Does the Number of Sex Partners Affect School Attainment?*

Joseph J. Sabia
American University
Department of Public Administration and Policy
School of Public Affairs
Washington, D.C. 20016
Phone: (202) 885-3653
Fax: (202) 885-2347
Email: sabia@american.edu

Daniel I. Rees
University of Colorado Denver
Department of Economics, CB 181
P.O. Box 173364
Denver, CO 80217-3364
Phone: (303) 556-3348
Fax: (303) 556-3547
E-mail: Daniel.Rees@ucdenver.edu

September 2009

* This research uses data from the National Longitudinal Study of Adolescent Health, designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris, and funded by a grant P01-HD31921 from the National Institute of Child Health and Human Development, with cooperative funding from 17 other agencies. Special acknowledgment is due Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Persons interested in obtaining data files from the National Longitudinal Study of Adolescent Health should contact Add Health, Carolina Population Center, 123 W. Franklin Street, Chapel Hill, NC 27516-2524 **(**http://www.cpc.unc.edu/addhealth/contract.html**).**

Does the Number of Sex Partners Affect School Attainment?

Abstract

We use data on young women from the National Longitudinal Study of Adolescent Health to explore the relationship between number of sex partners and educational attainment. Using the average physical development of male schoolmates to generate plausibly exogenous variation in number of sex partners, instrumental variables estimates suggest that number of sex partners is negatively related to educational attainment, a result that is consistent with the argument that romantic involvements are time consuming and can impose substantial emotional costs on adolescent and young adult females. The estimated relationship between number of sex partners and educational attainment is robust to controlling for teen fertility and age at first intercourse, and persists when age at first intercourse is treated as an endogenous variable. We conclude that reducing the number of sex partners during adolescence and young adulthood may yield modest educational benefits.

Keywords: adolescent sex, schooling, abstinence

JEL codes: I21; I18; I10

I. Introduction

In a recent study, Sabia and Rees (forthcoming) found that delaying age at first intercourse sharply increases the probability that females graduate high school, and that this effect persisted even after controlling for teen fertility. One interpretation of this result is that early sexual activity impedes human capital accumulation through fostering social and psychological turmoil (Rector and Johnson 2005). In fact, there is evidence that an early sexual debut leads to more frequent sexual encounters (Kahn et al. 2003) and more romantic partners (Sandfort et al. 2008), both of which could, in theory, take time away from academic pursuits and adversely impact psychological wellbeing.

Using a sample of females 22 through 24 years of age drawn from the National Longitudinal Study of Adolescent Health, we explore whether number of lifetime sex partners is related to educational attainment. Ordinary least squares estimates indicate a strong negative relationship between number of sex partners and educational attainment. This relationship, however, could easily be due to difficult-to-measure individual or family background characteristics. In order to account for such characteristics, we pursue an instrumental variables strategy. Specifically, exogenous variation in the number of sex partners is identified using the pubertal physical development of the respondent's male schoolmates. We hypothesize that having schoolmates of the opposite sex who reached puberty quickly should lead to a greater number of lifetime sex partners due to increased availability and desirability of potential sex partners.

Instrumental variables results suggest that number of sex partners is negatively related to number of years of schooling, the probability of high school graduation, and the probability of attending college. The magnitude of the effect is modest (each additional

sex partner is associated with an approximately 0.1-year decline in years of schooling attained), however a wide set of sensitivity and falsification tests bolster the case for a causal interpretation of these results. Moreover, the negative relationship between number of sex partners and educational attainment remains when we condition on teen fertility and age at first intercourse, and when age at first intercourse is treated as an endogenously determined variable. This pattern of results suggests that among young women the frequency of sex partners may play an important role in the formation of human capital.

II. Background

Economists have recently become interested in social interactions and their relationship to educational and labor market outcomes. For instance, Segal (2005) examined the effects of disruptive social behavior on educational and labor market outcomes; Krueger and Schkade (2008) examined the relationship between interactions with friends and occupation choice; and Borghans, Weel and Weinberg (2006) examined the effect of social behavior as an adolescent and young adult on a variety of labor market outcomes. Although these and other studies attempt to explore the influence of interpersonal interactions on outcomes typically studied by economists, there has been comparatively little attention paid to interactions of a romantic nature. Such interactions are arguably as important to teens and young adults as interactions with friends and family.

In fact, there is evidence that the typical U.S. teenager spends a great deal of time thinking about, and in the company of, the opposite sex. For instance, Richards et al.

(1998) paged 11th and 12th graders living in Chicago at random intervals and asked them to write down what they were thinking and doing. The results of this study suggest that female 11th and 12th graders were engaged in thinking about "an individual of the opposite sex" approximately 8 hours per week, and were alone with a male approximately 10 hours per week. In contrast, teenagers spend on average less than 6 hours per week studying or reading for pleasure (Juster et al. 2004).[1]

Although Richards et al. (1998) noted that being in the company of an individual of the opposite sex was often associated with higher self-esteem and other "positive feelings," they did not attempt to assess the impact of romantic relationships on psychological wellbeing. Using data from the National Longitudinal Study of Adolescent Health, Joyner and Udry (2000) found that becoming involved in short-lived, unstable romantic relationships was associated with an increase in the symptoms of depression, especially among females. Ayduk et al. (2001), Grello et al. (2003), and Davila et al. (2004) focused on the impact of romantic relationships gone sour. Their results, summarized by Collins et al. (2009, p. 641), suggest that, "break-ups, rather than involvement in romantic relationships per se, may explain the frequent reports of elevated depressive symptoms [among adolescents]."

A related vein of research examines the effect of having multiple sex partners on psychological wellbeing and behavior. For instance, Rector et al. (2002) found that having multiple sex partners was associated with a greater likelihood of feeling "very unhappy"; Howard et al. (2004) found that it was associated with substance use; and

[1] Juster et al. (2004) analyzed data from the Child Development Supplement to the Panel Study of Income Dynamics. They found that, during the 2002-2003 academic year, the average 15-17 year-old spent 4 hours and 59 minutes per week studying and an additional 49 minutes reading.

Hallfors et al. (2005) found that adolescent females who had multiple sex partners were 10 times more likely to more likely to develop the symptoms of major depression than their counterparts who remained sexually abstinent, but found no evidence of a similar relationship between having multiple sex partners and depression among male adolescents. Hallfors et al. (2005) hypothesized that female adolescents were especially susceptible to stress and depression as a result of sexual activity.[2]

As noted above, our interest is in whether lifetime number of sex partners is negatively related to the educational attainment of young women. There are at least three reasons why we might expect to find evidence of such a relationship. First, there is a potential tradeoff between time spent in the pursuit of academic goals and time spent thinking about or in the company of the opposite sex. Second, to the extent that it is a measure of the intensity or frequency of romantic relationships, work by Joyner and Udry (2000) and others suggests that number of sex partners may be negatively related to psychological wellbeing, which in turn may be related to educational outcomes. In fact, Joyner and Udry (2000) found that school performance explained a substantial proportion of the estimated effect of romantic relationships on depression. Finally, having multiple sex partners may increase the risk of sexually transmitted diseases and teen childbearing, both of which could influence schooling decisions.

[2] Specifically, Hallfors et al. (2005, p. 168) wrote,

> girls' greater interpersonal sensitivity contributes to higher levels of interpersonal stress during adolescence. Substance use and sexual activity likely contribute to experienced stress. The greater exposure to stress due to risk behavior, and girls' more negative reactivity to interpersonal stressors, may partially account for demonstrated gender differences in depression.

The remainder of this paper is organized as follows. The next section describes the data and provides a description of the outcome variables used in the analysis below. Section IV introduces the instruments and empirical models. In Section V we present the basic results and then conduct a series of sensitivity and falsification tests. Section VI concludes.

III. Data and Measures

The primary data source for this project is the National Longitudinal Study of Adolescent Health (Add Health), a nationally representative school-based survey conducted by the Carolina Population Center at the University of North Carolina at Chapel Hill. The first wave of the Add Health (the Wave I core in-home sample) provides detailed health and behavioral information on 20,745 middle and high school students from 1995. Approximately one year later, at Wave II, 14,738 of these students were re-interviewed; approximately 5 years later, at Wave III, 15,170 of the original participants were contacted and interviewed.[3]

Our analysis is focused on a sample of 3,684 females who were between the ages of 22 and 24 at Wave III (2002).[4] In order to be included in this sample, a respondent had to answer questions about their educational attainment and number of sexual partners

[3] A sample of 80 high schools and 52 middle schools from the U.S was selected with unequal probability. Incorporating systematic sampling methods and implicit stratification into the Add Health study design ensured this sample is representative of U.S. schools with respect to region of country, urbanicity, school size, school type, and ethnicity. (See Harris et al. 2003 for more information on the research design).

[4] At Wave III, Add Health respondents were between the ages of 18 and 28. In the interest of keeping our sample homogeneous and old enough to have completed high school and begun college, we focused on individuals between the ages of 22 and 24. However, our main results are robust to examining a larger sample that includes younger females aged 18-21 (see Appendix Table 2). Only 5.2 percent of female Add Health respondents were older than 24 at Wave III.

at Wave III. In addition, we restricted our focus to respondents who reported having had intercourse by Wave III. Fully 91 percent of the female Add Health respondents between the ages of 22 and 24 were sexually active by their Wave III interview.[5]

Three educational attainment measures were constructed from the information in the Add Health data. The first is a continuous measure equal to the number of years of schooling completed; the second is a dichotomous variable equal to 1 if the respondent had reported receiving a high school diploma by the time of the Wave III survey in 2001, and equal to 0 if she dropped out; the third is equal to 1 if the respondent was attending college at the time of the Wave III survey or had completed at least one year of college prior to the survey.

The key independent variable of interest is *Number of Sex Partners.* This variable is constructed using respondents' answers to the following question asked of Wave III participants: "With how many partners have you ever had vaginal intercourse, even if only once?" We also define a dichotomous variable, *Seven or More Partners*, equal to 1 if an individual reported having seven or more different sex partners, and equal to 0 otherwise. The typical respondent in our sample reported having had almost 6 sex partners, and approximately 30% of the sample reported having had 7 or more sex partners.[6]

In Table 1A we present descriptive statistics for numbers of sexual partners by educational attainment. It provides evidence that number of sexual partners is negatively

[5] Nine percent of 22-to-24 year-olds reported having zero sexual partners in their lifetime at the time of the Wave III survey. These individuals are omitted from our sample in order to avoid having to estimate abstinence effect. However, their inclusion does not appreciably change the results presented below. Estimates including virgins are available upon request.

[6] Approximately a third of the sample reported 1-2 partners, 37.4 reported 3-6 partners, and 29.8 percent reported seven or more partners.

related to educational attainment. For respondents who completed 10 years of schooling or less, the average number of lifetime sex partners was 7.41. In contrast, respondents who completed 15 or more years of schooling had, on average, 5.28 sex partners. Those who reported receiving a high school diploma by Wave III had an average of 5.76 sex partners, while the corresponding figure for dropouts was 7.04. Respondents who attended college had an average of 5.65 sex partners, while the corresponding figure for those who did not attend college was 6.35.

IV. Estimation Strategies

These differences, although statistically significantly, could easily be driven by factors such as personal characteristics, family background, or even school structure or size. The first step in our analysis is to test whether the relationship between number of sex partners and educational attainment can be explained by these variables. Specifically, we estimate the following equation using Ordinary Least Squares (OLS):

$$E_i = \beta_0 + \boldsymbol{\beta'_1 X_i} + \beta_2 \textit{Number of Sex Partners}_i + \varepsilon_i, \qquad (1)$$

where E_i is a measure of educational attainment constructed from answers to the Wave III Add Health survey; $\mathbf{X_i}$ is a vector of controls; and *Number of Sex Partners* is the continuous variable defined above. In an alternative set of regressions, the variable *Number of Sexual Partners* is replaced with the variable *Seven or More Partners*.

We include a wide set of individual-, family-, and school-level variables in $\mathbf{X_i}$. Most are measured at Wave I, including the educational attainment of the parent who

answered the parental questionnaire, household income, parents' marital status, the respondent's Peabody Picture Vocabulary Test (PPVT) score (a measure of cognitive ability), measures of religiosity, race, ethnicity, height, weight, class size, whether the respondent attended a public school, percent of students in the respondent's school who were enrolled in college preparatory classes, school size, school type (high school versus junior high/middle school), average age of students in the respondent's school, whether the respondent had an older sibling, and a measure of the respondent's attractiveness as rated by the Add Health interviewer. Controls drawn from the Wave III include age dummies and an indicator for whether the respondent had ever been married.[7]

Although the detailed information available in the Add Health allows us to include a wide variety of "observables" in the vector $\mathbf{X}_i$, the estimate of β_2 will be biased if there are unobserved characteristics that are associated with number of sex partners and educational attainment. For example, family background characteristics such as the degree of parental supervision may be associated with both sexual activity as an adolescent and the decision to drop out of school.

One method of addressing the issue of family-level unobservables is to restrict the sample to twin sisters and include a vector of family fixed effects in the estimating equation:

$$E_{ij} = \beta_0 + \boldsymbol{\beta'_1 X_i} + \beta_2 \textit{Number of Sex Partners}_{ij} + \kappa_j + \varepsilon_{ij}, \qquad (2)$$

[7]Table 1 of the appendix presents descriptive statistics for the all the variables used in the analysis.

where *j* denotes the individual's family and κ_j is the vector of family fixed effects. While this approach controls for the influence of difficult-to-measure differences at the family level, it is also associated with a number of drawbacks.

First, twin sisters may not be exactly alike in terms of personality and experiences, and these unmeasured differences between twins could be correlated with both the number of sex partners chosen and school attainment. For instance, one twin may have discounted the future more than the other or have been more risk adverse. Another drawback to adding family fixed effects to the estimating model is that it involves a large reduction in sample size. As noted by Keplinger, Lundberg, and Plotnick (1999, p. 424), this reduction in sample size, coupled with a focus on respondents with twins, may "reduce the efficiency of estimates, and may introduce sample selection bias." Finally, if additional time spent in school leads to different preferences with regard to number of sex partners or provides greater exposure to potential partners, then reverse causality could be an issue.

In order to address the potential sources of endogeneity outlined above, we pursue an instrumental variables strategy. If $\mathbf{Z_i}$ is a vector of instruments correlated with the number of sex partners but uncorrelated with the error term of equation (1), and number of sex partners is given by:

$$\textit{Number of Sex Partners}_i = \gamma_0 + \boldsymbol{\gamma'_1 X_i} + \boldsymbol{\gamma'_2 Z_i} + \varepsilon_{i,} \qquad (3)$$

then β_2 can be obtained using two-stage least squares (2SLS) estimation. 2SLS estimation will produce a consistent estimate of the effect of number of sexual partners

on educational attainment provided that appropriate instruments can be found. We utilize three instruments related to the timing of the biological onset of puberty.

We begin by following the approach of Sabia and Rees (forthcoming; 2009) and use two measures of the respondent's own pubertal physical development as instruments. The first of these is the respondent's physical development score on a 5-point physical development scale. At Wave I, after a series of questions with regard to breast development and body curves, female Add Health participants were asked, "[h]ow advanced is your physical development compared to other girls your age?" Possible responses were: "I look younger than most" =1; "I look younger than some" = 2; "I look about average" = 3; "I look older than some" = 4; and "I look older than most" = 5.

The second instrument is the respondent's age of menarche. There is evidence to suggest that age of menarche is related to age at first intercourse (Sabia and Rees forthcoming, Averett et al. 2002, Phinney et al. 1990, Soefer et al. 1985, Zabin et al. 1986) and the dating behavior of adolescent females (Phinney et al. 1990, Presser 1978), but there is little reason to believe that it should directly affect educational attainment. In fact, several studies have assumed that physical development, as measured by age of menarche, is exogenous to educational attainment (Sabia and Rees forthcoming, Klepinger et al. 1995, Klepinger et al. 1999, Ribar 1994, Field and Ambrus 2008), conditional on body weight, height, and physical attractiveness.

However, a criticism of each of the above instruments is that the timing of the respondent's own physical development may be correlated with unmeasured components of physical or mental health, which in turn could affect educational attainment.[8]

[8] The early onset of sexual maturation may be associated with obesity or being overweight (Adair et al. 2001, Anderson et al. 2001), and late onset of sexual maturation may be associated with bulimia or being

Therefore, our final instrument does not measure the respondent's *own* physical development, but rather how physically developed the respondent's male schoolmates were at Wave I. After a series of questions with regard to facial hair growth, underarm hair growth, and the deepening of their voice, males who participated in the Add Health were asked, "[h]ow advanced is your physical development compared to other boys your age?" Again, the possible responses were: "I look younger than most" =1; "I look younger than some" = 2; "I look about average" = 3; "I look older than some" = 4; and "I look older than most" = 5. These responses were used to calculate a mean physical development score for the males in each respondent's school, which can be thought of as measuring the number of potential partners or their desirability.

We hypothesize that the mean physical development score will be positively related to number of sex partners. Although male Add Health respondents were asked to assess their physical maturity relative to "other boys your age," we are careful to control for school characteristics that could be related to educational attainment, including the average age of students, whether the school was public or private, whether it was a high school or junior high school, average class size, school size, and percentage of students enrolled in college preparatory classes. We find little evidence that the mean male physical development score is related to school characteristics (see Appendix Table 3); thus we believe that with the inclusion of the above controls, the remaining variation in the mean physical development score can be thought of as essentially random.[9]

---

extremely underweight (Striegel-Moore et al. 2001). It is also possible that early maturation may be associated with greater self-esteem and better mental health (Argys et al. forthcoming, Booth 1990, Prieto and Robbins 1975).

[9] In Appendix Table 3, we show the results of regressing this mean physical development score on a wider set of school characteristics intended to capture other dimensions of school environment and school quality. Among the additional controls are student attendance rates, race of teachers, educational attainment of

Appendix Table 4A shows some descriptive evidence that the number of female sex partners rises with the average physical development score of her male schoolmates, and Appendix Table 4B shows results of regressing number of sex partners on male physical development quartile, controlling for average age of students in the school, school size, and whether the school was a high school.[10] They suggest a strong positive relationship between attending school with more physically developed males and number of sex partners even with these controls. For instance, female respondents attending school with males in the top quartile of the male physical development distribution had, on average, 1.62 more sex partners than their counterparts who attended schools with the least developed males (those in lowest quartile).

In order to test the exogeneity of the instruments, we take a number of tacks. First, we include them as regressors in equation (1) and observe whether, after controlling for number of sexual partners, they are individually or jointly significant predictors of educational attainment. In addition, we use a Hansen test of overidentifying restrictions as a more formal method of investigating whether the instruments are correlated with the residuals of equation (1). We also conduct a wide set of robustness tests, testing the sensitivity of results to instrument choice. Moreover, to ensure that the instruments are not capturing physical or mental health, we explore the sensitivity of our results to adding an extensive set of controls for weight, depression, and self-esteem. Finally, we assess of the validity of our identification strategy by conducting falsification tests on a set of

---

teachers, and more detailed measures of school type. The results provide little evidence that school characteristics are related to the male physical development index, adding support to the hypothesis that remaining variation can be thought of as random. The 2SLS estimates presented below are qualitatively similar if we include these additional school-level characteristics as controls in the vector **X.**

[10] A high school is defined as having 12th graders enrolled in it.

outcomes correlated with educational attainment, but that should not, in theory, be causally related to the number of sex partners.

V. Results

Regression results are presented in Tables 2-11. They are based on unweighted data and the reported standard errors are corrected for clustering at the school level. Our focus is on the estimates of β_2, the coefficient of *Number of Sex Partners*. The estimated coefficients of the control variables are not shown but are available upon request.

OLS Estimates

Table 2 presents OLS estimates of the relationship between number of sex partners and educational attainment. Panel I shows results for the full sample of 22 to 24 year-old females. Conditional on observables, we find that each additional sex partner is associated with 0.035 fewer years of schooling (column 1), a 0.005 lower probability of receiving a high school diploma (column 2), and a 0.005 lower probability of attending college (column 3).[11]

The specification in Panel I includes a set of age dummies. In Panels II-IV, we estimate separate regressions by age. The results indicate that the negative relationship between number of sex partners and educational attainment exists across the age distribution, although the estimated effects are slightly larger for respondents who were 22 years of age at Wave III.

[11] Using a single-equation probit model to estimate effects on high school completion and college attendance produced similar results. Each additional sex partner is associated with a 0.004 increase in the probability of high school diploma receipt (standard error = 0.001; p-value = 0.00) and a 0.006 increase in the probability of college attendance (standard error = 0.001; p-value = 0.00).

Naively interpreted, the results in Table 2 suggest that having multiple sex partners leads to lower human capital acquisition. However, because the association between sex partners and educational attainment may be driven by family-level unobservables, we next turn to a model that compares differences in educational attainment between twin sisters.

Twin Sisters

Table 3 presents estimates of (2) based on a sample of 143 twins.[12] The sample includes both monozygotic and dizygotic twins, and twins of unknown zygoticity. If two twins reported the same number of sex partners, the pair was not included in the analysis. For purposes of comparison, Table 3 also presents OLS estimates based on the twins sample.

Estimates of (2) provide some evidence that the negative effect of having multiple sex partners is not fully explained by family-level unobservables (Table 3). Specifically, we find that each additional sex partner is associated with a 1.6 percentage-point decline in the probability of graduating high school, an estimate that is statistically equivalent to that produced by OLS. However, there is little evidence that number of sex partners is related to years of schooling completed or the probability of college graduation.

It is tempting to view the negative estimated relationship between number of sex partners and the probability of high school graduation in Table 3 as casual in nature. However, there is reason to treat it with care. As noted, estimates based on twin data

[12] The sample includes 70 twin pairs and one set of triplets. Because equation (2) includes family fixed effects, there are only four controls in the vector $\mathbf{X_i}$: the respondent's attractiveness as assessed by the Add Health interviewer, bodyweight, PPVT score, and marital status at Wave III.

could reflect reverse causality, or could reflect the fact that we have only a small sample of twins with which to work. The next section presents 2SLS estimates of the relationship between number of sex partners and educational attainment. Provided that we have valid instruments with sufficient power, 2SLS estimates will allow us to avoid these problems.

Baseline IV Estimates

Table 4 provides evidence with regard to the relevance and exogeneity of the instruments. The first column of Table 4 shows estimates of (3). The respondent's own physical development score is positively related to number of sex partners; a one-point increase in this score is associated with 0.65 more sex partners. The mean physical development score of males in the respondent's school is also positively related to number of sex partners. Specifically, a one-point increase in the mean score is associated with 2.6 additional sexual partners. The estimated coefficient of *Age of Menarche*, however, is not significantly related to number of sex partners.[13] Jointly, the instruments are significant predictors of number of sex partners, with an F-statistic of 13.3, meeting the standard for instrument relevance suggested by Staiger and Stock (1997). In columns (2)-(4) we present estimates of equation (1) that include the instruments as explanatory variables along with the number of sex partners. The instruments are never individually or jointly significant predictors of education, suggesting that they do not proxy for unmeasured determinants of educational attainment.

[13] If the own physical development index is dropped as an instrument, the coefficient of age of menarche becomes positive, but is not significant at the 5 percent level.

Table 5A presents the second-stage estimates as well as OLS estimates for the sample used in the 2SLS analysis. They show that an additional sex partner reduces years of schooling by 0.035, reduces the probability of high school graduation by 0.015, and reduces the probability of college attendance by 0.017. Although these estimates are larger than the corresponding OLS estimates, Hausman tests fail to reject equivalence. In all three specifications, overidentification tests indicate that the instruments are valid.

Because the effect of sex partners on educational attainment may be nonlinear, we replace *Number of Sex Partners* with *Seven or More Partners* in Table 5B. Having seven or more lifetime sex partners reduces years of schooling by 1.3, reduces the probability of high school graduation by 0.186 (22.0%), and reduces the probability of college attendance by 0.245 (38.5%). These magnitudes are comparable to those of remaining abstinent until the age of 18 (Sabia and Rees forthcoming) and binge drinking (Koch and McGeary 2005). Taken together, the findings in Tables 5A and 5B suggest that females accrue important human capital gains from limiting their number of sex partners during adolescence and young adulthood.[14]

Robustness Checks on Validity of Instruments

Next, we explore the sensitively of our results to including additional controls in the vector $\mathbf{X_i}$. These controls are intended to address the possibility that pubertal development is correlated with factors other than number of sex partners that could impact schooling. Column (1) of Table 6 presents results from the baseline 2SLS model. First, studies have shown that early onset of sexual maturation may be associated with

[14] IV probit estimates of the effect of multiple sex partners on high school completion and college attendance produce similar results.

obesity or being overweight (Adair et al. 2001; Anderson et al. 2001), and that late onset of sexual maturation may be associated with bulimia or being extremely underweight (Striegel-Moore et al. 2001). In order to ensure that the respondent's physical development score is uncorrelated with the error term of equation (1), the variable *Weight* was replaced by the following controls: whether the respondent made herself vomit to lose weight or keep from gaining weight, whether the respondent was severely underweight, whether the respondent was underweight, whether the respondent was overweight, and whether the respondent was obese.[15] The results of this exercise, presented in column (2) of Table 6, are similar to those in Table 5A.

While all specifications control for the marital status of the respondent's parent who filled out the Add Health questionnaire, some studies have suggested that pubertal timing could be related to the absence of biological father or presence of a stepfather in the household, (Ellis and Garber, 2000; Boageart, 2004). In column (3), we include a control for whether the biological father was absent from the household and whether the mother remarried. The 2SLS estimate from this specification is similar to that obtained without these additional controls.

The timing of puberty could also affect the self-esteem of the adolescent, which, in turn, could have long-run effects on schooling (Booth 1990, Prieto and Robbins 1975). In column (4), we show 2SLS estimates controlling for the respondent's score on the Rosenberg Self-Esteem Scale at Wave I (when questions used to construct the puberty

[15]The bulimia indicator was based on responses to the Wave III Adolescent Health survey. The weight indicators were based on the respondent's Body Mass Index at the time of the Wave I survey and CDC charts available at: http://www.cdc.gov/growthcharts/.

scales were asked). The estimated effect of number of sex partners remains is unchanged when this additional control is added to $\mathbf{X_i}$.

Finally, peer choice represents another possible route through which puberty could, in theory, affect educational attainment. Students who develop earlier may choose different peer groups, which, in turn, could affect schooling choices. At Wave I, when physical development was measured, respondents to the Add Health survey were asked, "Of your 3 best friends, how many: Smoke at least 1 cigarette a day? Drink alcohol at least once a month? Use marijuana at least once a month?" Column (3) of Table 6 shows the 2SLS estimate controlling for the answers to these questions.[16] Again, it is similar to that presented in Table 5A.[17]

Taken together, the results in Table 6 suggest that the negative impact on educational attainment of having multiple partners is robust to adding controls for being overweight, being underweight, bulimia, self esteem, and peer behavior..

An alternative method of exploring the validity of our instruments is to examine the sensitivity of the 2SLS estimates to various exclusion restrictions. Table 7 presents such an exploration. Column (1) of Table 7 reproduces the baseline results for years of schooling first presented in Table 5A. In column (2), we drop age of menarche and the respondent's physical development score as instruments, relying on the mean physical development score of males in the respondent's school to identify exogenous variation in

[16] The answers were dichotomized. Specifically, $\mathbf{X_i}$ was augmented by: an indicator equal to 1 if the respondent reported having 1 friend who smoked, and equal to 0 otherwise; an indicator equal to 1 if the respondent reported having 2 friends who smoked, and equal to 0 otherwise; an indicator equal to 1 if the respondent reported having 3 friends who smoked, and equal to 0 otherwise; an indicator equal to 1 if the respondent reported having 1 friend who drank, and equal to 0 otherwise; and so forth.

[17] We also experimented with using peer characteristics measured at Wave II, but the results were qualitatively similar to those reported in Table 5.

number of sex partners. The estimated coefficient of *Number of Sex Partners* is still negative and statistically significant, albeit slightly less precise.

In column (3), we experiment with an alternative method of measuring the physical development of males in the respondent's school. Male Add Health respondents were asked at Wave I:

> 1. How much hair is under your arms now? The possible responses were: "I have no hair at all" = 1; "I have a little hair" = 2; "I have some hair, but not a lot; it has spread out since it first started growing and is thicker" = 3; "I have a lot of hair that is thick" = 4; and "I have a whole lot of hair that is very thick, as much hair as a grown man" = 5.
>
> 2. How thick is the hair on your face? The possible responses were: "I have a few scattered hairs, but the growth is not thick" = 1; "The hair is somewhat thick, but you can still see a lot of skin under it" = 2; "The hair is thick; you can't see much skin under it" = 3; and "The hair is very thick, like a grown man's facial hair" = 4.
>
> 3. Is your voice lower now than it was when you were in grade school? The possible responses were: "No, it is about the same as when you were in grade school" = 1; "Yes, it is a little lower than when you were in grade school" = 2; "Yes, it is somewhat lower than when you were in grade school" = 3; "Yes, it is a lot lower than when you were in grade school" = 4; and "Yes, it is a whole lot lower than when you were in grade school; it is as low as an adult man's voice" = 5.

The answers to these three questions were summed to create an alternative 14- point physical development scale for males, and the mean score on this scale by school was calculated. Using this alternative method of measuring the physical development of males in the respondent's school, 2SLS produces an estimate of the effect of number of sex partners on years of school equal to -0.09, although it is less precisely estimated than the estimate in column (2) presumably because the new instrument has less power than

the one it replaced (F-stat=6.1). When both physical development scores for males in the school are used as instruments, the results are similar to those presented in Table 5A.[18]

In columns (5)-(7), we drop the male physical development measures as instruments and focus on the respondent's physical development. When the respondent's physical development score is the sole instrument, we continue to find evidence of a negative sex partner effect that is comparable magnitude to that obtained when using the male physical development measures as instruments. However, one potential concern with regard to relying solely on the respondent's own physical development score as a source of exogenous variation in number of sex partners is that it could reflect the respondent's sense of perceived self-worth, personal maturity, or modesty, each of which could, in theory, be related to school attainment. Thus, we next examine an alternative, arguably more "objective," measure of female puberty onset. Female Add Health respondents were asked:

1. As a girl grows up her breasts develop and get bigger. Which sentence best describes you? The possible responses were: "My breasts are about the same size as when I was in grade school" =1; "My breasts are a little bigger than when I was in grade school" = 2; "My breasts are somewhat bigger than when I was in grade school" = 3; "My breasts are a lot bigger than when I was in grade school" = 4; and "My breasts are a whole lot bigger than when I was in grade school, they are as developed as a grown woman's breasts" = 5.

2. As a girl grows up her body becomes more curved. Which sentence best describes you? The possible responses were: "My body is about as curvy as when I was in grade school" = 1; "My body is a little more curvy than when I was in grade school" = 2; "My body is somewhat more curvy than when I was in grade school" = 3; "My body is a lot more curvy than when I was in grade school" = 4; and "My body is a whole lot more curvy than when I was in grade school" = 5.

[18] We also experimented with controlling for cognitive ability of the respondent's male schoolmates to ensure that self-reported puberty measured were not reflecting unmeasured school-differences in knowledge or ability. When we added the mean Peabody Picture Vocabulary Test (PPVT) score of the respondent's male schoolmates as an additional control in $\mathbf{X}_i$, 2SLS are qualitatively similar to those reported in Table 5A.

The answers to the above questions were summed to create an alternative 10-point physical development scale. Because the possible responses refer to the respondent's physical development in "grade school," we include controls for age of the respondent at Wave I as well as for their grade in school at Wave I. The results suggest that using either this or the original measure of the respondent's physical development as an instrument produces comparable 2SLS estimates. In column (7) we include both the alternative and the original physical development scores as instruments. The results suggest that an additional sex partner is associated with a 0.075 decrease in years of schooling. In column (8), we include all four physical development scales. The results suggest that an additional sex partner is associated with a 0.075 decrease in years of schooling.

Finally, we augment the vector $\mathbf{Z_i}$ with two policy instruments based on the work of Sabia and Rees (2008): the per-capita number of county-level family planning clinics per 10,000 population, and the presence of a contraceptive-inclusive HIV education program in the respondent's school. We hypothesize that these measures capture some portion of the cost of becoming sexually active, and that as this cost rises adolescents will be more likely to remain abstinent. The results are presented in the last column of Table 7. They suggest that adding these instruments to the vector $\mathbf{Z_i}$ has little impact on the estimated effect of number of sex partners on years of schooling.[19]

Falsification Tests

[19] Appendix Tables 5 and 6 present the robustness checks for the outcomes high school graduation and college attendance.

The 2SLS estimates discussed above are informative only if our instruments are appropriately excluded from the schooling equation. In order to further explore the validity of our exclusion restrictions, we conduct a series of falsification tests. Specifically, we examine the relationship between number of sex partners and four alternative outcomes measured at Wave III that are correlated with educational attainment, but, in theory, should not be caused by exogenous changes in the number of sex partners: whether the respondent engaged in binge drinking at least once per month in the last year, whether the respondent had any friends who binge drank, whether the respondent has smoked marijuana in the last 30 days, average hours per day spent watching television, whether the respondent engaged in theft, and how often the respondent went to an exercise or fitness center.[20] Although these outcomes are correlated with number of sex partners, there is no reason to expect an exogenous change in the number of sex partners to have an impact on them. Therefore, if 2SLS estimates indicate a relationship between number of sex partners and these outcomes, it would be

[20] Average hours per day watching television, the five-point agreement scale on theft, and number of days per week workout at fitness or exercise center are continuous variables. The remaining measures are dichotomous. The variables are constructed using responses to the following Wave III survey items:

1. During the past 12 months, on how many days d id you drink five or more drinks in a row?

2. Of your three best friends, how many drink alcohol at least once a month?

3. During the past 30 days, how many times have you used marijuana?

4. On average, how many hours a week do you spend watching television?

5. How much do you agree or disagree with the following statement about you: You never take things that don't belong to you.

6. In the past seven days, how many times did you go to an exercise or fitness center to exercise or work out?

evidence that our instruments are correlated with the unmeasured determinants of educational attainment.

Table 8 presents the results of the falsification tests. There is no evidence that number of sex partners is related to binge drinking, having friends who binge drink, smoking marijuana, hours spent watching television, theft, or exercising at a club or gym. These results can be viewed as lending support for excluding our instruments from the second stage.

Timing of Number of Partners

An important limitation to the variable *Number of Sex Partners* is that we do not observe when the relationships took place. This raises the possibility that some could have occurred *after* a respondent's schooling was completed. We explore this issue in Table 9.

At Wave III respondents were asked about their number of sex partners in the last 12 months. Panel I of Table 9 presents 2SLS estimates, subtracting number of sex partners in the past year from the respondent's lifetime total. The results are similar to those presented in presented in Table 5A: number of sex partners is negatively related to all three measures of educational attainment. This pattern of results suggests that romantic relationships that occurred just prior to Wave III interview are not driving our results.

As another check on this point, we examine whether our key instrument—the physical development of the respondent's male schoolmates—affects primarily the respondent's number of sexual partners while she is in school. The mean physical

development score of males should have little effect on the respondent's sex partners in the year prior to the Wave III survey or on the number of sex partners of those respondents who become sexually active at age 19 or later, when they are no longer attending high school. In Panel II of Table 9, we present estimates of the relationship between the mean physical development score of males in the respondent's school and number of sex partners. First, in column (1) we show that male physical development score is a strong predictor of the respondent's number of sex partners prior to the year of the Wave III survey. However, in column (2), we find when we examine the respondent's sex partners in the year prior to the Wave III survey, the estimated coefficient of the mean physical development score is small, negative and statistically insignificant, consistent with the hypothesis that this instrument is related to total lifetime partners through decisions made during adolescence as opposed to young adulthood.

In column (3) of Panel II, we present estimates of the relationship between total lifetime sex partners and the mean physical development score of males in the respondent's school, restricting the sample to respondents whose age at first intercourse was greater than 18. We would not expect the mean physical development score of male schoolmates to be related to number of sex partners for respondents who became sexually active near of after high school graduation, and in fact the results provide little evidence of such a relationship.

Finally, in Panel III of Table 9, we restrict our sample to respondents whose age at first intercourse was less than 18 and examine the relationship between lifetime number of sex partners (minus sex partners in the last year) and educational attainment. The results again indicate a negative relationship between number of sex partners and

educational attainment. For instance, an additional sex partner is associated with a decrease of 0.019 in the probability of high school graduation, an estimate that is slightly larger in absolute magnitude than that presented in Table 5A.

Proxy for Teen Childbearing, STDs, or Age at First Intercourse?

The findings presented thus far provide strong evidence that an increase in the number of sex partners negatively impacts the educational attainment of young women. We next explore why this relationship might exist.

One possibility is that having multiple sex partners increases the frequency of sexual intercourse, increasing the likelihood of teenage childbearing, which, in turn, affects school attainment. A number of studies have shown that having an out-of-wedlock child early in life negatively impacts educational attainment (Ribar 1994; Klepinger et al. 1999; Ribar 1999; Grogger and Bronars, 1994; Hoffman, Foster, and Furstenberg, 1993).[21] This finding raises the possibility that number of sex partners is related to educational attainment through fertility. Thus, we explore whether the multiple partner effect persists after controlling for teen childbearing. Column (1) of Table 10 presents the baseline specification.[22] In column (2), we add a control for whether the respondent had a child when she was a teenager. The results suggest that the multiple partner effect persists even after controlling for teen fertility.

Another possibility is that number of sex partners proxies for sexually transmitted infections, which could also affect schooling. In column (3), we control for whether the

[21] In contrast, Hotz et al. (1997; 2005) find that much of the adverse effects of teen childbearing can be explained by selection.
[22] Note that the sample size is slightly different because we require all respondents to have provided information on their age at first intercourse.

respondent reported having been diagnosed with a sexually transmitted infection in the year prior to being interviewed.[23] Controlling for sexually transmitted diseases has no impact on the estimated effect of number of sex partners on school attainment.

Still another possibility is that number of sex partners proxies for age at first intercourse. Previous authors have found that age at first intercourse has an effect on educational attainment (Billy et al. 1988; Dorius et al. 1993; Rector and Johnson 2005; Sabia 2007a,b; Schvaneveldt et al. 2001; Upchurch and McCarthy 1990; Sabia and Rees forthcoming), and there is evidence that it is associated with having multiple partners (Sandfort et al. 2008).

In columns (4)-(6) of Table 10, we explore whether the effects of number of sex partners and the timing of first intercourse can be distinguished. Specifically, we pursue two empirical strategies. The first is to add controls for the timing of first intercourse to the vector $\mathbf{X_i}$.[24] The second strategy is to treat both number of sex partners and timing of first intercourse as endogenously determined. This strategy is made possible by the fact that we have more than one instrument at our disposal.

In column (3), we include a set of dummy variables for age at first intercourse as additional controls. Controlling for age at first intercourse, number of sex partners is still negatively related to years of schooling. This suggests that number of sex partners is not simply capturing the timing of first sex.

---

[23] Our measure of STDs is dichotomous, created from respondents' answers to the following question:

> In the past 12 month s, have you been told by a doctor or nurse that you had the following sexually transmitted diseases: Chlamydia, gonorrhea, trichomoniasis, genital herpes, genital warts, human papilloma virus, bacterial vaginosis, pelvic inflammatory disease, cervicitis, HIV/AIDS, urethritis, vaginitis, or other sexually transmitted infections?

[24] Add Health respondents were asked the following question at Wave III: "How old were you the first time you had vaginal intercourse?"

In columns (4), we present 2SLS estimates of the effect of age at first intercourse on years of schooling in which age at first intercourse in instrumented by age of menarche, the respondent's physical development score, and the mean physical development score of males in the respondent's school.[25] Our results are consistent with those of Sabia and Rees (forthcoming): delaying age at first intercourse is positively related to school attainment. However, when we instrument for both age at first intercourse and number of sex partners, the estimated coefficient of *Age at First Intercourse* changes sign and loses statistical significance, while the estimated coefficient of *Number of Sex Partners* retains its magnitude and significance. This pattern of results suggests that frequency of sex partners, as distinct from timing of first intercourse, may play a role in the formation of human capital, and implies that losing one's virginity early in life only adversely affects schooling to the extent that it is associated with more sex partners. It is consistent with research by Arcidiacono et al. (2007, p. 29) showing that first intercourse involves a fixed cost such as crossing a "moral or psychological barrier," but that once this barrier is crossed adolescents rarely revert to abstinence.

Gender Differences

To this point in the analysis, we have focused on females and their behavior, and there are reasons to expect that the effect of having multiple sex partners males may be quite different for males. For instance, females typically shoulder a disproportionate share of the cost of an unintended pregnancy; thus, one might expect them to be more

[25] Appendix Table 7 shows the first-stage results. Sabia and Rees (forthcoming) used age of menarche to instrument for age at first intercourse. Although age of menarche is a strong predictor of age at first intercourse, it does not provide much predictive power for number of sex partners. Similarly, the mean male physical development index is a strong predictor of number of sex partners, but does not have as much predictive power for age at first intercourse.

preoccupied with the potential physiological consequences of sexual activity than their male counterparts. In fact, there is evidence that while females who have multiple sex partners are more likely to suffer from poor psychological health (Hallfors et al. 2005; Rector et al., 2005), adolescent males, on the other hand, seem to weather becoming sexually active with more equanimity, and may even experience an increase in self-esteem upon losing their virginity (Sabia and Rees 2008). Recent work by Sabia and Rees (2009) suggests that these differences may extend to schooling—they find that age at first intercourse is unrelated to the probability of high school graduation and college attendance for males.

In Table 11, we explore whether there exists a multiple partner effect for males. The first two columns show results for a sample composed of twin brothers. We find little evidence of a multiple partner effect in the twin brother sample, either in specifications that include or exclude family fixed effects.

For the IV-sample, OLS estimates do show a negative relationship between number of sex partners and schooling (column 3). Controlling for observables, each additional sex partner is associated with 0.019 fewer years of schooling, and a 0.003 lower probability of high school graduation and college attendance. However, when we instrument for number of sex partners, our results suggest little evidence that sex partners are related to educational attainment. In column (4), we use the male's own physical development score and a puberty index based on the respondent's responses to questions on underarm hair growth and facial hair growth to identify exogenous variation in sex partners. 2SLS estimates, while imprecise, are statistically indistinguishable from zero and are positive. A similar pattern of results emerges when we experiment with alternate

sets of instruments: only the male puberty index (column 5), only the male physical development score (column 6), and both indexes along with the mean physical development score of females in the respondent's school (column 7). We conclude that the robust evidence of negative schooling effects from multiple sex partners for females does not appear to extend to males.

VI . Conclusion

This study is the first in the literature to attempt to isolate the causal effect of number of sex partners on school attainment. Using both family fixed effects models on a sample of twin sisters and an instrumental variables approach, we find consistent evidence that higher numbers of sex partners have modest adverse schooling effects for females. Instrumental variables estimates are robust across instrument choice, a wide set of robustness checks, and a number of falsification tests. Moreover, the multiple partner effect persists after controlling for teen fertility and age at first intercourse, as well as when age at first intercourse is treated as an endogenously determined variable. These results suggest that the frequency of sexual partners during youth rather than the timing of first intercourse is an important determinant of educational attainment for females. For males, however, there is little evidence that multiple sex partners adversely effects schooling, consistent with theoretical expectations.

Advocates of both comprehensive and abstinence-only sex education programs agree that teenagers should be taught to limit their number of sexual partners. For instance, a leading member of the American Psychological Association Committee on Psychology and AIDS concluded, after a review of the research in this area:

> We have found that comprehensive sexuality education programs, those that provide information, encourage abstinence, promote condom use for those who are sexually active, [and] encourage fewer sexual partners…are the most effective in keeping sexually active adolescents disease free. (Rotheram, 2005)

On the other side of the sex education debate, the Heritage Foundation argues that,

> Any new monies devoted to preventing pregnancy should be directed not to amply funded contraception programs, but to abstinence education programs that teach teens to delay sexual activity, reveal the harm caused by casual sex with multiple partners, and help young people to prepare for fidelity, intimacy, and healthy marriage. (Pardue et al., 2004)

Our findings suggest that there may be common ground upon which proponents of abstinence-only and contraceptive-based sex education could build. If sex education courses are taught in such a way as to effectively encourage monogamy and sex partner limitation, there could be human capital benefits for females. However, it is important to underscore that our IV estimates should be interpreted as local average treatment effects (Imbens and Angrist 1994). A successful sex education program that reduced number of sex partners may have a different impact on educational attainment depending on whose sex decisions were affected.

A next step for research in this area might be to examine the time and psychological costs of adolescent relationship dissolutions. In particular, it would be interesting to explore if the effect of breaking up differs by gender or whether the couple were having intercourse. Such an analysis would take us a step closer to understanding why number of sex partners is negatively related to female educational attainment.

References

Ayduk O., Downey G., Kim M. 2001. Rejection Sensitivity and Depressive Symptoms in Women. Personal. Soc. Psychol. Bull, Vol. 27, pp. 868–877.

Billy, J.O.G., N.S. Landale, W.R. Grady,.and D.D. Zimmerle. 1988. "Effects of Sexual Activity on Adolescent Social and Psychological Development." *Social Psychology Quarterly* 51(3): 190-212.

Boegeart. 2004. http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B6WH0-4F9737K-3&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_userid=10&md5=c031797effa1fc9c826f6da19465fde8

Booth, Nancy D. 1990. "The Relationship between Height and Self-Esteem and the Mediating Effect of Self-consciousness." Journal of Social Psychology, Vol.130, No. 5, pp. 609-617

Borghans, Lex, Bas ter Weel, and Bruce A. Weinberg. 2005. "People's People: Social Capital and the Labor-Market Outcomes of Underrepresented Groups." Bohn: IZAWorking Paper No. 1494.

Collins, W. Andrew, Deborah P.Welsh, and Wyndol Furman. 2009. "Adolescent Romantic Relationships." Annual Review of Psychology, Vol. 60, pp. 631–52

Davila, J.. 2008. "Depressive Symptoms and Adolescent Romance: Theory, Research, and Implications." *Child Development Perspectives*, Vol. 2, pp. 26-31.

Davila J, Steinberg S, Kachadourian L, Cobb R, Fincham F. 2004. Romantic Involvement and Depressive Symptoms in Early and Late Adolescence: the role of a Preoccupied Relational Style. Personal Relations, Vol. 11, pp.161–178.

Dorius, G.L., T.B Heaton, and P.Steffen. 1993. "Adolescent Life Events and Their Association with the Onset of Sexual Intercourse." *Youth and Society* 25 (1): 3-23.

Ellis, B.J., & J. Garber. 2000. "Psychosocial antecedents of variation in girls' pubertal timing: Maternal depression, stepfather presence, and marital and family stress," *Child Development* 71, 485-501.

Grello CM, Welsh DP, Harper MS. 2006. No strings attached: the nature of casual sex in college students. J. Sex Res, Vol. 43, pp. 255–267.

Grogger, Jeff and Steven G. Bronars. 1994. "The Economic Consequences of Unwed Motherhood: Using Twin Births as a Natural Experiment," *American Economic Review* 84(5): 1141-1156.

Hallfors, Denise D., Martha W. Waller, Carol A. Ford, and Carolyn T. Halpern. 2005. "Which Comes First in Adolescence—Sex and Drugs or Depression?" American Journal of Preventative Medicine, Vol. 29, No. 3, pp.163-170.

Harper MS, Welsh DP. 2007. Keeping quiet: self-silencing and its Association with Relational and Individual Functioning among Adolescent Romantic Couples. J. Soc. Personal. Relations, Vol. 24, pp. 99–116.

Hoffman, S.D., E.M Foster, and F.F Furstenberg. 1993. "Re-Evaluating the Costs of Teenage Childbearing." *Demography* 30(1): 1-13.

Howard, Donna E. and Min Qi Wang. 2004. "Multiple Sexual-Partner Behavior Among Sexually Active US Adolescent Girls." American Journal of Health Behavior(s?), Vol. 28, No. 1, pp. 3-12.

Hotz, V. J.; C. Mullin, C. and S. Sanders. 1997. "Bounding Causal Effects Using Data from a Contaminated Natural Experiment: Analyzing the Effects of Teenage Childbearing" *Review of Economic Studies* 64(4): 575-603.

Hotz, V. J., S. McElroy, and S. Sanders. 2005. Teenage Childbearing and Its Life Cycle Consequences: Exploiting a Natural Experiment." Journal of Human Resources 40(3): 683-715.

Imbens, G.W. and J.D. Angrist. 1994. "Identification and Estimation of Local Average Treatment Effects." *Econometrica* 62 (2): 467-475.

Joyner, Kara and J. Richard Udry. 2000. "You Don't Bring Me Anything but Down: Adolescent Romance and Depression." Journal of Health and Social Behavior, Vol. 41, No. 4, pp. 369–391.

Juster, Thomas F., Hiromi Ono, and Frank P. Stafford. 2004. Changing Times of American Youth: 1981-2003. Ann Arbor: Institute for Social Research, University of Michigan.

Kahn, J.A., S.L. Rosenthal, P.A. Succop, G.Y.F. Ho, and R.D. Burk. 2002. "Mediators of the Association Between Age of First Sexual Intercourse and Subsequent Human Papillomavirus Infection." *Pediatrics* 109 (1): E5.

Klepinger, D., S. Lundberg, and R. Plotnick. 1999. "How Does Adolescent Fertility Affect the Human Capital and Wages of Young Women?" *The Journal of Human Resources* 34 (3): 421-448.

Krueger Alan B., and David Schkade. 2008. "Sorting in the Labor Market: Do Gregarious Workers Flock to Interactive Jobs?" Journal of Human Resources, Vol. 43, No. 4, pp. 859-883.

Pardue, Melissa G., Robert E. Rector, and Shannan Martin. 2004. "Government Spends $12 on Safe Sex and Contraceptives for Every $1 Spent on Abstinence," Heritage Foundation Report. Available at: http://www.heritage.org/Research/Abstinence/bg1718.cfm; Accessed January 19, 2009.

Prieto, Alfonso G. and Michael C. Robbins, 1975. "Perceptions of Height and Self-Esteem." Perceptual and Motor Skills, Vol. 40, No. 2, pp. 395-398

Rector, R.E. and K.A.Johnson. 2005. "Teenage Sexual Abstinence and Academic Achievement." Washington DC: The Heritage Foundation.

Rector, Robert E., Kirk A. Johnson, Lauren R. Noyes, and Shannan Martin. 2002. The Harmful Effects of Early Sexual Activity and Multiple Sexual Partners among Women: A Book of Charts. Washington, DC: The Heritage Foundation.

Ribar, D.C. 1994. "Teenage Fertility and High School Completion." *Review of Economics and Statistics* 76(3): 413-424.

Ribar, D.C. 1999. "The Socioeconomic Consequences of Young Women's Childbearing: Reconciling Disparate Evidence." *Journal of Population Economics* 12(4): 547-565.

Richards, Maryse H., Paul A. Crowe, Reed Larson, Amy Swarr. 1998. "Developmental Patterns and Gender Differences in the Experience of Peer Companionship during Adolescence." Child Development, Vol. 69, No. 1, pp. 154-163.

Rotheram, M.J. 2005. "Based on the Research, Comprehensive Sex Education is More Effective at Stopping the Spread of HIV Infection, Says APA Committee," APA Press Release, Available at: http://www.apa.org/releases/sexeducation.html; Accessed January 19, 2009.

Sabia, J.J. 2007a. "Reading, Writing, and Sex: The Effect of Losing Virginity on Academic Performance." *Economic Inquiry* 45(4): 647-670.

Sabia, J.J. 2007b. "Early Adolescent Sex and Diminished School Attachment: Selection or Spillovers?" *Southern Economic Journal* 74(1): 239-268.

Sabia, Joseph J. and Daniel I. Rees. Forthcoming. "The Effect of Adolescent Virginity Status on Females Educational Attainment." *Demography*.

Sabia, Joseph J. and Daniel I. Rees. 2008. "The Effect of Adolescent Virginity Status on Psychological Wellbeing." *Journal of Health Economics* 27(5):1368-1381.

Sabia, Joseph J. and Daniel I. Rees. 2009. "Boys will be Boys: Gender Differences in the Schooling Effect of Sexual Abstinence," Working Paper, American University.

Sandfort, T.G.M., M. Orr, J.S. Hirsch and J. Santelli. 2008. "Long-Term Health Correlates of Timing of Sexual Debut: Results From a National US Study." *American*

Journal of Public Health 98 (1): 155-161.

Schvaneveldt, Paul L., Miller, Brent C., Berry E. Helen, and Lee, Thomas R. 2001. "Academic Goals, Achievement, and Age at First Sexual Intercourse: Longitudinal, Bidirectional Influences." *Adolescence* 36(144): 767-787.

Segal, Carmit. 2005. "Misbehavior, Education, and Labor Market Outcomes." Working Paper, Palo Alto: Stanford University.

Upchurch, D.M. and J. McCarthy. 1990. "The Timing of First Birth and High School Completion." *American Sociological Review* 55 (2): 224-234.

Table 1A. Average Number of Sexual Partners by School Attainment

	Overall	≤ 10 Years	11-12 Years	13-14 Years	15+ Years	No HS Diploma	HS Diploma	No College	College
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of Sexual Partners	5.96	7.41	6.27	6.21	5.28	7.04	5.76	6.35	5.73
	(6.48)	(7.81)	(6.96)	(6.74)	(5.46)	(7.66)	(6.21)	(6.99)	(6.15)
N	3,684	164	1,338	881	1,301	578	3,106	1,352	2,332

Note: Standard deviations are in parentheses. The sample is drawn from respondents aged 22-24 at the time of the Wave III survey of the National Longitudinal Study of Adolescent Health. The sample consists of non-virgin females with non-missing information on schooling and total number of sexual partners.

Table 1B. Distribution of Sexual Partners by School Attainment

	Overall	≤ 10 Years	11-12 Years	13-14 Years	15+ Years	No HS Diploma	HS Diploma	No College	College
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1-2 Sex Partners	0.327	0.226	0.318	0.296	0.371	0.303	0.332	0.308	0.338
	(0.469)	(0.419)	(0.466)	(0.457)	(0.483)	(0.460)	(0.471)	(0.462)	(0.473)
3-6 Sex Partners	0.374	0.427	0.373	0.393	0.357	0.341	0.381	0.376	0.373
	(0.484)	(0.496)	(0.484)	(0.489)	(0.479)	(0.474)	(0.486)	(0.485)	(0.484)
7+ Sex Partners	0.298	0.348	0.309	0.311	0.272	0.356	0.287	0.315	0.288
	(0.458)	(0.478)	(0.462)	(0.463)	(0.445)	(0.479)	(0.453)	(0.465)	(0.453)
N	3,684	164	1,338	881	1,301	578	3,106	1,352	2,332

Note: Standard deviations are in parentheses. The sample is drawn from respondents aged 22-24 at the time of the Wave III survey of the National Longitudinal Study of Adolescent Health. The sample consists of non-virgin females with non-missing information on schooling and total number of sexual partners.

Table 2. OLS Estimates of Relationship between Number of Sex Partners and Females' School Attainment

	Years of Schooling	High School	College
	(1)	(2)	(3)
	Panel I: Aged 22-24		
Number of Sex Partners	-0.035***	-0.005***	-0.005***
	(0.006)	(0.001)	(0.001)
	[3,684]	[3,684]	[3,684]
	Panel II: Age 22		
Number of Sex Partners	-0.045***	-0.006***	-0.008***
	(0.010)	(0.002)	(0.002)
	[1,287]	[1,287]	[1,287]
	Panel III: Aged 23		
Number of Sex Partners	-0.016***	-0.005**	-0.004***
	(0.005)	(0.002)	(0.002)
	[1,302]	[1,302]	[1,302]
	Panel IV: Aged 22-24		
Number of Sex Partners	-0.026***	-0.003	-0.004**
	(0.008)	(0.002)	(0.002)
	[1,095]	[1,095]	[1,095]

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment. All models include the full set of controls in Appendix Table 1.

Table 3. Family Fixed Estimates of Relationship between Number of Sex Partners and Schooling for Sample of Twin Sisters

	Years of Schooling		High School		College	
	OLS	FE	OLS	FE	OLS	FE
	(1)	(2)	(3)	(4)	(3)	(4)
Number of Sex Partners	-0.036	-0.004	-0.019**	-0.016**	-0.003	0.010
	(0.044)	(0.044)	(0.009)	(0.008)	(0.011)	(0.012)
	[143]	[143]	[143]	[143]	[143]	[143]

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample sizes are in brackets. Standard errors in OLS models are corrected for clustering at the family level. Estimates are from unweighted OLS and family fixed effects regressions based on a sample of twin sisters from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment. OLS models include the controls in Appendix Table 1. Family fixed effects models include controls for PPVT score, bodyweight, marital status, and attractiveness.

Table 4. Estimated Relationship between the Instruments, Sexual Partner Variables, and Schooling

	Instrument Relevance	***Instrument Exogeneity***		
	Number Partners	Years of Schooling	High School	College
	(1)	(3)	(4)	(6)
Average Male Physical Development Score in Female's School	2.64***	-0.286	-0.006	-0.095
	(0.732)	(0.257)	(0.038)	(0.061)
Own Physical Development Index	0.651***	-0.033	-0.009	-0.002
	(0.117)	(0.031)	(0.008)	(0.006)
Age of Menarche	-0.022	0.004	0.001	0.0005
	(0.066)	(0.017)	(0.003)	(0.005)
F-stat on all instruments	F = 13.3	F = 0.94	F = 0.47	F = 0.88
p-value on joint significance test	p = 0.00	p = 0.42	p = 0.70	p = 0.45
Number of Sexual Partners		-0.034***	-0.005***	-0.005***
		(0.006)	(0.001)	(0.001)
N	3,578	3,578	3,578	3,578

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.

Table 5A. 2SLS Estimates of Effect of Number of Sex Partners on Females' School Attainment

	Years of Schooling		High School		College	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (3)	2SLS (4)
Number of Sex Partners	-0.035***	-0.101**	-0.005***	-0.015*	-0.005***	-0.017**
	(0.006)	(0.042)	(0.001)	(0.009)	(0.001)	(0.008)
	[3,578]	[3,578]	[3,578]	[3,578]	[3,578]	[3,578]
F-stat on instruments (first-stage)		F = 13.3		F = 13.3		F = 13.3
Hansen J-stat on overidentification test		J = 0.283		J = 0.356		J = 1.90
p-value on overid test		p = 0.87		p = 0.84		p = 0.39

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS and 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.

Table 5B. 2SLS Estimates of Effect of Multiple Sex Partners on Females' School Attainment

	Years of Schooling (1)	High School (2)	College (3)
Seven or More Sex Partners	-1.34**	-0.186	-0.245**
	(0.528)	(0.114)	(0.120)
	[3,578]	[3,578]	[3,578]
F-stat on instruments (first-stage)	F = 25.8	F = 25.8	F = 25.8
Hansen J-stat on overid test	J = 0.047	J = 0.617	J = 1.23
p-value on overid test	p = 0.98	p = 0.73	p = 0.54

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS and 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.

Table 6. Robustness of 2SLS Estimates to Added Controls

	Main Model	Use Controls for BMI, Bulimia	(2) + Control for Stepfather	(3) + Controls for Basline Self-Esteem	(4) + Peer Effects
	(1)	(2)	(3)	(4)	(5)
Number of Sex Partners	-0.101**	-0.110**	-0.105**	-0.107**	-0.085*
	(0.042)	(0.044)	(0.044)	(0.043)	(0.045)
	[3,578]	[3,578]	[3,578]	[3,578]	[3,578]
F-stat on instruments	F = 13.3	F = 13.6	F = 12.8	F = 12.8	F = 10.6
Hansen J-stat on overid test	J = 0.283	J = 0.094	J = 0.051	J = 0.045	J = 0.099
p-value on overid test	p = 0.87	p = 0.95	p = 0.97	p = 0.98	p = 0.95

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls listed in Appendix Table 1. Model (1) includes the following instruments: (i) the number of county-level family planning clinics per 10,000 women; and (ii) the presence of a contraceptive-inclusive HIV education program as measured by the presence of a state HIV education mandate coupled with school-level provision of (or referral to) family planning services. Model (2) replaces the continuous variable *Weight* by the variables *Severely Underweight* , *Underweight* , *Overweight* , *Obese* , and *Bulimia* . Model (3) includes a control for whether the respondent's biological father does not reside in the household and the mother has had multiple marriage or marriage-like relationships in the previous 18 years. Model (4) includes a control for the continuous RSE Scale. Model (5) adds controls for the number of best friends of the respondent at Wave I who engaged in binge drinking, cigarette consumption, and marijuana use.

Table 7. Sensitivity of 2SLS Estimates of Effect of Number of Sex Partners on Years of Schooling to Instrument Choice

	Main Model	IV: Average Male Phys. Develop Index Only	IV: Average Male Hair Index Only	IV: Average Male Phys. Develop + Avg. Hair Index	IV: Own Physical Develop Index Only	IV: Own Breast and Curves Index Only	IV: Own Phys. Develop Index + Breast-Curves Index	IV: All Indexes	IV: All Indexes + Policy Instruments
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Number of Sex Partners	-0.101**	-0.138*	-0.092	-0.137*	-0.085*	-0.080	-0.075*	-0.074*	-0.078*
	(0.042)	(0.081)	(0.143)	(0.081)	(0.047)	(0.076)	(0.045)	(0.041)	(0.042)
	[3,578]	[3,578]	[3578]	[3,066]	[3,558]	[3,558]	[3,558]	[3,553]	[3,049]
F-stat on instruments	F = 13.3	F = 12.8	F = 6.1	F = 6.4	F = 10.9	F = 17.8	F = 18.6	F = 11.0	F = 12.4
Hansen J-stat (overid)	J = 0.283	--	--	J = 0.157	--	--	J = 0.392	J = 1.46	J = 5.79
p-value on overid test	p = 0.87	--	--	p = 0.69	--	--	p = 0.53	p = 0.69	p = 0.33

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls listed in Appendix Table 1.

Table 8. Falsification Tests

	Binge Drinking ≥ once per month	Any Friends who Drink	Smoke Marijuana in Last 30 Days	Hours of Television Viewing	Theft Scale	Days Workout at Exercise Club
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Sex Partners	0.007	0.004	0.009	-0.121	-0.025	0.005
	(0.007)	(0.009)	(0.008)	(0.309)	(0.018)	(0.034)
	[3,566]	[3,491]	[3,549]	[3,560]	[3,578]	[3,573]
F-stat on instruments	F = 13.1	F = 12.8	F = 12.8	F = 13.5	F = 13.3	F = 13.4
Hansen J-stat on overid test	J = 1.17	J = 2.61	J = 7.94	J = 2.12	J = 1.14	J = 2.73
p-value on overid test	p = 0.56	p = 0.27	p = 0.02	p = 0.35	p = 0.57	p = 0.26

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the three main instruments. All models include the full set of controls listed in Appendix Table 1 along with the added controls in column (4).

Table 9. Robustness Checks on Timing of Sex Partners and Relevance of Male PDI

	Panel I: Subtract Prior Year's Sex Partners (2SLS)		
	Years of Schooling	High School	College
Number of Sex Partners - Number of Partners in Last Year	-0.109***	-0.016*	-0.019**
	(0.042)	(0.009)	(0.009)
F-stat on instruments	F = 14.3	F = 14.3	F = 14.3
Hansen J-stat on overid test	J = 0.178	J = 0.746	J = 1.61
p-value on overid test	p = 0.91	p = 0.69	p = 0.45
	[3,560]	[3,560]	[3,560]
	Panel II: Effect of Male PDI on Sex Partners (First-Stage)		
	Number of Sex Partners - Number of Partners in Last Year	Number of Partners in Last Year	Number of Sex Partners for those with Age at First Sex > 18
Average Male Physical Develop Score in Female's School	2.91***	-0.154	-0.267
	(0.729)	(0.107)	(0.724)
	[3,560]	[3,560]	[685]
	Panel III: Age at First Sex ≤ 18 (2SLS)		
	Years of Schooling	High School	College
Number of Sex Partners - Number of Partners in Last Year	-0.100**	-0.019**	-0.016
	(0.041)	(0.009)	(0.010)
F-stat on instruments	F = 10.2	F = 10.2	F = 10.2
Hansen J-stat on overid test	J = 0.135	J = 0.586	J = 0.372
p-value on overid test	p = 0.94	p = 0.75	p = 0.83
	[2,879]	[2,879]	[2,879]

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls listed in Appendix Table 1.

Table 10. Examining whether Multiple Partner Effect is Explained by Teen Childbearing or Age at First Intercourse

	Panel I: Years of Schooling					
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Sex Partners	-0.105**	-0.090**	-0.110**	-0.102*	--	-0.117*
	(0.043)	(0.040)	(0.046)	(0.057)		(0.061)
1st-Stage F-stat on instruments	F = 13.1	F = 12.6	F = 11.8	F = 9.0		F = 13.1
Age at First Intercourse	--	--	--	*Includes dummies*	0.132**	-0.025
					(0.063)	(0.097)
1st-Stage F-stat on instruments					F = 57.0	F = 57.0
Teen Childbearing	--	-0.998***	--	--	--	--
		(0.111)				
Sexually Transmitted Disease			0.227			
			(0.177)			
J-stat overid test	J = 0.324	J = 1.17	J = 0.350	J = 0.807	J = 3.18	J = 0.286
p-value overid test	p = 0.86	p = 0.56	p = 0.84	p = 0.67	p = 0.20	p = 0.59
N	3,567	3,567	3,567	3,567	3,567	3,567

	Panel II: High School					
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Sex Partners	-0.016*	-0.014	-0.017*	-0.012	--	-0.011
	(0.009)	(0.009)	(0.010)	(0.011)		(0.012)
1st-Stage F-stat on instruments	F = 13.1	F = 12.7	F = 11.8	F = 9.0		F = 13.1
Age at First Intercourse	--	--		*Includes dummies*	0.026	0.010
					(0.018)	(0.023)
1st-Stage F-stat on instruments					F = 57.0	F = 57.0
Teen Childbearing	--	-0.129***		--	--	--
		(0.023)				
Sexually Transmitted Disease			0.047			
			(0.033)			
J-stat overid test	J = 0.154	J = 0.119	J = 0.270	J = 0.210	J = 0.970	J = 0.295
p-value overid test	p = 0.70	p = 0.94	p = 0.87	p = 0.90	p = 0.62	p = 0.86
N	3,567	3,567	3,567	3,567	3,567	3,567

Table 10, Continued

	Panel III: College					
	(1)	(2)	(3)	(4)	(5)	(6)
Number of Sex Partners	-0.018**	-0.015*	-0.019**	-0.024*	--	-0.027*
	(0.009)	(0.008)	(0.009)	(0.014)		(0.015)
1st-Stage F-stat on instruments	F = 13.1	F = 12.7	F = 11.8	F = 9.0		F = 13.1
Age at First Intercourse	--	--		*Includes dummies*	0.016	-0.021
					(0.014)	(0.027)
1st-Stage F-stat on instruments					F = 57.0	F = 57.0
Teen Childbearing	--	-0.192***		--	--	--
		(0.023)				
Sexually Transmitted Disease			0.032			
			(0.041)			
J-stat overid test	J = 1.44	J = 3.70	J = 2.16	J = 2.93	J = 3.64	J = 2.16
p-value overid test	p = 0.23	p = 0.16	p = 0.34	p = 0.23	p = 0.16	p = 0.34
N	3,567	3,567	3,567	3,567	3,567	3,567

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.

Table 11. Estimates of Effect of Number of Sex Partners on Years of Schooling for Males

	OLS: Twin Sample (1)	FE: Twin Sample (2)	OLS: IV Sample (3)	IV-1 (4)	IV-2 (5)	IV-3 (6)	IV-4 (7)
	Panel I: Years of Schooling						
Number of Sex Partners	0.007	-0.022	-0.019***	0.008	0.060	-0.013	-0.001
	(0.024)	(0.021)	(0.003)	(0.037)	(0.074)	(0.037)	(0.039)
	[128]	[128]	[3,323]	[3,323]	[3,323]	[3,351]	[3,322]
F-stat on instruments	--	--	--	F = 10.0	F = 8.4	F = 19.1	F = 8.7
Hansen J-stat (overid)	--	--	--	J = 1.27	--	--	J = 1.40
p-value on overid test	--	--	--	p = 0.26	--	--	p = 0.50
	Panel II: High School						
Number of Sex Partners	0.002	-0.006	-0.003***	0.008	0.015	0.005	0.003
	(0.005)	(0.004)	(0.001)	(0.008)	(0.012)	(0.009)	(0.007)
	[128]	[128]	[3,323]	[3,323]	[3,323]	[3,351]	[3,322]
F-stat on instruments	--	--	--	F = 10.0	F = 8.4	F = 19.1	F = 8.7
Hansen J-stat (overid)	--	--	--	J = 0.925	--	--	J = 2.11
p-value on overid test	--	--	--	p = 0.34	--	--	p = 0.35
	Panel III: College						
Number of Sex Partners	-0.005	-0.006	-0.003***	0.001	0.015	-0.005	0.002
	(0.005)	(0.007)	(0.001)	(0.012)	(0.020)	(0.012)	(0.010)
	[128]	[128]	[3,323]	[3,323]	[3,323]	[3,351]	[3,322]
F-stat on instruments	--	--	--	F = 10.0	F = 8.4	F = 19.1	F = 8.7
Hansen J-stat (overid)	--	--	--	J = 1.56	--	--	J = 1.86
p-value on overid test	--	--	--	p = 0.21	--	--	p = 0.40

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted FE and 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The FE sample sample includes twin brothers aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment. FE models include controls for PPVT score, bodyweight, attractiveness, and marital status. IV models include males aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and the relevant instruments. The instruments used in IV-1 are the physical development scale for boys and the male puberty index; model IV-2 includes only the male puberty index; model IV-3 includes only the physical development scale; and model IV-4 includes the male puberty index, the physical development scale, and the mean physical development score of females in the respondent's school.

Appendix Table 1. Means of Dependent and Independent Variables [1]

Dependent Variables		*Control Variables*		*Control Variables*	
Years of School Completed	13.7 (2.16)	Separated	0.042 (0.201)	Age at Wave III [3]	23.0 (0.803)
Received High School Diploma	0.845 (0.362)	Widowed	0.029 (0.169)	Class Size	26.8 (6.07)
Attended or Graduated from College	0.636 (0.481)	Divorced	0.122 (0.327)	Public School	0.940 (0.239)
Sex Partner Variables		PVT Score	99.3 (14.2)	% Enrolled in college college courses	55.0 (24.5)
Number of Sexual Partners	6.01 (6.53)	Rural	0.176 (0.381)	Small School Size	0.095 (0.294)
≥ Seven Sexual Partners	0.301 (0.459)	Suburban	0.556 (0.497)	Medium School Size [4]	0.282 (0.450)
Instruments		West	0.262 (0.440)	Severely Underweight	0.030 (0.171)
Average Male Puberty Index in Female's School	3.18 (0.191)	Midwest	0.265 (0.441)	Underweight	0.063 (0.243)
Own Puberty Index	3.22 (1.09)	South	0.345 (0.476)	At-Risk of Overweight	0.134 (0.340)
Age of Menarche	12.5 (1.63)	Catholic	0.274 (0.446)	Obese	0.081 (0.272)
County Family Planning Providers per 10,000 women [2]	1.24 (1.71)			Bulimia	0.040 (0.197)
Contraceptive-Inclusive HIV Education [2]	0.396 (0.489)	Baptist or Methodist	0.376 (0.484)		
Controls		Other Christian	0.180 (0.394)	Number biological siblings	1.62 (1.44)
Log Household Income	10.5 (0.808)	Non-Christian Relig	0.043 (0.202)	Whether have older sibling	0.503 (0.500)
Parent Completed High School	0.295 (0.456)	Black	0.217 (0.412)	Very attractive	0.212 (0.409)
Parent Trade School	0.093 (0.290)	Asian	0.075 (0.263)	Attractive	0.381 (0.486)
Parent Some College	0.194 (0.395)	Indian	0.018 (0.135)	Unattractive	0.032 (0.176)
Parent College Ed	0.136 (0.342)	Hispanic/Other	0.180 (0.384)	Very unattractive	0.023 (0.150)
Parent Post-College Education	0.090 (0.287)	Height (inches)	64.5 (2.78)	Ever Married	0.306 (0.461)
Single Parent	0.045 (0.207)	Weight (pounds)	134.5 (27.9)	Average Age of Students in Wave I School	16.3 (5.27)

[1]Sample size is 3,578. Standard deviations are in parentheses. Each of the three dependent variables, sex partner variables, age, and respondent's marital status are measured at Wave III. All other control variables are measured at Wave I.

[2]Sample size for these instruments is 3,066.

[3]Age dummies are included in each regression.

[4]All models also include controls for whether the respondent attended a high school at Wave I.

Appendix Table 2. 2SLS Estimates of Effect of Number of Sex Partners on Females' School Attainment

	Years of Schooling		High School		College	
	OLS (1)	2SLS (2)	OLS (3)	2SLS (4)	OLS (3)	2SLS (4)
Number of Sex Partners	-0.032***	-0.072**	-0.005***	-0.018**	-0.006***	-0.020**
	(0.004)	(0.035)	(0.001)	(0.008)	(0.001)	(0.008)
	[6,223]	[6,223]	[6,223]	[6,223]	[6,223]	[6,223]
F-stat on instruments (first-stage)		F = 15.8		F = 25.8		F = 15.8
Hansen J-stat on overidentification test		J = 1.03		J = 2.14		J = 0.596
p-value on overid test		p = 0.52		p = 0.34		p = 0.74

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS and 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 18-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.

Appendix Table 3. OLS Regression of Mean Male Physical Development Index on School Characteristics

	Mean Male Puberty Index
Public School	-0.038 (0.085)
General Comprehensive School (vs Specialized School)	0.053 (0.082)
School has 1-400 Students	0.020 (0.072)
School has 401-1000 Students	-0.020 (0.058)
Average Daily Attendance: 90%-94%	0.025 (0.042)
Average Daily Attendance: 85%-89%	-0.120* (0.063)
Average Daily Attendance: 80%-84%	-0.043 (0.103)
Average Daily Attendance: 75%-79%	-0.013 (0.178)
Percent of Students Enrolled in Academic/College Prep Courses	0.001 (0.001)
High School (12th Graders Attend)	0.297 (0.314)
Average Age of Students in School	-2.05 (2.55)
Average Age of Students Squared	0.066 (0.080)
School is Graded	0.94 (0.652)
Midwestern Region	-0.008 (0.050)
Southern Region	-0.071 (0.057)
Northeastern Region	-0.034 (0.053)

Appendix Table 3, Continued

Suburban	0.027 (0.050)
Rural	0.004 (0.070)
Number of Full-Time Teachers	-0.0004 (0.0006)
Average Class Size	-0.004 (0.005)
Percent of Full-Time Teachers who are Women	0.002 (0.002)
Percent of Full-Time Teachers with Master's Degrees	0.001 (0.001)
Percent of Full-Time Teachers who are White	0.004*** (0.001)
Percent of Full-Time Teacgers who are Hispanic or of Spanish Origin	-0.001 (0.002)
Number of Schools	104

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Sample is restricted to schools with non-missing observations on all of the covariates. Estimates are from unweighted OLS regressions based on data from Wave I using the sample of schools that correspond to respondents aged 22-24 at Wave III who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments.

Appendix Table 4A. 2SLS Estimates of Effect of Number of Sex Partners on Females' School Attainment

Quartile of Male Physical Development Score	Male Physical Development Score Range	Mean (StD) Number of Female Sex Partners
Top Quartile	3.33 - 3.67	6.61 (6.77)
50th-75th Percentile	3.18 - 3.33	6.34 (6.61)
25-50th Percentile	3.02 - 3.18	6.19 (6.92)
Bottom Quartile	2.56 - 3.02	1.98 (5.76)

Source: Data from Waves I and III of National Longitudinal Study of Adolescent Health. Sample restricted to females aged 22-24 at Wave III with at least one sex partner, with valid school identifier at Wave I, and non-missing information on own pubertal development.

Appendix Table 4B. Regression of Female Sex Partners on Male PDI, Controlling for Average Age of Students in School, School Size, and School Structure

	Quartile of Male Physical Development Score
Top Quartile	1.62*** (0.384)
50th-75th Percentile	1.39*** (0.373)
25-50th Percentile	1.22*** (0.454)
N	3,578

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: The omitted category is the bottom quartile. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the three main instruments. The model includes controls for mean age of students in the school, school size, and whether a junior high or high school.

Appendix Table 5. Robustness of 2SLS Estimates to Added Controls

	Main Model	Use Controls for BMI, Bulimia	(2) + Control for Stepfather	(3) + Controls for Basline Self-Esteem	(4) + Peer Effects
	(1)	(2)	(3)	(4)	(5)
	Panel I: High School				
Number of Sex Partners	-0.015*	-0.016*	-0.016*	-0.017*	-0.012
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
	[3,578]	[3,578]	[3,578]	[3,578]	[3,578]
F-stat on instruments	F = 13.3	F = 13.6	F = 12.8	F = 12.8	F = 10.6
Hansen J-stat on overid test	J = 0.356	J = 0.539	J = 0.628	J = 0.750	J = 1.04
p-value on overid test	p = 0.84	p = 0.76	p = 0.73	p = 0.69	p = 0.59
	Panel II: College				
Number of Sex Partners	-0.017**	-0.019**	-0.018*	-0.020**	-0.015*
	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)
	[3,578]	[3,578]	[3,578]	[3,578]	[3,578]
F-stat on instruments	F = 13.3	F = 13.6	F = 12.8	F = 12.8	F = 10.6
Hansen J-stat on overid test	J = 1.90	J = 1.27	J = 1.03	J = 1.00	J = 1.16
p-value on overid test	p = 0.39	p = 0.53	p = 0.60	p = 0.61	p = 0.56

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls listed in Appendix Table 1. Model (1) includes the following instruments: (i) the number of county-level family planning clinics per 10,000 women; and (ii) the presence of a contraceptive-inclusive HIV education program as measured by the presence of a state HIV education mandate coupled with school-level provision of (or referral to) family planning services. Model (2) replaces the continuous variable *Weight* by the variables *Severely Underweight*, *Underweight*, *Overweight*, *Obese*, and *Bulimia*. Model (3) includes a control for whether the respondent's biological father does not reside in the household and the mother has had multiple marriage or marriage-like relationships in the previous 18 years. Model (4) includes a control for the continuous RSE Scale. Model (5) adds controls for the number of best friends of the respondent at Wave I who engaged in binge drinking, cigarette consumption, and marijuana use.

Appendix Table 6. Sensitivity of 2SLS Estimates of Effect of Number of Sex Partners on Years of Schooling to Instrument Choice

	Main Model	IV: Average Male Phys. Develop Index Only	IV: Average Male Phys. Develop + Avg. Hair Index	IV: Own Physical Develop Index Only	IV: Own Breast and Curves Index Only	IV: All Indexes	IV: All Indexes + Policy Instruments
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Panel I: High School						
Number of Sex Partners	-0.015*	-0.007	-0.007	-0.017	-0.015	-0.012	-0.008
	(0.009)	(0.014)	(0.014)	(0.012)	(0.014)	(0.009)	(0.007)
	[3,578]	[3,578]	[3,578]	[3,558]	[3,578]	[3,553]	[3,049]
F-stat on instruments	F = 13.3	F = 12.8	F = 6.4	F = 31.3	F = 17.8	F = 11.0	F = 12.4
Hansen J-stat (overid)	J = 0.356	--	J = 1.45	--	--	J = 2.27	J = 2.68
p-value on overid test	p = 0.84	--	p = 0.23	--	--	p = 0.52	p = 0.74
	Panel II: College						
Number of Sex Partners	-0.017**	-0.038**	-0.038**	-0.007	-0.007	-0.012	-0.019**
	(0.008)	(0.019)	(0.019)	(0.009)	(0.016)	(0.008)	(0.009)
	[3,578]	[3,578]	[3,066]	[3,558]	[3,558]	[3,553]	[3,049]
F-stat on instruments	F = 13.3	F = 12.8	F = 6.4	F = 10.9	F = 17.8	F = 11.0	F = 12.4
Hansen J-stat (overid)	J = 1.90	--	J = 0.141	--	--	J = 3.20	J = 4.16
p-value on overid test	p = 0.39	--	p = 0.71	--	--	p = 0.36	p = 0.53

*** Statistically significant at the 1% level; ** at the 5% level; * at the 10% level

Notes: Sample sizes are in brackets. Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted 2SLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls listed in Appendix Table 1.

Appendix Table 7. 2SLS Estimates of Relationship between Number of Sex Partners and Females' School Attainment

	Number of Sex Partners	Age at First Intercourse
	(1)	(2)
Average Male Physical Development in Female's School	2.64***	-0.287
	(0.730)	(0.273)
Own Puberty Index	0.646***	-0.317***
	(0.117)	(0.044)
Age of Menarche	-0.021	0.157***
	(0.066)	(0.028)
F-stat on all instruments	F = 13.1	F = 57.0
p-value on joint significance test	p = 0.00	p = 0.00
N	3,567	3,567

*** Statistically significant at the 1% level; ** at 5% the level; * at the 10% level.

Notes: Standard errors corrected for clustering at the school level are in parentheses. Estimates are from unweighted OLS regressions based on data from Waves I and III of the National Longitudinal Study of Adolescent Health. The sample includes respondents aged 22-24 who have had at least one sexual partner in their lifetime and have non-missing information on educational attainment and each of the instruments. All models include the full set of controls in Appendix Table 1 along with average age of students in the female's school, and indicators for whether the female's school is a junior high school, high school, or comprehensive school.