years since debut was, not surprisingly, strongly associated with risk of nonmarital pregnancy, whereas age of sexual debut was not significant. This suggests that the hazard of nonmarital pregnancy was affected not by age of sexual debut but by number of years of sexual activity. In terms of sociodemographic controls, Latinas had a greater risk of nonmarital pregnancy (HR = 2.2, $p < .01$) than Whites. Grade point average, alternatively, was associated with a lower probability of nonmarital pregnancy: a one-point increase in GPA was associated with a 38% (HR = .62, $p < .001$) decrease in the hazards of nonmarital pregnancy. Further, in a separate analysis, we also examined whether there were differences between pledgers and nonpledgers regarding pregnancy intentions and found no statistically significant difference between the groups. In fact, consistent with prior research, the proportion of pregnancies that were planned among both groups was only around 20%–25% (results available on request). Taken together, both sets of results are consistent with the notion that pledge breakers were less likely to be consistent users of condoms; as their exposure risk increased, they had increased risk of negative health outcomes.

A different pattern was apparent for marriage formation. Both age of sexual debut and years since sexual debut were associated with entry into marriage. A delay of one year in the onset of first sexual intercourse was associated with a 43% (HR = 1.43, $p < .001$) increase in likelihood of marriage, whereas years since sexual debut was also associated with a significant increase in the probability of marriage formation. In addition, the percentage of evangelical Christian youth in a given school substantially increased the probability of marriage in this sample of young women. Specifically, a one-percentage-point increase in evangelical youth in respondents' schools was associated with a 3% (HR = 1.031, $p < .01$) increase in the probability of marrying. By contrast, two factors were associated with reduced hazards of marriage. Specifically, each one-point increase in respondents' GPA was associated with a 38% (HR = .62, $p < .05$) reduction in the likelihood of marriage, and African American women had a strikingly 90% lower hazard rate (HR = .1, $p < .001$) than White women.

Discussion

After accounting for differences in exposure risk between sexually active pledgers and nonpledgers, this research reveals that pledgers have increased risks for HPV and nonmarital pregnancies. Specifically, pledge breakers were more likely to become infected with HPV once they reached approximately six or more sex partners. Similarly, controlling for the amount of time female respondents were sexually active, we showed that pledgers had increased hazards of nonmarital pregnancy than nonpledgers. Both findings are consistent with the argument that pledge breakers are less likely to use condoms or contraceptives consistently. By projection, we maintain that as exposure risk increases, this pattern of behavior can translate into health disparities. Moreover, our findings complement one another. The HPV models show significant results using urine test results as opposed to self-reports but are somewhat limited because they are cross-sectional. Nevertheless, the event history analysis strengthens our confidence in the results from the cross-sectional analysis. We maintain that the results indicate that abstinence beliefs associated with pledging have the unintended consequence of increasing risks of HPV and nonmarital pregnancies among pledge breakers, thereby contributing to the reduced sexual and reproductive health of teens and young adults.

In terms of theory, our results are consistent with Swidler's (1986) cultural-lag hypothesis. As individuals become sexually active, they draw on preexisting cultural scripts and repertoires, or figure out for themselves how to respond to novel situations. In the context of sexual activity, adolescent girls and young women face decisions about the use of condoms or contraceptives. Abstinence pledgers are more likely to receive cultural messages downplaying the effectiveness of condoms and contraceptives, as well as to be exposed to the framing of premarital sexual activity as a form of failure. As a consequence, girls and young women who pledge may be less “prepared” to manage the risks associated with sexual activity by obtaining condoms and contraceptives themselves, or less apt to initiate conversations about precautions with their partners. Our evidence is consistent with the idea that skills, habits, repertoires, and strategies for action can and do continue to pattern behavior even when the ideas and beliefs that originally motivated them are absent or no longer salient to an individual. Young adults are slow to adapt their scripts and habits regarding contraceptive use and often fall back on previously acquired information, such as the mistrust of contraceptives conveyed by abstinence-only programs. This cultural context sets the stage for increased risk of nonmarital pregnancies and STIs. Future research might examine this argument vis-à-vis other cultural arguments about sexual and fertility behaviors, such as hypotheses on cultural heterogeneity (Harding, 2007).

This research has several implications. First, our research shows that findings of no differences in STIs and even a slight pledging advantage for nonmarital pregnancy may be a product of modeling issues. On the one hand, our analysis of seventh and eighth graders reveals, in fact, a pledging disadvantage in nonmarital pregnancies and no difference in sexual debut. This suggests that pledge studies relying on the entire Add Health sample and using pledge variables from later waves might have measurement error where a number of sexually active pledgers have recanted (e.g., Adamczyk & Felson, 2008; Brückner & Bearman 2005). On the other hand, even if pledgers are a low-risk group, exhibiting later sexual debut and a slower rate of sex partner accumulation, our results indicate that pledging enhances their risks as their exposure risk increases. Studies failing to account for differences in exposure, then, may be comparing two groups with different levels of exposure.

Second, in terms of public policy, our research highlights the unintended consequences of abstinence-only promotion. If adolescents either are provided inaccurate information about condom use or contraception or are socialized to be hostile to these practices, they could be in a bind when they break pledges, as almost all of them do. Even though this research focuses on the effects of abstinence pledging, a direct implication is that abstinence-only beliefs, more generally, can have perverse unintended consequences. Among girls and young women who have learned to believe that sex is appropriate only in marriage, when exposure risk (i.e., number of partners) increases, their risk for STIs and nonmarital pregnancies should also increase. This highlights the importance of comprehensive sexual education, or at least some form of abstinence-plus education that ensures that young adults are adequately prepared to effectively manage their sexual and reproductive health once they become sexually active. Importantly, randomized or quasi-randomized control trials showed that comprehensive sex education, which includes instruction on safe-sex practices as a compliment to abstinence programming, generated protective effects on sexual behavior, STIs, and pregnancies (Kirby, Laris, & Rolleri, 2007; Underhill, Operario, & Montgomery, 2007).

That said, the research clearly shows that reducing exposure risks in terms of having fewer sex partners or delaying first sexual intercourse is a pathway for reducing STI acquisition and nonmarital pregnancies. The key is to develop effective interventions that reduce both amount of exposure risk and likelihood of negative outcomes when sexually active. From this perspective, the current trend of developing evidence-based interventions is sound policy (Schalet et al., 2014). An unanswered question is whether abstinence pledging has similar effects on boys and young men. This is an issue that should be addressed by future research.

Like any research, our study is not without limitations. First, there is measurement error in our key variables. For example, it is possible that pregnancies are more underreported by those who hold more conservative values. However, if pledgers are more likely to underreport pregnancy rates, then this bias would likely make this research an even more conservative test of pledge effects. We also relied on a single question for our pledge variable obtained during the first wave of data collection. We used this measure to strengthen temporal ordering and to minimize recall bias, as it has been shown that pledgers tend to forget that they had pledged previously once they become sexually active (Rosenbaum, 2006). Second, there are several sampling limitations. We cannot assess whether our findings are generalizable beyond the period covered by the Add Health data, and we note that the survey was conducted during the period of initial frenzy surrounding AOSE and the virginity pledge movement of the early 1990s. It is not clear, therefore, whether the respondents who engaged in pledging behavior in our data would be different from the types of individuals who may engage in similar behaviors today. More important, HPV tests were limited to a subsample of sexually active women at Wave 3; as such, selectivity based on sexual activity may bias our estimates of pledge effects. We believe, however, that sexually active pledge breakers may be more similar to nonpledgers than pledgers who remain abstinent. As such, our test is likely to be conservative.

Finally, we recognize some data and modeling limitations. Ideally, our modeling would include measures for whether adolescents were exposed to AOSE, either school- or religion-based programs. This type of measure would allow us to more accurately specify abstinence beliefs in the sample and allow for making stronger inferences about pledge effects in relation to both comprehensive and abstinence-only sex education. Similarly, although we sought to control for exposure risk, the data do not contain measures of condom or contraceptive use consistency and frequency of sex for the time frames examined. Consequently, our measurements of exposure risk, which are based on number of partners and exposure time, are approximations. We also assumed that pledgers and nonpledgers were equally likely to have sex with HPV-positive individuals. It is possible that this probability depends on pledge status and could be examined in future research. One possibility is that pledgers tend to choose partners with less sexual experience. If this is the case, then the random-mixing assumption is a conservative one. Also, we acknowledge that our models cannot demonstrate a causal relationship between pledging and health and reproductive outcomes. We note, however, that selection into pledging is important on its own right and suggest that pledge effects could be better understood as a proxy for underlying abstinence beliefs. This suggests that examining pledge effects may help facilitate understanding more generally about the unintended consequences of abstinence beliefs.

In summary, this study has sought to examine the relationship between the broken promises of abstinence pledging and negative sexual and reproductive health outcomes. We have demonstrated that pledging can be associated with negative health effects for young adults once they engage in sexual activity. Furthermore, this research indicates that it is incumbent upon researchers in this area to account for differences in exposure risk when assessing the efficacy of the types of programs discussed in this study.

AUTHORS' NOTE

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References

Adamczyk, A., & Felson, J. (2008). Fetal positions: Unraveling the influence of religion on premarital pregnancy resolution. *Social Science Quarterly*, *89*, 17–38. doi: 10.1111/j.1540-6237.2008.00519.x

Bearman, P. S., & Brückner, H. (2001). Promising the future: Virginity pledges and first intercourse. *American Journal of Sociology*, *106*, 859–912. doi: 10.1086/320295

Boonstra, H. D. (2014). What is behind the declines in teen pregnancy rates? *Guttmacher Policy Review*, *17*, 15–21.

Box-Steffensmeier, J. M., & Jones, B. (2004). *Event history modeling: A guide for social scientists*. New York, NY: Cambridge University Press.

Brewster, K. L., Valle, G., & Harker Tillman, K. (2013). *The relative timing of sexual behaviors among youth in the United States*. Paper presented at the meeting of the Population Association of America (New Orleans, LA).

Brückner, H., & Bearman, P.S. (2005). After the promise: The STD consequences of adolescent virginity pledges. *Journal of Adolescent Health*, *36*, 271–278. doi: 10.1016/j.jadohealth.2005.01.005

Centers for Disease Control. (2014a). *Genital HPV infection: Fact sheet*. Retrieved from http://www.cdc.gov/std/HPV/STDFact-HPV.htm

Centers for Disease Control. (2014b). *Trends in the prevalence of sexual behavior and HIV testing national YRBS: 1999–2013*. Retrieved from http://www.cdc.gov/healthyyouth/yrbs/pdf/trends/us_sexual_trend_yrbs.pdf

Ford, C. A., Wells Pence, B., Miller, W. C., Resnick, M. D., Bearinger, L. H., Pettingell, S., & Cohen, M. (2005). Predicting adolescents' longitudinal risk for sexually transmitted infection: Results from the National Longitudinal Study of Adolescent Health. *JAMA Pediatrics*, *159*, 657–664. doi: 10.1001/archpedi.159.7.657

Harding, D. J. (2007). Cultural context, sexual behavior, and romantic relationships in disadvantaged neighborhoods. *American Sociological Review*, *72*, 341–364. doi: 10.1177/000312240707200302

Joseph, R. (2012). Sex, abortion and Obama. *Journal of Family Planning and Reproductive Health Care*, *38*, 187–190. doi: 10.1136/jfprhc-2011-012513

Kirby, D. B., Laris, B. A., & Rolleri, L. A. (2007). Sex and HIV education programs: Their impact of sexual behaviors of young people throughout the world. *Journal of Adolescent Health*, *40*, 206–217. doi: 10.1016/j.jadohealth.2006.11.143

Kirk, D., & Papachristos, A. V. (2011). Cultural mechanisms and the persistence of neighborhood violence. *American Journal of Sociology*, *116*, 1190–1233. doi: 10.1086/655754

Laumann, E. O., Gagnon, J. H., Michael, R. T., & Michaels, S. (1994). *The social organization of sexuality*. Chicago, IL: University of Chicago Press.

Manhart, L. E., Holmes, K. K., Koutsky, L. A., Wood, T. R., Kenney, D. L., Feng, Q., & Kiviat, N. B. (2006). Human papillomavirus infection among sexually active young women in the United States: Implications for developing a vaccination strategy. *Sexually Transmitted Diseases*, *33*, 502–508. doi: 10.1097/01.olq.0000204545.89516.0a

Martino, S., Elliott, M., Collins, R., Kanouse, D., & Berry, S. (2008). Virginity pledges among the willing: Delays in first intercourse and consistency of condom use. *Journal of Adolescent Health*, *43*, 341–348. doi: 10.1016/j.jadohealth.2008.02.018

Meier, A. M. (2007). Adolescent first sex and subsequent mental health. *American Journal of Sociology*, *112*, 1811–1847. doi: 10.1086/512708

Pachucki, M. A., & Breiger, R. L. (2010). Cultural holes: Beyond rationality in social networks and culture. *Annual Review of Sociology*, *36*, 205–224. doi: 10.1146/annurev.soc.012809.102615

Rosenbaum, J. E. (2006). Reborn a virgin: Adolescents' retracting of virginity pledges and sexual histories. *American Journal of Public Health*, *96*, 1098–1103. doi: 10.2105/AJPH.2005.063305

Rosenbaum, J. E. (2009). Patient teenagers? A comparison of the sexual behavior of virginity pledgers and matched nonpledgers. *Pediatrics*, *123*, e110–e120. doi: 10.1542/peds.2008-0407

Satterwhite, C. L., Torrone, E., Meites, E., Dunne, E. F., Mahajan, R., Ocfemia, M. C. B., . . . Weinstock, H. (2013). Sexually transmitted infections among US women and men: Prevalence and incidence estimates, 2008. *Sexually Transmitted Diseases*, *40*, 187–193. doi: 10.1097/OLQ.0b013e318286bb53

Schalet, A. T., Santelli, J. S., Russell, S. T., Halpern, C. T., Miller, S. A., Pickering, S. S., . . . Hoenig, J. M. (2014). Broadening the evidence for adolescent sexual and reproductive health and education in the United States. *Journal of Youth and Adolescence*, *43*, 1595–1610. doi: 10.1007/s10964-014-0178-8

SIECUS. *A brief history of federal funding for sex education and related programs.* Retrieved from http://www.siecus.org/document/docWindow.cfm?fuseaction=document.viewDocument&documentid=69&documentFormatId=69.

Swidler, A. (1986). Culture in action: Symbols and strategies. *American Sociological Review*, *51*, 273–286.

Tavory, I., & Swidler, A. (2009). Condom semiotics: Meaning and condom use in rural Malawi. *American Sociological Review*, *74*, 171–189. doi: 10.1177/000312240907400201

Uecker, J. E. (2008). Religion, pledging, and the premarital sexual behavior of married young adults. *Journal of Marriage and Family*, *70*, 728–744. doi: 10.1111/j.1741-3737.2008.00517.x

Underhill, K., Montgomery, P., & Operario, D. (2007). Sexual abstinence only programmes to prevent HIV infection in high income countries: Systematic review. *British Medical Journal*, *335*, 248–260. doi: 10.1136/bjm.39245.446586.BE

Underhill, K., Operario, D., & Montgomery, P. (2007). Systematic review of abstinence-plus HIV prevention programs in high-income countries. *PLOS Medicine*, *4*, e275. doi: 10.1371/journal.pmed.0040275

Vaisey, S. (2009). Motivation and justification: A dual process model of culture in action. *American Journal of Sociology*, *114*, 1675–1715. doi: 10.1086/597179

Williams, J. C. (2011). Battling a “sex-saturated society”: The abstinence movement and the politics of sex education. *Sexualities*, *14*, 416–443. doi: 10.1177/1363460711406460

Yamaguchi, K. (1991). *Event history analysis.* Newbury Park, CA: Sage.

Zolna, M., & Lindberg, L. D. (2012). *Unintended pregnancy: Incidence and outcomes among young adult unmarried women in the United States*, *2001 and 2008*. Washington, DC: Guttmacher Institute. Retrieved from http://alanguttmacherinstitute.com/pubs/unintended-pregnancy-US-2001-2008.pdf

Table 1. *Unweighted Descriptive Statistics of Variables*

	HPV Analysis (*n* = 3,254)						Nonmarital Pregnancy Analysis (*n* = 1,335)					
	No Pledge		Pledge				No Pledge		Pledge			
Variables	*M*	*SD*	*M*	*SD*	*Sig.*	*Range*	*M*	*SD*	*M*	*SD*	*Sig.*	*Range*
HPV infection	0.27	0.44	0.26	0.44		0–1						
Pregnancy/marriage (none)							0.71	.46	0.59	0.49	***	0–1
Nonmarital pregnancy							0.24	.43	0.31	0.46	*	0–1
Marriage							0.06	.23	0.09	0.29	*	0–1
Number of partners (ln)	5.99	6.46	3.99	4.94	***	1–50						
Age	16.22	1.66	15.76	1.66	***	13–21	13.84	.69	13.92	0.81		12–18
Parents' education (less than HS)	0.14	0.35	0.18	0.39	*	0–1	0.11	.32	0.16	0.37	*	0–1
High school grad or GED	0.30	0.46	0.31	0.46		0–1	0.32	.47	0.30	0.30		0–1
Some college	0.21	0.41	0.20	0.40		0–1	0.20	.40	0.23	0.42		0–1
College graduate	0.22	0.42	0.21	0.41		0–1	0.25	.43	0.21	0.41		0–1
Postgraduate degree	0.12	0.32	0.10	0.30		0–1	0.11	.32	0.09	0.29		0–1
Family structure (two bio)	0.50	0.50	0.57	0.49	**	0–1	0.55	.50	0.54	0.50		0–1
Stepparent	0.09	0.29	0.07	0.25	*	0–1	0.10	.30	0.08	0.27		0–1
Single mother	0.27	0.44	0.26	0.44		0–1	0.27	.44	0.27	0.45		0–1
Other	0.14	0.35	0.10	0.30	**	0–1	0.08	.27	0.10	0.31		0–1
GPA	2.80	0.79	2.89	0.77	*	1–4	3.02	.73	3.00	0.65		1–4

Race/ethnicity (White)	0.55	0.50	0.47	0.50	***	0–1	0.65	.48	0.52	0.50	***	0–1
Black	0.24	0.43	0.26	0.44		0–1	0.20	.20	0.29	0.45	**	0–1
Latina	0.14	0.35	0.20	0.40	**	0–1	0.09	.09	0.16	0.36	**	0–1
Other	0.07	0.25	0.08	0.27		0–1	0.06	.06	0.04	0.19		0–1
Religiosity	2.73	1.05	3.21	0.91	***	1–4	2.54	1.09	3.06	1.05	***	1–4
Religious affiliation (mainline)	0.13	0.33	0.10	0.30		0–1	0.16	.37	0.13	0.34		0–1
Other Protestant	0.43	0.49	0.60	0.49	***	0–1	0.43	.49	0.58	0.49	***	0–1
Catholic/Orthodox	0.26	0.44	0.22	0.42	*	0–1	0.24	.43	0.18	0.38	**	0–1
Other religion	0.05	0.22	0.03	0.17	*	0–1	0.05	.21	0.04	0.19		0–1
None	0.14	0.34	0.05	0.23	***	0–1	0.12	.33	0.07	0.25	**	0–1
Depression	1.60	0.44	1.55	0.42	*	1–4	1.46	.38	1.48	0.38		1–3
Age of sexual debut	16.32	2.17	17.26	2.16	***	10–25	16.45	1.55	16.59	1.53		12–21
Percentage of school that pledged	12.15	6.52	17.27	9.71	***	2–57	15.17	7.98	21.63	12.05	***	0–67
Percentage evangelical in school	43.50	21.22	50.79	22.78	***	6–97	45.61	23.12	53.98	22.85	***	0–96
N	2,760		494				1,028		307			

Note. Wald χ^2 tests and *t*-tests were used for categorical and continuous variables, respectively.

**p* < .05. ***p* < .01. ****p* < .001 (two-tailed test).

Table 2. *Logistic Regression of HPV on Pledging Status, Number of Sex Partners, and Controls (*n = *3,254)*

	Model 1		Model 2		Model 3	
	B	*SE B*	*B*	*SE B*	*B*	*SE B*
Pledge	0.00	0.15	0.11	0.15	–0.36	0.25
Number of partners (ln)			0.50***	0.07	0.43***	0.07
Pledge × num. of partners (ln)					0.41*	0.16
Age	–0.09**	0.03	–0.14***	0.03	–0.13***	0.03
Parents' education (less than HS)						
High school grad or GED	0.12	0.17	0.05	0.17	0.04	0.17
Some college	0.17	0.18	0.09	0.18	0.09	0.17
College graduate	0.01	0.20	–0.15	0.20	–0.16	0.20
Postgraduate degree	0.43*	0.20	0.27	0.20	0.27	0.20
Family structure (two bio)						
Stepparent	0.02	0.18	–0.01	0.18	–0.01	0.18
Single mother	–0.05	0.14	–0.12	0.14	–0.13	0.14
Other	–0.51**	0.17	–0.58***	0.18	–0.57**	0.18
GPA	–0.05	0.07	–0.04	0.07	–0.04	0.07
Race/ethnicity (White)						
Black	0.28	0.16	0.32*	0.16	0.32*	0.16
Latina	0.30	0.21	0.41	0.21	0.43	0.22
Other	–0.39	0.30	–0.40	0.31	–0.40	0.31
Religiosity	0.04	0.06	0.03	0.07	0.04	0.07
Religious affiliation (mainline)						

Other Protestant	0.10	0.18	0.10	0.18	0.10	0.18
Catholic/Orthodox	–0.05	0.20	–0.06	0.20	–0.07	0.20
Other religion	–0.11	0.28	–0.13	0.29	–0.13	0.29
None	–0.06	0.22	0.01	0.23	0.01	0.23
Depression	0.28*	0.11	0.25*	0.11	0.24*	0.11
Age of sexual debut	–0.05	0.03	0.06*	0.03	0.06	0.03
Percentage of school that pledged	–0.01	0.01	–0.01	0.01	–0.01	0.01
Percentage evangelical in school	0.00	0.00	0.00	0.00	0.00	0.00
Constant	0.60	0.75	–0.89	0.77	–0.86	0.77
Wald χ^2 test			50.6***		6.48*	

*p < .05. **p < .01. ***p < .001 (two-tailed test).

Table 3. *Discrete-Time Multinomial Logistic Regression of Nonmarital Pregnancy and Marriage (*n = *1,335; Obs. = 5,319)*

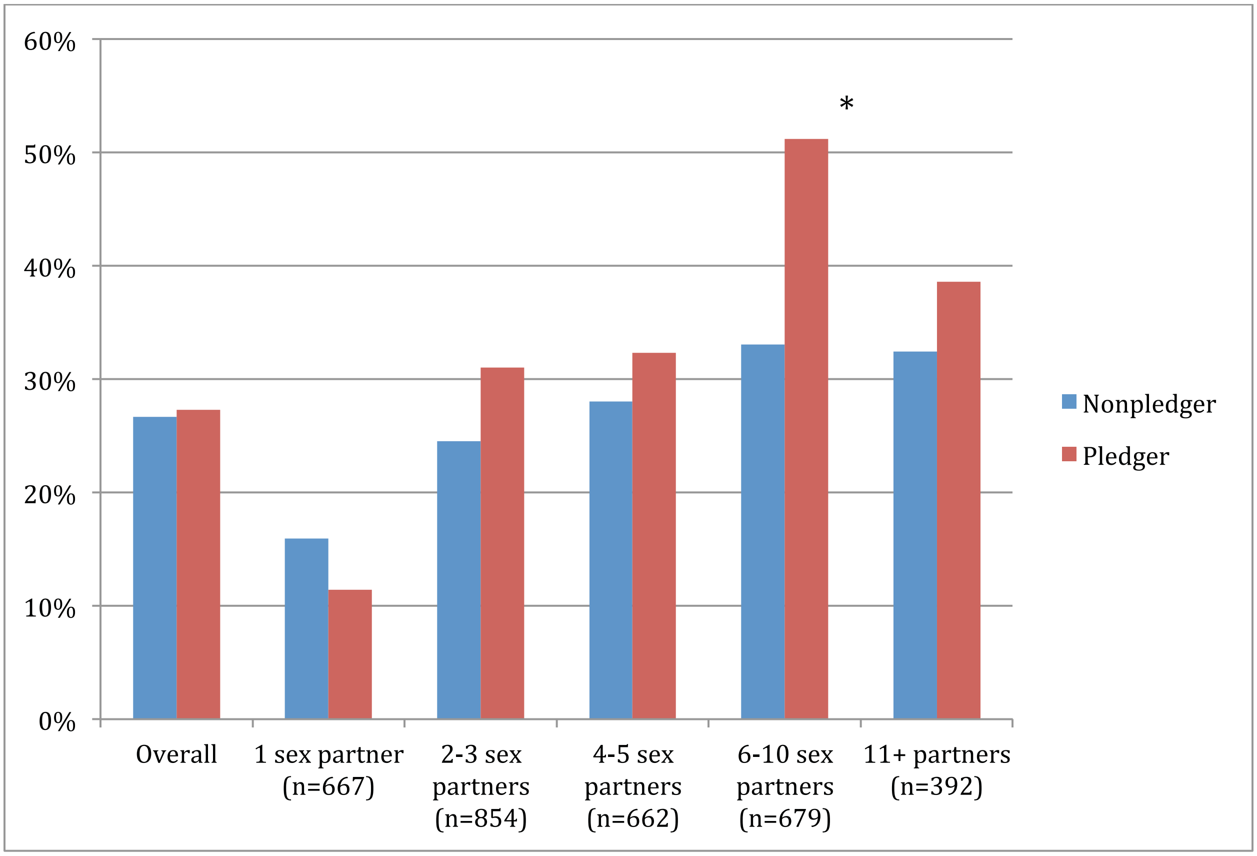
	Nonmarital Pregnancy		Marriage	
Predictor	*HR*	*SE*	*HR*	*SE*
Time (ln)	2.07***	0.25	4.96***	1.83
Pledge	1.51*	0.24	1.29	0.36
Age	0.96	0.11	1.21	0.27
Parents' education (less than HS)				
High school grad or GED	1.00	0.21	0.72	0.32
Some college	1.03	0.25	0.59	0.33
College graduate	0.84	0.20	0.59	0.30
Postgraduate degree	0.54	0.22	0.32	0.26
Family structure (two bio)				
Stepparent	1.13	0.28	0.87	0.34
Single mother	1.27	0.20	1.51	0.34
Other	1.04	0.29	0.53	0.26
GPA	0.62***	0.07	0.62*	0.13
Race/ethnicity (White)				
Black	1.42	0.35	0.10***	0.06
Latina	2.20**	0.56	1.60	0.87
Other	1.48	0.64	0.14	0.19
Religiosity	0.98	0.08	1.26	0.18
Religious affiliation (mainline)				
Other Protestant	0.91	0.27	1.56	0.67
Catholic/Orthodox	0.93	0.26	0.55	0.34

Other religion	1.10	0.47	1.29	1.22
None	0.75	0.25	2.58	1.61
Depression	0.98	0.19	0.85	0.32
Age of sexual debut	0.99	0.05	1.42***	0.12
Percentage of school that pledged	0.98	0.01	0.99	0.02
Percentage evangelical in school	1.01	0.00	1.03**	0.01
F(46, 34)	5.51***			

Note. HR = hazard ratios.

*p < .05. **p < .01. ***p < .001 (two-tailed test).

FIGURE 1. HPV PREVALENCE BY PLEDGING STATUS AND NUMBER OF PRIOR SEX PARTNERS (N = 3,254).



*p < .05. **p < .01. ***p < .001 (two-tailed test).

FIGURE 2. PREDICTED PROBABILITIES OF HPV INFECTION BY NUMBER OF SEX PARTNERS AND ABSTINENCE PLEDGING.

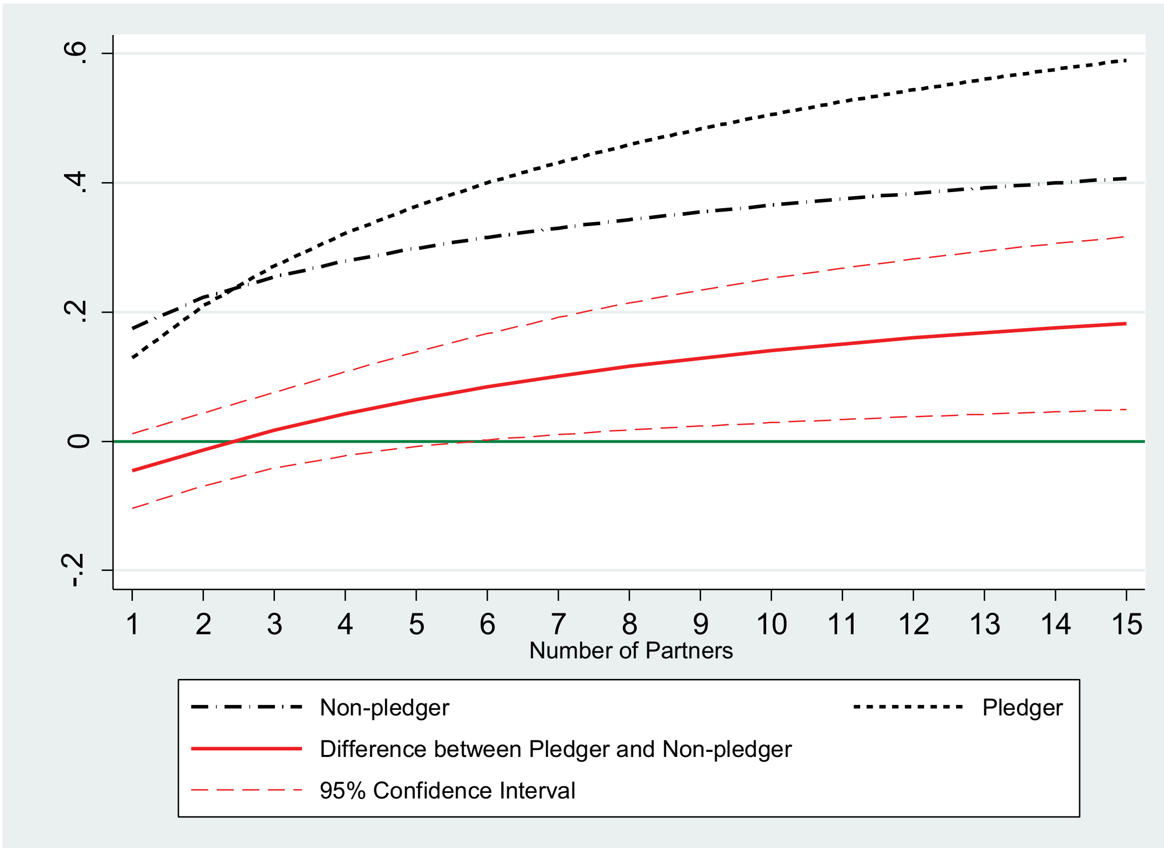


FIGURE 3. KAPLAN-MEIER ESTIMATES FOR NONMARITAL PREGNANCY.