Southern Economic Journal 2014, 81(1), 113–134
DOI: 10.4284/0038-4038-2012.195

High School Dropouts and Sexually Transmitted Infections

D. Mark Anderson* and Claus C. Pörtner**

People who drop out of high school fare worse in many aspects of life. We analyze the relationship between dropping out of high school and the probability of contracting a sexually transmitted infection (STI). Previous studies on the relationship between dropout status and sexual outcomes have not empirically addressed unobserved heterogeneity at the individual level. Using fixed effects estimators, we find evidence supporting a positive relationship between dropping out of high school and the risk of contracting an STI for females. Furthermore, we present evidence that illustrates differences between the romantic partners of dropouts versus enrolled students. These differences suggest that female dropouts may be more susceptible to contracting STIs because they partner with significantly different types of people than do nondropouts. Our results point to a previously undocumented benefit of encouraging those at risk of dropping out to stay in school longer.

JEL Classification: I10, I20, J13

1. Introduction

People who drop out of high school do substantially worse compared to those who graduate. Dropouts earn less (Oreopoulos 2006), report lower levels of happiness (Oreopoulos 2007), commit more crimes (Lochner and Moretti 2004; Anderson, in press), and suffer from poorer health (Lleras-Muney 2005; Kemptner, Jurges, and Reinhold 2011; van Kippersluis, O'Donnell, and van Doorslaer 2011). Although the research on the consequences of dropping out is substantial, significantly less attention has been paid to the relationship between dropout status and sexual behavior. We fill this gap in the literature by examining the impact of dropping out of high school on the likelihood of contracting a sexually transmitted infection (STI).

* Department of Agricultural Economics and Economics, Montana State University, P.O. Box 172920, Bozeman, MT 59717-2920, USA; E-mail dwight.anderson@montana.edu; corresponding author.

** Department of Economics, Albers School of Business and Economics, Seattle University, Pigott 502, Box 222000, Seattle, WA 98122, USA, and Center for Studies of Demography and Ecology, University of Washington; E-mail cportner@seattleu.edu.

We would like to thank Benjamin Hansen, Shelly Lundberg, David Ribar, and Erdal Tekin for helpful comments and suggestions. This research uses data from Add Health, a project directed by Kathleen Mullan Harris and designed by J. Richard Udry, Peter S. Bearman, and Kathleen Mullan Harris at the University of North Carolina at Chapel Hill and funded by grant P01-HD31921 from the Eunice Kennedy Shriver National Institute of Child Health and Human Development, with cooperative funding from 23 other federal agencies and foundations. Special acknowledgment is due to Ronald R. Rindfuss and Barbara Entwisle for assistance in the original design. Information on how to obtain the Add Health data files is available on the Add Health Web site (http://www.cpc.unc.edu/addhealth). No direct support was received from grant P01-HD31921 for this analysis. Partial support for this research came from a Eunice Kennedy Shriver National Institute of Child Health and Human Development research infrastructure grant, 5R24HD042828, to the Center for Studies in Demography and Ecology at the University of Washington.

Received September 2012; accepted September 2013.

From a policy and social perspective, it is crucial to understand the determinants of STIs because of their health and economic consequences (Eng and Butler 1997; Weinstock, Berman, and Willard 2004). Certain STIs can lead to cancer, infertility, or even death. Treating STIs and their complications places a substantial stress on health expenditures; the costs of STIs have been estimated at $17 billion per year (Eng and Butler 1997). A focus on young people is vital because nearly half of STIs contracted occur among individuals 15–24 years of age (Weinstock, Berman, and Willard 2004), and teens and young adults account for nearly 30% of new HIV infections annually (Hall et al. 2008).

Although several studies have focused on the relationship between leaving high school early and sexual outcomes, this article is the first to examine the relationship between dropping out and the risk of STI contraction. Prior research has found that high school dropouts are more likely to lose their virginity earlier (Brewster et al. 1998), become pregnant (Manlove 1998), and give birth (Manlove et al. 2000) and are less likely to use contraception (Darroch, Landry, and Oslak 1999). Although these studies contribute to the discussion on the consequences of dropping out, none have empirically addressed the fact that the dropout decision is endogenously determined.[1] Our research improves on this literature by controlling for unobserved heterogeneity at the individual level.

In addition, much of the research on the relationship between dropping out and risky behaviors has focused on issues that are relevant primarily for one gender. For example, teenage pregnancies have a much greater impact on females, and males are more likely to engage in criminal activities. In fact, there is little research on the relationship between dropping out and risky behavior where the outcome of interest affects both males and females at similar rates. Focusing on STIs allows us to analyze the impact of dropping out for both sexes and to also observe potential short-run consequences of dropping out. Most other adverse health outcomes do not manifest until the person is much older.

To estimate the relationship between high school dropout status and the risk of contracting an STI, we employ data from the National Longitudinal Study of Adolescent Health (Add Health). Longitudinal data allow us to use a fixed effects approach to account for important sources of unobserved heterogeneity. We include individual fixed effects to control for characteristics such as individual tastes and preferences, household poverty, and parenting styles that may not only predict an individual's dropout status but also determine his or her decision to engage in risky sexual behaviors. This approach also accounts for the possibility that adolescents who grow up in disadvantaged neighborhoods may be simultaneously more likely to drop out of high school and engage in risky sex. As a result, our estimates are less likely to be biased due to sources of unobserved heterogeneity that have plagued previous studies on education and sexual behavior. Another advantage of the Add Health data is that they contain information on the characteristics of individuals. Previous studies in economics have relied on aggregated STI data despite the fact that the choice to engage in risky sex is made at the individual level.[2]

When not controlling for unobserved individual characteristics, our results suggest that both male and female dropouts have substantially higher STI rates than those who stay in

[1] The lone exception appears to be Black, Devereux, and Salvanes (2008). These authors exploited variation in compulsory schooling laws to estimate the relationship between education and teenage births.

[2] Klick and Stratmann (2003, 2008) and Girma and Paton (2011) estimated the effects of easier abortion access and emergency birth control on STI rates among young people. Chesson, Harrison, and Kassler (2000), Carpenter (2005), and Cook and Clark (2005) estimated the effects of alcohol policies on STI rates.

school. When we control for unobserved heterogeneity at the individual level, we still find evidence of a positive relationship between dropping out and the risk of STI contraction for females but not for males. A complementary analysis suggests that female dropouts face a higher STI risk because of their postdropout choice of sexual partners. Our results illustrate that females who drop out match with significantly older partners, and we find some evidence that these partners are more likely to be physically and verbally abusive.

2. Theoretical Framework

How might dropping out of high school influence an adolescent's risky sexual behavior? More specifically, what are the important mechanisms that underlie the relationship between dropping out and risky sex?

First, dropping out may impede human capital accumulation and thereby lower expected income and reduce the opportunity cost of risky behaviors, such as unprotected sex. Contraction of an STI may therefore be less costly for individuals with fewer years of schooling. While some STIs are easily treated, others have debilitating effects that can seriously impact labor market opportunities. Additionally, youth may learn important values in school that alter their tastes for engaging in risky sex (Arrow 1997).

Second, school may have an incapacitation effect; school attendance leaves less time and opportunity for potentially detrimental activities (Jacob and Lefgren 2003; Luallen 2006; Black, Devereux, and Salvanes 2008; Anderson in press). As a result, we may expect the frequency of sexual intercourse to be higher for youths who face less stringent time constraints. Adolescents are also more likely to be monitored in school as opposed to elsewhere. Previous research has demonstrated that the incapacitation effects of school decrease the probability of adolescent motherhood (Berthelon and Kruger 2011).

Finally, dropping out may change the makeup of one's social circle and thereby affect behavioral outcomes. No longer being around high school students alters the pool of available sexual partners, and the new pool of partners may be more likely to include older individuals and persons with less desirable characteristics. This may be particularly detrimental for young females, as the relative age of their sexual partners has been found to be positively associated with nonvoluntary intercourse (Kaiser Family Foundation 2011). A growing literature suggests that exposure to negative peer effects is vitally important to the health outcomes of adolescents (Gaviria and Raphael 2001; Kawaguchi 2004; Lundborg 2006).

Although we are able to provide suggestive evidence as to which underlying factors are important, we cannot pin down the exact mechanism(s) through which dropping out influences sexual behavior. We are, however, able to address to what extent the probability of STI contraction is due to (unobservable) individual characteristics.[3] Dropouts may have intrinsic characteristics that simultaneously make them more likely to drop out and engage in risky sex.

---

[3] Because of the problems associated with identifying causal effects, the literature has focused on understanding the impacts of policies designed to affect the likelihood of dropping out. Researchers have, for example, studied the effects of compulsory schooling laws (Lochner and Moretti 2004; Lleras-Muney 2005; Oreopoulos 2007; Black, Devereux, and Salvanes 2008; Anderson in press). Policy experiments, however, do not necessarily reveal the relative importance of individual-level factors that influence future outcomes.

If this is the case, dropping out serves as a marker for (potentially unobservable) characteristics, such as lower intellectual ability, a higher discount rate, or inferior social skills.

If individual characteristics are truly intrinsic and do not change with more schooling, individuals who are likely to drop out because of those characteristics will do poorly even if forced to finish high school. Addressing the importance of these individual characteristics can provide an indication of how much we might expect policies aimed at reducing dropout rates to affect risky sexual behavior and, more generally, enhance future outcomes (Eckstein and Wolpin 1999). If, instead, human capital, incapacitation, and/or peer effects are important, then policies that successfully lower the probability of dropping out will have positive social effects.

3. Data

The data used in this article come from Add Health, a nationally representative sample of adolescents in the United States who were in grades 7–12 during the 1994–1995 school year. Data collection started with the identification of over 26,000 schools that included an 11th grade and enrolled more than 30 students. From this sample frame, 80 high schools were selected to ensure representation of schools with respect to region of country, urbanicity, size, type, and ethnicity. Participating high schools were asked to identify feeder schools that included a seventh grade and sent at least five graduates to that high school. Feeder schools chosen to participate in the study were selected with the probability proportional to the number of students they contributed to the high school. After including feeders, the total number of participating schools was 132.

In wave I, data were collected from adolescents, their parents, siblings, friends, relationship partners, fellow students, and school administrators. The Add Health cohort has been followed with three subsequent in-home surveys in 1996, 2000–2001, and 2007–2008. The data include information on respondents' social, economic, psychological, and health status. In addition to individual-level information, the Add Health also contains contextual data on the family, neighborhood, school, and adolescents' peer networks (Udry 2003).

We use data from the in-home surveys from waves I and II because they contain information on self-reported sexual behaviors. By wave II, a substantial number of students reported having dropped out of school. We therefore use wave II for the cross-sectional analysis and incorporate wave I when exploiting the panel nature of the data. Waves III and IV were fielded when respondents were adults and are therefore not used.

We limit the sample to those aged 15–19 at the time of wave I. The lower limit is set at age 15 because some of the variables used in this analysis were constructed from questions that were asked only to respondents who were at least 15 years old. The upper age limit is 19 because individuals older than this were more likely to have been in high school at wave I for atypical reasons. To ensure that our comparison group consists of enrolled students, we exclude individuals from the sample who were out of school for reasons other than having dropped out. These reasons include the following: pregnancy, expulsion, sick, on leave, graduated, and "other." We also exclude individuals who reported having dropped out for only part of the school year. This restriction addresses some concerns about reverse causality in that it lowers the likelihood that an individual was diagnosed with an STI before dropping out. Finally, we exclude individuals who reported having been married at any time during wave I or II or who had missing information on their age, race, ethnicity, or place of birth. Based on our sample selection decisions, 398 females and 362 males who were in the 15–19-year age range were dropped from the sample.[4] The final sample sizes are 4222 males and 4207 females, whom we observe in both waves.

4. Estimation Strategy

To evaluate the relationship between dropping out of high school and the risk of STI contraction, our preferred approach is to estimate the following equation:

$$STI_{it} = \alpha + \beta_1 Dropout_{it} + \boldsymbol{X_{it}\beta_2} + \lambda_i + \varepsilon_{it}, \tag{1}$$

where i indexes individuals and t indexes the survey wave. The variable *STI* refers to whether the respondent had been diagnosed with an STI over a specific period discussed below, so that it is possible to be counted as infected in period 1 and not in period 2. Respondents were asked to report if they had been told by a doctor or nurse that they had any of the following STIs: chlamydia, syphilis, gonorrhea, HIV/AIDS, genital herpes, genital warts, trichomoniasis, and hepatitis B. Females were also asked if they had been diagnosed with bacterial vaginosis or nongonococcal vaginitis.

The variable *Dropout* is a binary indicator equal to one if the individual had dropped out of high school and zero otherwise. Each adolescent was asked if he or she was currently attending school.[5] If the respondent was not attending school, the interviewer asked a follow-up question as to why the respondent was not in school. An available choice was that the individual had "dropped out." The coefficient of interest, β_1, measures the relationship between dropping out and STI status. In our sample, approximately 1.6% of male high school students and 3% of female high school students reported having been diagnosed with an STI between waves I and II. In contrast, 8.1% of male dropouts and 14% of female dropouts reported having been diagnosed with an STI during the same period.

The vector $\boldsymbol{X}$ includes time-varying personal and family characteristics that may be associated with dropout status and sexual behavior. These variables include rates of church attendance, whether the respondent moved between survey waves, whether the respondent's mother strongly disapproves of her child having sex, and the respondent's aspirations for college, perceived life expectancy, and his or her propensity for impulsive behavior.[6] Table 1 provides variable definitions and descriptive statistics.

Because Add Health respondents are observed in multiple survey waves, we are able to include individual fixed effects, λ_i, on the right-hand side of Equation 1. These effects account for unobserved time-invariant factors at the individual level that may be correlated with the

[4] We compared respondent characteristics from our estimation sample with characteristics from the sample of all youths in the 15–19-year age range. There was little evidence to suggest that bias due to sample selection would be an issue.

[5] If the respondent was interviewed in the summer, the question was worded in a retrospective manner. In this case, the respondent was able to identify if he or she had dropped out for the entire previous school year or only part of the year.

[6] The measures for college aspirations and life expectancy reflect levels of future orientation. Impulsive behavior is proxied by whether the respondent generally goes with his or her "gut feeling" and does not think about consequences before making a decision.

Table 1. Descriptive Statistics

Variable	Description	Males(*N* = 4222)		Females(*N* = 4207)	
		Mean	Standard Deviation	Mean	Standard Deviation
Dependent variable					
STI[c]	Equal to 1 if respondent has been diagnosed with an STI, 0 otherwise	0.018	0.134	0.046	0.209
Baseline respondent characteristics					
Dropout[c]	Equal to 1 if respondent has dropped out of high school, 0 otherwise	0.040	0.197	0.036	0.185
Age 15[b]	Equal to 1 if respondent is 15 years old, 0 otherwise	0.039	0.193	0.033	0.179
Age 16[b]	Equal to 1 if respondent is 16 years old, 0 otherwise	0.330	0.470	0.362	0.481
Age 17[b]	Equal to 1 if respondent is 17 years old, 0 otherwise	0.321	0.467	0.325	0.468
Age 18[b]	Equal to 1 if respondent is 18 years old, 0 otherwise	0.225	0.418	0.213	0.409
Age 19[b]	Equal to 1 if respondent is 19 years old, 0 otherwise	0.075	0.263	0.062	0.241
Hispanic[b]	Equal to 1 if respondent is Hispanic, 0 otherwise	0.125	0.330	0.116	0.321
Black[b]	Equal to 1 if respondent is black, 0 otherwise	0.163	0.369	0.174	0.380
White[b]	Equal to 1 if respondent is white, 0 otherwise	0.732	0.443	0.724	0.447
Other nonwhite[b]	Equal to 1 if respondent is of another nonwhite race, 0 otherwise	0.147	0.354	0.139	0.346
U.S. born[b]	Equal to 1 if respondent was born in the United States, 0 otherwise	0.939	0.240	0.921	0.269
Family characteristics					
Moved[b]	Equal to 1 if family moved between waves I and II, 0 otherwise	0.055	0.228	0.057	0.232
Only child[a]	Equal to 1 if respondent is an only child, 0 otherwise	0.193	0.394	0.195	0.396
Only child missing[a]	Equal to 1 if only child information is missing, 0 otherwise	0.006	0.076	0.005	0.068
No religion[b]	Equal to 1 if respondent has no religion, 0 otherwise	0.157	0.364	0.131	0.338
Baptist[b]	Equal to 1 if respondent is Baptist, 0 otherwise	0.207	0.405	0.221	0.415
Christian church[b]	Equal to 1 if respondent attends Christian church (Disciples of Christ), 0 otherwise	0.089	0.285	0.082	0.274
Mormon[b]	Equal to 1 if respondent is Mormon, 0 otherwise	0.011	0.103	0.013	0.112
Methodist[b]	Equal to 1 if respondent is Methodist, 0 otherwise	0.054	0.226	0.060	0.237
Catholic[b]	Equal to 1 if respondent is Catholic, 0 otherwise	0.254	0.436	0.250	0.433
Jewish[b]	Equal to 1 if respondent is Jewish, 0 otherwise	0.009	0.092	0.010	0.102
Protestant[b]	Equal to 1 if respondent is Protestant, 0 otherwise	0.038	0.192	0.025	0.157
Other religion[b]	Equal to 1 if respondent is of another religion, 0 otherwise	0.180	0.384	0.208	0.406
Religion missing[b]	Equal to 1 if religion information is missing, 0 otherwise	0.005	0.070	0.005	0.068
Church attendance 1[c]	Equal to 1 if respondent did not attend church last year, 0 otherwise	0.269	0.443	0.220	0.414

Table 1. Continued

Variable	Description	Males(N = 4222)		Females(N = 4207)	
		Mean	Standard Deviation	Mean	Standard Deviation
Church attendance 2[c]	Equal to 1 if respondent went to church less than once per month last year, 0 otherwise	0.183	0.386	0.194	0.396
Church attendance 3[c]	Equal to 1 if went to church at least once per month last year, 0 otherwise	0.525	0.499	0.571	0.495
Church attendance missing[c]	Equal to 1 if church attendance information is missing, 0 otherwise	0.023	0.151	0.015	0.122
Mother's education 1[a]	Equal to 1 if mother has less than a high school degree, 0 otherwise	0.143	0.350	0.168	0.374
Mother's education 2[a]	Equal to 1 if mother has high school degree or GED, 0 otherwise	0.323	0.468	0.329	0.470
Mother's education 3[a]	Equal to 1 if mother has more schooling than a high school degree, 0 otherwise	0.419	0.494	0.419	0.493
Mother's education missing[a]	Equal to 1 if mother's education information is missing, 0 otherwise	0.116	0.320	0.084	0.278
Father's education 1[a]	Equal to 1 if father has less than a high school degree, 0 otherwise	0.107	0.309	0.112	0.315
Father's education 2[a]	Equal to 1 if father has high school degree or GED, 0 otherwise	0.224	0.417	0.225	0.418
Father's education 3[a]	Equal to 1 if father has more schooling than a high school degree, 0 otherwise	0.363	0.481	0.336	0.472
Father's education missing[a]	Equal to 1 if father's education information is missing, 0 otherwise	0.306	0.461	0.326	0.469
Father present[a]	Equal to 1 if biological father was present at the time of wave I, 0 otherwise	0.529	0.499	0.519	0.500
Father present missing[a]	Equal to 1 if information on biological father's presence is missing, 0 otherwise	0.117	0.321	0.126	0.331
Parental income 1[a]	Equal to 1 if total household income is less than $40,000, 0 otherwise	0.379	0.485	0.381	0.486
Parental income 2[a]	Equal to 1 if total household income is between $40,000 and $80,000, 0 otherwise	0.308	0.462	0.291	0.455
Parental income 3[a]	Equal to 1 if total household income is greater than $80,000, 0 otherwise	0.097	0.297	0.105	0.306
Parental income missing[a]	Equal to 1 if total household income information is missing, 0 otherwise	0.215	0.411	0.223	0.416
Public assistance[a]	Equal to 1 if mother receives public assistance, such as welfare, 0 otherwise	0.099	0.299	0.100	0.300
Public assistance missing[a]	Equal to 1 if information on public assistance is missing, 0 otherwise	0.014	0.119	0.004	0.067
Sex disapproval[c]	Equal to 1 if respondent thinks mother strongly disapproves of him or her having sex, 0 otherwise	0.382	0.486	0.551	0.498
Sex disapproval missing[c]	Equal to 1 if information on mother's disapproval is missing, 0 otherwise	0.070	0.255	0.053	0.225
Additional respondent characteristics					
PVT score[a]	Add Health Picture and Vocabulary Test score	97.33	25.36	96.35	24.50
PVT score missing[a]	Equal to 1 if Picture and Vocabulary Test score is missing	0.045	0.208	0.040	0.197
College goals[c]	Scale of respondent's college aspirations (1 = low aspirations, 5 = high aspirations)	4.047	1.405	4.163	1.432
College goals missing[c]	Equal to 1 if college aspirations information is missing, 0 otherwise	0.033	0.179	0.053	0.223
Life expectancy[c]	Scale of odds respondent thinks he or she will live to 35 (1 = almost no chance, 5 = almost certain)	4.229	0.941	4.331	0.883

Table 1. Continued

Variable	Description	Males(N = 4222) Mean	Males(N = 4222) Standard Deviation	Females(N = 4207) Mean	Females(N = 4207) Standard Deviation
Life expectancy missing[c]	Equal to 1 if life expectancy information is missing, 0 otherwise	0.003	0.055	0.004	0.061
Gut feeling[c]	Scale reflecting if respondent makes decisions based on a "gut feeling" without thinking about the consequences (1 = strongly agrees he or she goes with "gut feeling," 5 = strongly disagrees he or she goes with "gut feeling")	2.957	1.155	3.187	1.156
Gut feeling missing[c]	Equal to 1 if "gut feeling" information is missing, 0 otherwise	0.003	0.057	0.004	0.061

Wave II values were used for the OLS analysis.
[a] Measured during wave I and included only in the OLS analysis.
[b] Measured during wave II and included only in the OLS analysis.
[c] Measured during both waves and included in the OLS analysis and the fixed effects analysis.

dropout decision and the risk of STI contraction. All regressions are estimated with standard errors corrected for clustering at the school level.

A potential issue with the estimation of Equation 1 is that the dependent variable in wave I captures whether the respondent had been diagnosed with at least one STI before the beginning of the wave I survey, whereas in wave II the dependent variable captures whether the respondent had been diagnosed with at least one STI between waves I and II. Fortunately, in our case, this discrepancy should bias our estimates downward; holding everything else equal, the likelihood of reporting an STI in wave I, that is, before dropping out occurs, is higher than in wave II. We experimented with excluding individuals who were infected in the first period but not the second. Using this sample, the coefficient of interest was generally larger in magnitude and measured with more precision, providing further support for the conclusions we reach below.[7]

Finally, it is important to note that individual-level fixed effects do not purge our estimates of all potential biases. First, no information is available on the exact timing of events. As a result, some infections may have preceded the dropout outcome, thus ruling out a causal interpretation for these cases. Second, to the extent that contracting an STI negatively affects a student's academic performance, students who are on the margin of dropping out may do so as a result of contracting an STI, leading to reverse causality issues. We discuss these two issues further below. Finally, the fixed effects do not control for time-varying unobservable characteristics. We control for a variety of time-varying characteristics below but cannot entirely rule this out as a source of bias.[8]

5. Results

Before proceeding to the results based on the estimation of Equation 1, Table 2 presents ordinary least squares (OLS) estimates from regressions that rely on STI data from only wave II and, as a result, do not include individual fixed effects. Each column represents the results from a separate regression, and only the coefficient estimate of interest, β_1, is reported.[9] To inspect the extent to which background characteristics explain the association between dropout and STI status, we examine increasingly rich specifications. The first group of specifications (columns 1 and 2) include standard individual characteristics, including age, ethnicity, race, and whether the respondent was born in the United States. These estimates illustrate a positive and statistically significant relationship between dropout and STI status. Males and females who drop out of high school are 6.3 and 14.6 percentage points more likely to report having been

---

[7] These results are available from the authors on request.

[8] An instrumental variables strategy could, in principle, be used to control for reverse causality and unobserved time-varying heterogeneity. This approach was attempted. However, given the Add Health data, identifying a valid set of instruments was difficult. Following other research (Campolieti, Fang, and Gunderson 2010), we used county and local unemployment rates as instruments, but these variables performed poorly in predicting dropout status in the first stage. We also considered county- and local-level industry composition rates, government expenditures on education, labor force participation rates by age, proportions of the population with high school diplomas, and lagged school-level dropout rates. None of these variables predicted adolescent dropout status sufficiently enough to avoid the problems common to weak instruments (Bound, Jaeger, and Baker 1995; Staiger and Stock 1997).

[9] The full results are presented in Appendix A.

Table 2. Dropping Out and Sexually Transmitted Infections

	(1)Males	(2)Females	(3)Males	(4)Females	(5)Males	(6)Females
Dropout	0.063**	0.146***	0.053*	0.123**	0.053*	0.110**
	(0.030)	(0.054)	(0.028)	(0.052)	(0.028)	(0.052)
N	4222	4207	4222	4207	4222	4207
Baseline covariates	Yes	Yes	Yes	Yes	Yes	Yes
Family covariates	No	No	Yes	Yes	Yes	Yes
Additional individual-level covariates	No	No	No	No	Yes	Yes

Each cell represents a separate OLS estimate. Regressions are weighted by the sample weights provided by Add Health. The covariates are described in Table 1. Standard errors, shown in parentheses, are corrected for clustering at the school level.

* Significant at the 10% level.

** Significant at the at 5% level.

*** Significant at the at 1% level.

diagnosed with an STI, respectively. The estimate for males is statistically significant at the 0.05 level, while the estimate for females is statistically significant at the 0.01 level.

The second group (columns 3 and 4) adds family attributes, including whether the family moved between survey waves, whether the respondent was an only child, rates of church attendance and religious denomination, parental education and income indicators, whether the respondent's mother received public assistance (e.g., welfare),[10] whether the respondent's biological father was living in the household at the time of the wave I interview, and whether the respondent's mother strongly disapproved of her child having sex. In these specifications, the coefficient estimates remain positive in sign, large in magnitude, and statistically significant.

The last group (columns 5 and 6) adds additional individual-level characteristics, including the respondent's score on the Add Health Picture and Vocabulary Test, aspirations for college, perceived life expectancy, and propensity for impulsive behavior.[11] Again, the coefficient estimates remain positive in sign, large in magnitude, and statistically significant.[12]

Table 3 shows the fixed effects results based on the estimation of Equation 1 using the data from waves I and II of the Add Health.[13] Waves I and II were only one year apart, and most unobserved characteristics correlated with dropout and STI status were likely constant over this period, but in an attempt to assess the sensitivity to time-variant heterogeneity, we present results with and without time-varying controls. For males, dropping out of high school

[10] Previous studies using state-level data have shown that welfare payments are positively related to rates of fertility, illegitimacy, and STIs (Ozawa 1989; Matthews, Ribar, and Wilhelm 1997; Clarke and Strauss 1998; Garfinkel et al. 2003; Ressler, Waters, and Watson 2006). While this research uniformly supports the hypothesis that higher welfare payments reduce the costs of nonmarital fertility and risky sex, there is significant variation regarding the size of the effect. Horvath-Rose, Peters, and Sabia (2008) found evidence suggesting that welfare reform policies are endogenous to state-level nonmarital birth rates. There is less evidence from individual-level studies that welfare policies have had detectable effects on sexual behavior. Ribar (1994) found little evidence that monthly state Aid to Families with Dependent Children benefits influenced the likelihood that a female gave birth before the age of 20. Lundberg and Plotnick (1995) showed that higher welfare benefits increased rates of premarital childbearing for white females but not for blacks.

[11] The Add Health Picture and Vocabulary Test proxies cognitive ability.

[12] We also estimated regressions where we pooled the samples from both waves but did not include individual fixed effects. These estimates, available from the authors on request, were generally larger in magnitude and estimated with more precision than those presented in Table 2.

[13] Table 3 reports both the number of individuals in the data set and the number of observations. The latter is twice the size of the former because we observe each individual in both waves.

Table 3. Dropping Out and Sexually Transmitted Infections (Individual Fixed Effects)

	Individual Fixed Effects without Time-Varying Controls		Individual Fixed Effects with Time-Varying Controls	
	Males	Females	Males	Females
Dropout	0.019	0.095*	0.023	0.098*
	(0.040)	(0.056)	(0.041)	(0.056)
N	8444	8414	8444	8414
Individuals	4442	4207	4442	4207

Each cell represents a separate individual fixed effects estimate. Regressions are weighted by the sample weights provided by Add Health. The time-varying controls include church attendance, whether the respondent moved, sentiment of mother toward sexual behavior, college aspirations, life expectancy, and an indicator for making decisions based on a "gut feeling." Standard errors, shown in parentheses, are corrected for clustering at the school level.
* Significant at the 10% level.
** Significant at the at 5% level.
*** Significant at the at 1% level.

is associated with an increase in the likelihood of STI contraction by 1.9–2.3 percentage points. However, these estimates are nowhere near statistically significant. For females, dropping out of high school is associated with an increase in the likelihood of STI contraction by 9.5–9.8 percentage points, and these estimates are statistically significant at the 0.10 level. Because contracting an STI requires having had sex, we also considered models where virgins were excluded from the analysis. The results changed little under this specification.

Robustness of Individual Fixed Effects

In Table 4, we analyze the robustness of the individual fixed effects results. We report results for three different samples: the primary sample based on 15–19-year-olds, a sample based on 15–18-year-olds, and a sample with no age restrictions.[14] The estimates based on the models that include time-varying controls from Table 3 are shown in the first cell for reference.

When we restrict the sample to individuals aged 15–18, we see little change in the estimates. For females, dropping out is associated with a 9.7-percentage-point increase in the likelihood of STI contraction, but this estimate is not statistically significant at conventional levels (p-value = 0.118). When no age restrictions are made, the results again change little from those based on the 15–19-year-old sample. For females, dropping out is associated with a 9.4-percentage-point increase in the likelihood of STI contraction, and this estimate is statistically significant at the 0.10 level. Across all three estimates, none are statistically different from each other.

In the second row, we exclude those who are infected with HIV/AIDS from the sample. This is done primarily to address concerns regarding reverse causality. Although evidence suggests that increases in sexual activity can have adverse impacts on academic performance (Sabia 2007; Sabia and Rees 2009, 2011, 2012), we believe it is unlikely that being diagnosed with a less serious STI would cause a youth to leave school entirely. Of the individuals in wave II of the Add Health who tested positive for an STI, roughly 65% were diagnosed with an STI that is curable with antibiotics. Roughly 20% tested positive for herpes or genital warts. While not curable, herpes and warts are treatable and can be managed effectively. Dropping out of

[14] The sample of 15–18-year-olds is also restricted to respondents who were enrolled in grades 9–12 at the time of the wave I survey.

Table 4. Dropping Out and Sexually Transmitted Infections (Robustness Checks)

	15–19-Year-Olds		15–18-Year-Olds		No Age Restrictions	
	Males	Females	Males	Females	Males	Females
1. Baseline estimates	0.023 (0.041)	0.098* (0.056)	0.017 (0.039)	0.097 (0.062)	0.024 (0.039)	0.094* (0.056)
N	8444	8414	7722	7894	12,200	12,804
2. Exclude cases of HIV/AIDS from the sample	−0.014 (0.035)	0.079 (0.051)	−0.013 (0.023)	0.071 (0.049)	−0.010 (0.034)	0.076 (0.051)
N	8380	8394	7668	7878	12,126	12,766
3. Include those that dropped out for only part of the year	0.017 (0.039)	0.083 (0.052)	0.011 (0.042)	0.081 (0.056)	0.018 (0.036)	0.078 (0.051)
N	8516	8472	7780	7940	12,276	12,870
4. Exclude those who were dropouts at wave I	0.024 (0.042)	0.091 (0.057)	0.017 (0.039)	0.097 (0.062)	0.025 (0.040)	0.088 (0.057)
N	8398	8370	7722	7894	12,152	12,760
5. Standard errors corrected for clustering at the individual level	0.023 (0.041)	0.098* (0.055)	0.017 (0.038)	0.097* (0.057)	0.024 (0.039)	0.094* (0.055)
N	8444	8414	7722	7894	12,200	12,804
6. Conditional on having had sex	0.009 (0.051)	0.095 (0.065)	0.032 (0.051)	0.083 (0.055)	0.009 (0.049)	0.086 (0.065)
N	3258	3164	2926	2944	3702	3592

Each cell represents a separate individual fixed effects estimate. Regressions are weighted by the sample weights provided by Add Health. All models include the time-varying controls listed in the note to Table 3. With the exception of the estimates presented in row 5, standard errors, shown in parentheses, are corrected for clustering at the school level.
* Significant at the 10% level.
** Significant at the at 5% level.
*** Significant at the at 1% level.

high school may be a more likely outcome for an individual who has contracted an STI such as HIV. However, as stated above, we cannot entirely rule out this source of endogeneity because the data do not allow us to precisely sort out the timing of events. When we exclude those from the sample who were infected with HIV/AIDS, the result for females remains large in magnitude and implies that dropping out is associated with a 7.1–7.9-percentage-point increase in the likelihood of STI contraction, but these estimates are not statistically significant at conventional levels.

In the third row, we alter the baseline sample by including those individuals who had dropped out for only part of the school year as opposed to the entire year. For females, the coefficient estimates remain positive and relatively large in magnitude but are measured with less precision than our baseline estimates.

In the fourth row, we exclude individuals who were dropouts at the time of the wave I interview. This restriction ensures that individuals are the same with respect to dropout status at the time of the wave I interview. An identifying assumption of the individual fixed effects model is that those who drop out and those who stay continuously enrolled share common unobserved time trends. This assumption may be violated if the effects of dropping out are cumulative. Under this specification, dropping out is associated with an 8.8–9.1-percentage-point increase in the likelihood of STI contraction for females, but these estimates are not statistically significant at conventional levels.

In the fifth row, we present results where the standard errors are corrected for clustering at the individual level rather than the school level. Inference remains generally the same when clustering at the individual level, but the estimate for 15–18-year-olds is now statistically significant at the 0.10 level.[15]

Finally, we estimate Equation 1 conditional on the respondents having had sexual intercourse. Because STI contraction requires sexual activity, limiting the sample to those who report having had sex may be more appropriate than considering the sample in its entirety. However, it is important to note that many of the STIs we study can be transmitted through means other than vaginal sex (e.g., oral sex). When making this restriction, dropping out is associated with an 8.3–9.5-percentage-point increase in the likelihood of STI contraction for females, but these estimates are not statistically significant at conventional levels.[16]

While many of the results for females in Table 4 are measured less precisely than our baseline estimate for 15–19-year-olds, all are positive in sign and large in magnitude. Overall, these results provide supporting evidence that females who drop out are at a heightened risk for STI contraction. The Table 4 estimates for males are usually positive in sign but are small in magnitude and nowhere near statistically significant.

Dropping Out and Other Risky Behaviors

The identifying assumption underlying our individual fixed effects procedure is that $E(\varepsilon_{(t+1)} - \varepsilon_t \mid Dropout_{(t+1)} - Dropout_t) = 0$. This assumption is violated if there are time-varying unobservable characteristics that are correlated with dropout status and the likelihood of STI contraction. As mentioned above, because waves I and II were conducted only one year apart, it is likely that most unobserved personal characteristics that are correlated with sexual behavior and dropout status are relatively constant over this period. In Table 3, we observed that the results were robust to the inclusion of a set of time-varying controls. The possibility

---

[15] This is equivalent to estimating robust standard errors. We perform this exercise because both dropout and STI status are measured at the individual level. If we were interested in the effect of school policies or other school-level characteristics, then only correcting our standard errors for clustering at the school level would be relevant (Moulton 1990).

[16] We also considered a robustness check where we constructed the counterfactual based on a propensity score matching technique. Our results were robust to this alternative method but were omitted for the sake of brevity. These estimates are available from the authors on request.

Table 5. Dropping Out and Other Risky Behaviors

	Males	Females
Cigarette use in past month	−0.017	0.122**
	(0.040)	(0.050)
Mean of dependent variable	0.345	0.339
N	8460	8444
Alcohol use in past year	−0.159***	−0.052
	(0.055)	(0.058)
Mean of dependent variable	0.522	0.516
N	8530	8506
Heavy alcohol use in past year	0.066*	0.034
	(0.036)	(0.026)
Mean of dependent variable	0.054	0.034
N	8530	8506
Drug use in past month	−0.036	−0.090
	(0.064)	(0.066)
Mean of dependent variable	0.193	0.164
N	8158	8270
Gotten into a regrettable sexual situation due to drinking in past year	−0.034	−0.039
	(0.068)	(0.044)
Mean of dependent variable	0.096	0.098
N	8580	8532

Each cell represents a separate individual fixed effects estimate. Regressions are weighted by the sample weights provided by Add Health. All models include the time-varying controls listed in the note to Table 3. Standard errors, shown in parentheses, are corrected for clustering at the school level.

* Significant at the 10% level.

** Significant at the at 5% level.

*** Significant at the at 1% level.

remains, however, that the association between dropping out and STI contraction is explained by an overall change in recklessness.

To address this issue further, we present results from fixed effects models on the relationship between dropout status and other risky behaviors in Table 5. In particular, we consider the following binary outcomes: cigarette use in the past month, alcohol use in the past year, heavy alcohol use in the past year, drug use in the past month, and whether the respondent had a regrettable sexual encounter that was due to alcohol in the past year. Not surprisingly, estimates from OLS models without individual fixed effects (not shown here) indicate positive and often statistically significant relationships between dropout status and the risky behaviors listed above.[17] When including individual fixed effects, only heavy alcohol use by males and cigarette use by females share a positive and statistically significant relationship with dropout status. In fact, the majority of the estimates in Table 5 are negative. Of particular interest are the negative and statistically insignificant results for regrettable sexual encounters. If our relationship of interest is explained by an overall change in recklessness, then we would expect this outcome to be particularly sensitive to dropping out. Overall, the results in Table 5 suggest that the positive relationship between dropping out and STI contraction is not explained by a general change in behavior.

[17] These results are available from the authors on request.

Potential Mechanisms

Our results show that female dropouts are more likely to contract STIs, even after controlling for unobservable individual characteristics, whereas there is little evidence of an effect for males. In this section, we consider several possible mechanisms that could be driving these findings. We outlined three possible theoretical explanations above. First, the lower human capital of dropouts makes it less costly to engage in risky sex. Second, no longer being in school means that adolescents are less likely to be supervised and have more time and opportunity for risky behavior. Third, the makeup of a dropout's social circle changes and the new pool of potential partners may increase the probability of STI contraction.

One way to examine whether human capital or incapacitation effects matter is to estimate how dropping out impacts an adolescent's sexual behavior. The top panel of Table 6 illustrates individual fixed effects results of dropping out on whether the respondent used a condom during last intercourse and whether the respondent had sex during the three months before each survey round. If lower human capital leads to more risky sex, we would expect to see a decrease in condom use as a result of dropping out. The coefficient estimates on condom use are actually negative in sign, but neither the effect for males nor that for females is measured with precision.[18] If being in school leads to an incapacitation effect or more supervision, we would expect dropouts to be more likely to engage in sex. Although both coefficient estimates on recent sexual intercourse are positive, neither the effect for males nor that for females is measured with precision.

To further examine what drives the increase in STIs, the bottom panel of Table 6 presents results where the following outcome variables are regressed on dropout status: number of reported sexual partners since wave I, number of sexual partners since wave I (conditional on having had sex), average age of romantic partner, and whether the respondent reports being physically or verbally abused by their romantic partner.[19] Because of wave I data limitations, individual fixed effects analyses were not possible for these outcomes. The results are therefore from simple OLS regressions based on outcomes measured during wave II. Of course, these results come with the caveat that the effect of dropping out may be biased due to unobserved heterogeneity at the individual level.

The bottom panel of Table 6 indicates that female dropouts have roughly one more sexual partner than females who stay enrolled. However, this result loses statistical significance when conditioning on prior sex; as we saw above, female dropouts are no more likely to have been sexually active over the past three months. For males, it appears there is little difference in the number of sexual partners for dropouts versus enrolled students.

The bottom panel of Table 6 also highlights that female dropouts' partners are nearly one and a half years older than those of female high school students, and this estimate is statistically significant at the 0.01 level. Dropping out is also associated with a 7.2-percentage-point increase in the likelihood that a female reports being physically or verbally abused by her romantic partner, but this estimate is not statistically significant at conventional levels. While

---

[18] The results for recent condom use are conditional on previously having had sex.

[19] Ideally, we would like to directly observe how a dropout's peer group changes upon leaving school. While the Add Health allows each respondent to nominate peers, data are available only for peers who are themselves a part of the survey. As a result, it is not possible to observe the characteristics of a peer if that individual is a high school dropout who did not attend a school in the Add Health sample or is too old to show up in the sample even if not a dropout.

Table 6. Potential Mechanisms

	Males	Females
Individual fixed effects results for sexual behavior outcomes		
Condom use during last intercourse	0.013	0.040
	(0.086)	(0.089)
Mean of dependent variable	0.660	0.529
N	2520	2608
Sex during past 3 months	0.022	0.047
	(0.064)	(0.068)
Mean of dependent variable	0.301	0.341
N	7798	8008
Sexual and romantic partner outcomes		
Number of sexual partners since wave I interview	0.345	0.991**
	(0.469)	(0.463)
Mean of dependent variable	1.286	0.887
N	4218	4259
Number of sexual partners since wave I interview (conditional on having had sex)	0.134	0.923
	(0.626)	(0.648)
Mean of dependent variable	2.498	1.780
N	1596	1580
Average age of romantic partner	0.059	1.427***
	(0.178)	(0.401)
Mean of dependent variable	15.85	17.49
N	2790	3133
Physically or verbally abused by romantic partner	0.058	0.072
	(0.059)	(0.054)
Mean of dependent variable	0.123	0.131
N	2813	3141

Each cell in the top panel represents a separate individual fixed effects estimate. Each cell in the bottom panel represents a separate OLS estimate. Regressions are weighted by the sample weights provided by Add Health. The models in the top panel include the time-varying controls listed in the note to Table 3. The models in the bottom panel include the covariates listed in Table 1. Standard errors, shown in parentheses, are corrected for clustering at the school level.

* Significant at the 10% level.
** Significant at the at 5% level.
*** Significant at the at 1% level.

all estimates are positive in sign for males, none are measured with any precision.[20] The apparent lack of change in sexual behavior for male dropouts supports the null findings on STI status for this group.

The results for sexual and romantic partner outcomes indicate that female dropouts engage in romantic relationships with significantly different types of people. Their partners are not only older on average but also more likely to be abusive. STI rates are increasing in age for this group, and previous research has documented that females in abusive relationships are more worried about contracting STIs (Wingood and DiClemente 1997). These results indicate a

[20] The sample sizes for the models estimated in the bottom two rows of Table 6 are greatly reduced because the "Relationship Information" module in the Add Health data set is fraught with missing data. In addition, numerous individuals reported not having been in a romantic relationship.

possible explanation for the disparity in STI status between female dropouts and female high school students.

6. Conclusion

This article makes three important contributions to the literature. First and foremost, we estimate the relationship between dropping out of high school and the likelihood of STI contraction, an outcome previously unstudied. Using longitudinal data, we are able to estimate fixed effects models that control for unobserved heterogeneity at the individual level. Second, our research highlights a formerly unexplored pathway through which dropping out can affect future prospects, that of sexual partner choice and availability. Third, we contribute to the economic literature on the determinants of STIs by focusing on the link between education and risky sexual behavior and by using individual-level reports of STI status rather than relying on aggregated state-level rates.

Both male and female dropouts exhibit substantially higher STI rates than those who stay in school if unobserved heterogeneity is ignored. Controlling for individual fixed effects, we find that dropping out is associated with a much higher risk of STI contraction for females but not for males. Overall, the results indicate that dropping out is associated with roughly a 9–10-percentage-point increase in the likelihood that a female student will contract an STI. This implies that over 70% of the difference in the mean rate of STI status between female dropouts and females who stay in school can be explained by dropping out. However, despite our striking results, it is imperative to note that we cannot entirely rule out reverse causality and time-varying confounders as potential sources of endogeneity. These caveats need to be kept in mind by readers when drawing causal inferences.

What accounts for the difference in our findings between males and females? One explanation is that females are more likely to see a doctor regularly for OB-GYN checkups and infections are therefore more likely to be detected. This explanation, however, is unlikely to account for the large differences we observe. A more compelling hypothesis is that peer groups change and dropouts enter into significantly different romantic relationships than nondropouts. We find evidence to support this argument. Female dropouts match with substantially older males and are also more likely to be in abusive relationships, although this latter association is not statistically significant at conventional levels. Additionally, these differences suggest that romantic partner and peer effects are important mechanisms underlying the relationship between dropping out and the risk of STI contraction. To the extent that sexual behavioral outcomes either directly or through other pathways affect future prospects, our results indicate an important role for public policy in inducing those at risk from dropping out to remain in school longer.

What do these results imply for the scope and effectiveness of policies aimed at reducing dropout rates? Eckstein and Wolpin (1999) argued that the effects of individual characteristics for high school dropouts are so strong that even very restrictive policies will not materially impact graduation rates or other outcomes. They concluded that policies that do not change individual traits would have little impact on future labor market outcomes of youths who are kept in school. Contrary to Eckstein and Wolpin (1999) and taken at face value, our results indicate that controlling for time-invariant heterogeneity at the individual level does not explain away the relationship between dropping out of high school and STI contraction for females. For males, the opposite is the case; when we control for unobservable characteristics, there is no difference between dropouts and those who stay in school in terms of STI risk.[21]

Our estimates highlight that policies aimed at reducing dropout rates may impact males and females quite differently. For example, we might expect an increase in the minimum dropout age to be substantially more effective for females than for males in preventing STI contraction. To the extent that these effects translate to other outcomes, future research on dropout policies should consider the differences between males and females as well as other potentially important sources of heterogeneity. Future research will also benefit from identifying factors that lead to differential effects between genders.

[21] It is clear, however, that there is still a strong individual-characteristics effect for male dropouts on the risk of contracting an STI. Furthermore, it is possible that these results mask a causal decrease in human capital for males.

Appendix A: Dropping Out and Sexually Transmitted Infections (Full Table 2 Results)

	(1)Males	(2)Females	(3)Males	(4)Females	(5)Males	(6)Females
Dropout	0.063**	0.146***	0.053*	0.123**	0.053*	0.110**
	(0.030)	(0.054)	(0.028)	(0.052)	(0.028)	(0.052)
Age 16	−0.007	−0.004	−0.011	−0.003	−0.010	−0.004
	(0.012)	(0.017)	(0.013)	(0.017)	(0.013)	(0.017)
Age 17	0.002	0.010	−0.001	0.009	0.001	0.009
	(0.014)	(0.017)	(0.014)	(0.018)	(0.014)	(0.018)
Age 18	−0.013	0.029	−0.015	0.026	−0.012	0.028
	(0.012)	(0.019)	(0.012)	(0.019)	(0.013)	(0.019)
Age 19	0.005	0.016	−0.001	0.010	0.001	0.017
	(0.019)	(0.022)	(0.019)	(0.023)	(0.021)	(0.027)
Hispanic	0.006	−0.004	−0.004	−0.013	−0.006	−0.017
	(0.009)	(0.017)	(0.010)	(0.017)	(0.010)	(0.018)
Black	0.023**	0.056***	0.020*	0.047***	0.013	0.042***
	(0.011)	(0.013)	(0.011)	(0.012)	(0.011)	(0.013)
Other nonwhite	−0.001	0.020	0.001	0.021	−0.000	0.022
	(0.009)	(0.018)	(0.009)	(0.017)	(0.009)	(0.017)
U.S. born	0.005	0.022	0.003	0.024*	0.009	0.026*
	(0.010)	(0.013)	(0.010)	(0.014)	(0.010)	(0.016)
Moved	—	—	−0.026***	0.018	−0.025***	0.014
			(0.008)	(0.024)	(0.008)	(0.024)
Only child	—	—	0.002	0.028**	0.004	0.030**
			(0.007)	(0.013)	(0.007)	(0.013)
Only child missing	—	—	−0.023*	0.042	−0.025*	0.037
			(0.013)	(0.051)	(0.013)	(0.052)
Baptist	—	—	−0.011	0.004	−0.013	0.005
			(0.020)	(0.020)	(0.020)	(0.020)
Christian church	—	—	−0.011	0.019	−0.013	0.022
			(0.015)	(0.021)	(0.015)	(0.021)
Mormon	—	—	−0.012	−0.008	−0.014	−0.004
			(0.015)	(0.021)	(0.015)	(0.021)
Methodist	—	—	−0.001	0.002	−0.001	0.004
			(0.024)	(0.023)	(0.024)	(0.023)
Catholic	—	—	−0.009	0.007	−0.010	0.010
			(0.015)	(0.023)	(0.015)	(0.020)
Jewish	—	—	−0.013	−0.005	−0.007	0.006
			(0.014)	(0.023)	(0.013)	(0.024)
Protestant	—	—	−0.004	−0.016	−0.005	−0.015
			(0.024)	(0.021)	(0.024)	(0.021)
Other religion	—	—	−0.009	0.012	−0.010	0.015
			(0.017)	(0.021)	(0.017)	(0.021)
Religion missing	—	—	−0.030	0.023	−0.016	0.009
			(0.031)	(0.033)	(0.032)	(0.033)
Church attendance 2	—	—	0.002	0.019	0.003	0.020
			(0.009)	(0.015)	(0.009)	(0.015)
Church attendance 3	—	—	−0.005	−0.000	−0.004	0.000
			(0.008)	(0.012)	(0.008)	(0.012)
Church attendance missing	—	—	−0.002	−0.055***	−0.007	−0.043**
			(0.026)	(0.020)	(0.027)	(0.017)
Mother's education 2	—	—	−0.021*	−0.010	−0.020*	−0.008
			(0.012)	(0.015)	(0.012)	(0.015)

Appendix A: Continued

	(1)Males	(2)Females	(3)Males	(4)Females	(5)Males	(6)Females
Mother's education 3	—	—	−0.034**	−0.011	−0.030**	−0.007
			(0.013)	(0.015)	(0.012)	(0.015)
Mother's education missing	—	—	−0.039**	0.049*	−0.039**	0.048*
			(0.018)	(0.028)	(0.017)	(0.028)
Father's education 2	—	—	0.008	−0.002	0.008	−0.001
			(0.012)	(0.017)	(0.012)	(0.017)
Father's education 3	—	—	0.008	−0.012	0.011	−0.007
			(0.013)	(0.016)	(0.013)	(0.016)
Father's education missing	—	—	0.022	0.003	0.021	0.005
			(0.016)	(0.017)	(0.016)	(0.017)
Father present	—	—	0.004	0.012	0.004	0.012
			(0.008)	(0.015)	(0.008)	(0.015)
Father present missing	—	—	−0.026*	0.007	−0.023	0.006
			(0.015)	(0.021)	(0.014)	(0.021)
Parental income 2	—	—	−0.004	0.002	−0.003	0.003
			(0.007)	(0.011)	(0.007)	(0.011)
Parental income 3	—	—	0.001	−0.005	0.003	−0.002
			(0.008)	(0.015)	(0.008)	(0.016)
Parental income missing	—	—	0.017	−0.005	0.014	−0.006
			(0.014)	(0.015)	(0.014)	(0.015)
Public assistance	—	—	0.011	0.024	0.009	0.021
			(0.014)	(0.018)	(0.014)	(0.018)
Public assistance missing	—	—	−0.031***	−0.041**	−0.033	−0.045***
			(0.009)	(0.019)	(0.009)	(0.016)
Sex disapproval	—	—	0.001	−0.024**	0.003	−0.020**
			(0.006)	(0.011)	(0.006)	(0.010)
Sex disapproval missing	—	—	0.029	−0.021	0.028	−0.015
			(0.019)	(0.037)	(0.019)	(0.038)
PVT score/10	—	—	—	—	−0.005**	−0.001
					(0.002)	(0.004)
PVT score missing	—	—	—	—	−0.062**	−0.046
					(0.027)	(0.041)
College goals	—	—	—	—	0.003	−0.010
					(0.002)	(0.007)
College goals missing	—	—	—	—	0.002	−0.061
					(0.015)	(0.039)
Life expectancy	—	—	—	—	−0.008**	−0.008
					(0.004)	(0.006)
Life expectancy missing	—	—	—	—	−0.053**	−0.086***
					(0.023)	(0.026)
Gut feeling	—	—	—	—	−0.005**	−0.004
					(0.002)	(0.004)
Gut feeling missing	—	—	—	—	−0.033**	−0.072***
					(0.014)	(0.025)
N	4222	4207	4222	4207	4222	4207

Each column represents a separate OLS regression. Regressions are weighted by the sample weights provided by Add Health. Standard errors, shown in parentheses, are corrected for clustering at the school level.

* Significant at the 10% level.
** Significant at the at 5% level.
*** Significant at the at 1% level.

References

Anderson, D. Mark. In press. In school and out of trouble? The minimum dropout age and juvenile crime. *Review of Economics and Statistics*.

Arrow, Kenneth. 1997. The benefits of education and the formation of preferences. In *The social benefits of education*, edited by Jere Behrman and Nevzer Stacey. Ann Arbor, MI: University of Michigan Press, pp. 11–6.

Berthelon, Matias, and Diana Kruger. 2011. Risky behavior among youth: Incapacitation effects of school on adolescent motherhood and crime in Chile. *Journal of Public Economics* 95:41–53.

Black, Sandra, Paul Devereux, and Kjell Salvanes. 2008. Staying in the classroom and out of the maternity ward? The effect of compulsory schooling laws on teenage births. *Economic Journal* 118:1025–54.

Bound, John, David Jaeger, and Regina Baker. 1995. Problems with instrumental variables estimation when the correlation between the instruments and the endogenous explanatory variable is weak. *Journal of the American Statistical Association* 90:443–50.

Brewster, Karin, Elizabeth Cooksey, David Guilkey, and Ronald Rindfuss. 1998. The changing impact of religion on the sexual and contraceptive behavior of adolescent women in the United States. *Journal of Marriage and Family* 60:493–504.

Campolieti, Michele, Tony Fang, and Morley Gunderson. 2010. Labour market outcomes and skill acquisition of high-school dropouts. *Journal of Labor Research* 31:39–52.

Carpenter, Christopher. 2005. Youth alcohol use and risky sexual behavior: Evidence from underage drunk driving laws. *Journal of Health Economics* 24:613–28.

Chesson, Harrell, Paul Harrison, and William Kassler. 2000. Sex under the influence: The effect of alcohol policy on sexually transmitted disease rates in the United States. *Journal of Law and Economics* 43:215–38.

Clarke, George, and Robert Strauss. 1998. Children as income-producing assets: The case of teen illegitimacy and government transfers. *Southern Economic Journal* 64:827–56.

Cook, Robert, and Duncan Clark. 2005. Is there an association between alcohol consumption and sexually transmitted diseases? A Systematic Review. *Sexually Transmitted Diseases* 32:156–64.

Darroch, Jacqueline, David Landry, and Selene Oslak. 1999. Age differences between sexual partners in the United States. *Family Planning Perspectives* 31:160–7.

Eckstein, Zvi, and Kenneth Wolpin. 1999. Why youths drop out of high school: The impact of preferences, opportunities, and abilities. *Econometrica* 67:1295–339.

Eng, Thomas, and William Butler. 1997. *The hidden epidemic: Confronting sexually transmitted diseases.* U.S. Institute of Medicine, Committee on Prevention and Control of Sexually Transmitted Diseases. Washington, DC: National Academy Press.

Garfinkel, Irwin, Chien-Chung Huang, Sara Mclanahan, and Daniel Gaylin. 2003. The roles of child support enforcement and welfare in non-marital childbearing. *Journal of Population Economics* 16:55–70.

Gaviria, Alejandro, and Steven Raphael. 2001. School-based peer effects and juvenile behavior. *Review of Economics and Statistics* 83:257–68.

Girma, Sourafel, and David Paton. 2011. The impact of emergency birth control on teen pregnancy and STIs. *Journal of Health Economics* 30:373–80.

Hall, H. Irene, Ruiguang Song, and Philip Rhodes, et al. (2008). Estimation of HIV incidence in the United States. *Journal of the American Medical Association* 300:520–9.

Horvath-Rose, Ann, Elizabeth Peters, and Joseph Sabia. 2008. Capping kids: The family cap and nonmarital childbearing. *Population Research and Policy Review* 27:119–38.

Jacob, Brian, and Lars Lefgren. 2003. Are idle hands the devil's workshop? Incapacitation, concentration, and juvenile crime. *American Economic Review* 93:1560–77.

Kaiser Family Foundation. 2011. ''Sexual Health of Adolescents and Young Adults in the United States.'' Accessed 3 March 2011. Available http://www.kff.org/womenshealth/upload/3040-05-2.pdf.

Kawaguchi, Daiji. 2004. Peer effects on substance use among American teenagers. *Journal of Population Economics* 17:351–67.

Kemptner, Daniel, Hendrik Jurges, and Steffen Reinhold. 2011. Changes in compulsory schooling and the causal effect of education on health: Evidence from Germany. *Journal of Health Economics* 30:340–54.

Klick, Jonathan, and Thomas Stratmann. 2003. The effect of abortion legalization on sexual behavior: Evidence from sexually transmitted diseases. *Journal of Legal Studies* 32:407–34.

Klick, Jonathan, and Thomas Stratmann. 2008. Abortion access and risky sex among teens: Parental involvement laws and sexually transmitted diseases. *Journal of Law, Economics, and Organization* 24:2–21.

Lleras-Muney, Adriana. 2005. The relationship between education and adult mortality in the United States. *Review of Economic Studies* 72:189–221.

Lochner, Lance, and Enrico Moretti. 2004. The effect of education on crime: Evidence from prison inmates, arrests, and self-reports. *American Economic Review* 94:155–89.

Luallen, Jeremy. 2006. School's out … forever: A study of juvenile crime, at-risk youths and teacher strikes. *Journal of Urban Economics* 59:75–103.

Lundberg, Shelly, and Robert Plotnick. 1995. Adolescent premarital childbearing: Do economic incentives matter? *Journal of Labor Economics* 13:177–200.

Lundborg, Petter. 2006. Having the wrong friends? Peer effects in adolescent substance use. *Journal of Health Economics* 25:214–33.

Manlove, Jennifer. 1998. The influence of high school dropout and school disengagement on the risk of school-age pregnancy. *Journal of Research on Adolescence* 8:187–220.

Manlove, Jennifer, Elizabeth Terry, Laura Gitelson, Angela Papillo, and Stephen Russel. 2000. Explaining demographic trends in teenage fertility, 1980–1995. *Family Planning Perspectives* 32:166–75.

Matthews, Stephen, David Ribar, and Mark Wilhelm. 1997. The effects of economic conditions and access to reproductive health services on state abortion rates and birthrates. *Family Planning Perspectives* 29:52–60.

Moulton, Brent. 1990. An illustration of a pitfall in estimating the effects of aggregate variables on micro units. *Review of Economics and Statistics* 72:334–8.

Oreopoulos, Philp. 2006. Estimating average and local average treatment effects of education when compulsory schooling laws really matter. *American Economic Review* 96:152–75.

Oreopoulos, Philip. 2007. Do dropouts drop out too soon? Wealth, health and happiness from compulsory schooling. *Journal of Public Economics* 91:2213–29.

Ozawa, Marth. 1989. Welfare policies and illegitimate birth rates among adolescents: Analysis of state-by-state data. *Social Work Research and Abstracts* 14:5–11.

Ressler, Rand, Melissa Waters, and John Watson. 2006. Contributing factors to the spread of sexually transmitted diseases. *American Journal of Economics and Sociology* 65:943–61.

Ribar, David. 1994. Teenage fertility and high school completion. *Review of Economics and Statistics* 76:413–24.

Sabia, Joseph. 2007. Reading, writing, and sex: The effect of losing virginity on academic performance. *Economic Inquiry* 45:647–70.

Sabia, Joseph, and Daniel Rees. 2009. The effect of sexual abstinence on educational attainment. *Demography* 46:695–715.

Sabia, Joseph, and Daniel Rees. 2011. Boys will be boys: Are there gender differences in the effect of sexual abstinence on schooling? *Health Economics* 20:287–305.

Sabia, Joseph, and Daniel Rees. 2012. Does the number of sex partners affect educational attainment? Evidence from female respondents to the Add Health. *Journal of Population Economics* 25:89–118.

Staiger, Douglas, and James Stock. 1997. Instrumental variables regression with weak instruments. *Econometrica* 65:557–86.

Udry, J. Richard. 2003. The National Longitudinal Study of Adolescent Health (Add Health), Waves I & II, 1994–1996; Wave III, 2001–2002 [machine-readable data file and documentation]. Chapel Hill: Carolina Population Center, University of North Carolina at Chapel Hill.

van Kippersluis, Hans, Owen O'Donnell, and Eddy van Doorslaer. 2011. Long-run returns to education: Does schooling lead to an extended old age? *Journal of Human Resources* 46:695–721.

Weinstock, Hillard, Stuart Berman, and Cates Willard, Jr. 2004. Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. *Perspectives on Sexual and Reproductive Health* 36:6–10.

Wingood, Gina, and Ralph DiClemente. 1997. The effects of an abusive primary partner on the condom use and sexual negotiation practices of African-American women. *American Journal of Public Health* 87:1016–8.