The Effect of State-Level Sex Education Policies on Youth Sexual Behaviors[1]

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Abstract

Two types of sex education are generally offered in the United States: abstinence-only and comprehensive sex education. There is no clear scientific consensus over which approach minimizes the risk of unintended pregnancy and sexually transmitted diseases for teens. While there have been many studies of specific programs in clinical or quasi-experimental settings, there are very few evaluations of how state-level sex education policies affect the youth population. We estimate the impact of various state-level sex education policies on youth sexual activity and contraceptive use using data from four waves of the Youth Risk Behavior Surveillance System from 39 states. We find that states that require sexuality (sex and/or HIV/STD) education and contraceptive content or states that mandate education but leave the actual content up to local districts have lower rates of sexually active teens and higher rates of contraception use when teens are sexually active. States that require sexuality education and require abstinence content increase the rate at which teens are sexually active, and teens in those states are less likely to use hormonal birth control if they are sexually active.

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1. Introduction

In the United States, two types of sex education are generally offered to students in public schools: abstinence-only and comprehensive sex education (D. B. Kirby, 2008). Abstinence-only programs aim to decrease negative outcomes associated with teen sex by advocating abstinence from all sexual activity as the only acceptable behavioral option for teens until marriage, while comprehensive (or abstinence-plus) programs also educate students about the pregnancy and disease prevention benefits of contraception (Perrin & DeJoy, 2003). Both approaches have critics and advocates, and there is no clear scientific consensus regarding the superiority of either philosophy. This lack of scientific consensus has not served to moderate the policy debate. One difficulty is that while there have been studies that examine the (causal) relationship between the receipt of sex education and youth sexual behavior (Sabia, 2006), there is very little evidence about the effect – if any – that state-level sex education *policies* have at the (youth) population level. Thus, while much attention, political capital and emotion is regularly expended in attempts to change sex education laws by state legislatures, it is unclear whether state policies matter.

This paper will address this lack of evidence directly by estimating the impact of various state-level sex education policies on youth sexual activity and contraceptive use. We use data on individual high school student sexual behaviors from four waves (2004, 2006, 2008 and 2010) of the Youth Risk Behavior Surveillance System (YRBS) from 39 states. We merge a set of comprehensive measures of state sex and HIV/AIDS education regulations onto the YRBS. Although

considerable variation in state regulations exists regarding the type of education (sex vs. HIV/AIDS) and the content (abstinence-only vs. contraception), little research on the impact of such policies on reproductive health outcomes for youth exists. One likely reason for this gap stems from the fact that state-level sex education policies are difficult to categorize (Brown, 1997; Constantine, 2008). Instead of developing our own classifications of state sex education policy, we rely on characterizations maintained for more than a decade by the Alan Guttmacher Institute, a group that focuses on providing information regarding sexual and reproductive health. Our analysis also controls for the potential endogeneity of state sex education policies in our models of student decision-making. Our findings suggest that laws requiring comprehensive sex education decrease sexual activity and raise contraceptive use for youth who are sexually active, while state policies that mandate abstinence only serve to increase sexual activity and decrease hormonal contraceptive use among youth who are sexually active. The paper concludes with a discussion of the implications of these findings.

2. The Policy Debate:

Policy debate surrounding school-based sex education in the United States has historically been cyclical in nature – with different approaches dominating the discussion in different decades – but has generally always been contentious. The earliest policy debates were prompted by a coalition of clergy, temperance activists and physicians in the early decades of the 20th Century who advocated increased access to (largely) pregnancy prevention education in public schools (Irvine, 2004).

These issues became increasingly salient with the introduction of birth control pills and other effective means of contraception. During the 1960s, the Sex Information and Education Council of the United States (SIECUS) was formed to promote comprehensive sex education in the nation's schools (Irvine, 2004; SIECUS, 2012).

Over time the debate moved to whether or not it was appropriate for schools to educate students about sex (Boonstra, 2009). Due to growing concerns regarding teenage pregnancy and AIDS prevention in the 1970s and 1980s, sex education became more popular, and states began developing sex education policies (Boonstra, 2009). The focus of the debate then shifted to the content of sex education. Congress passed the Adolescent Family Life Act (AFLA) in 1981, which provides federal grant money to programs focused on abstinence-only sex education (Boonstra, 2009). As of 2009, AFLA had spent $13 million in support of abstinence-only sex education programs (Boonstra, 2009).

As part of the 1996 welfare reform, Congress instituted a $50 million a year matching grant for states spanning 1998-2002 that funded abstinence-only programs (Daley, 1997; Perrin & DeJoy, 2003; Trenholm et al., 2007). This policy set specific requirements for abstinence-only education (Perrin & DeJoy, 2003; Santelli et al., 2006; Trenholm et al., 2007). Initially, the policy indicated that not all of the guidelines needed to be met (although they could not be contradicted) in order to receive funding. However in 2000, $20 million was dedicated to programs that satisfied all eight of the federal requirements for abstinence-only education, and this funding level eventually doubled (Perrin & DeJoy, 2003; Youth, 1999). Opponents of abstinence-only sex education efforts argue that comprehensive sex

education can be more effective by promoting abstinence for youth who have yet to initiate sex but also teaching contraception for youth who are sexually active (D. B. Kirby, 2008).

Despite the focus on abstinence-only sex education by policy makers at the Federal and (most) state levels, public attitudes have been very consistently ambivalent about it. In the mid-1990s around 93 percent of respondents to an opinion poll expressed the view that sex education should be part of school curriculum and 92 percent believed that pregnancy prevention should be part of that education (Mayer, 1997). Currently, national estimates find that over 80 percent of U.S. adults favor providing comprehensive education in schools (Bleakley, Hennessy, & Fishbein, 2006). Surveys in individual states find similar super-majority support for comprehensive sex education rather than abstinence-only education (Eisenberg, Bernat, Bearinger, & Resnick, 2008; Raymond et al., 2008). As a result, a number of states began rejecting Federal abstinence-only education funds.

3. What is Known about the Impacts of Sex Education

3.1 Specific Programs

Although there are few studies focused on the evaluation of state sex education policies, the literature contains multiple analyses of specific sex education programs and curricula. In a review of abstinence and comprehensive sex education programs in the United States, Kirby (2008) summarized findings of studies examining the impacts of nine abstinence sex education programs and 48

comprehensive sex education programs. He found that three of the nine abstinence programs were shown to result in beneficial outcomes, including delayed sexual initiation, reduced sexual frequency, and reduced number of partners. The other abstinence programs reviewed did not have any positive effect on reproductive health behaviors of participants.

Of the comprehensive sex education programs Kirby reviewed, he found that approximately two-thirds of these programs had positive benefits including delayed sexual initiation and increased condom use. Kirby concluded that this review supports the expansion of comprehensive sex education but calls the continuation of abstinence-only programs into question (D. B. Kirby, 2008). Advocates for Youth, an organization that works to improve adolescent responsibility and decision-making with regard to reproductive health related issues, produced a review of the evaluation literature identifying programs that had been shown to be successful. (Alford, Bridges, & Gonzalez, 2011) Of the 26 qualifying programs, 23 included some comprehensive education aspect.

In 1997, Congress sanctioned an evaluation of the Title V, Section 510 Abstinence Education Program. This evaluation was completed by Mathematica and focused on four Title V, Section 510 abstinence education programs over a multi-year period using an experimental research design. Overall, the findings indicated a lack of beneficial impact of abstinence-only sex education programs. More specifically, researchers found no difference in the treatment and control groups with regard to abstention from sexual activity, number of partners, or differences in

initiation of sexual activity. The researchers did not find evidence of negative effects of these programs either (Trenholm et al., 2007).

A major hurdle in much of the literature evaluating the effect of sex education on youth is the potential for endogenous selection effects: youth who engage in risky behaviors may be more likely to receive sex education (or, remember receiving it) than youth who do not engage in risky behaviors. Such selection bias may lead researchers to mis-measure the direction of the treatment effect from sex education. One of the few studies in the literature to systematically assess whether selection effects are important and address them was by Joseph Sabia (Sabia, 2006). He used two years of data from the National Longitudinal Study of Adolescent Health (AddHealth) to evaluate whether youth exposed to sex education were more likely to have worse outcomes; these included: early initiation, more frequent sex, more unprotected sex, becoming pregnant and contracting a STD.

Sabia found that failure to control for non-random selection likely accounts for many of the significant effects observed in the literature. His instrumental variables based findings suggest that sex education did not significantly change sexual frequency or contraceptive use; however, he did find that sex education was associated with earlier sexual initiation. Our work presented here will be expand upon that of Sabia in that we will: 1) use newer data (repeated cross-section) on a larger population; 2) examine behaviors over a much longer time frame; 3) avoid the endogeneity concerns raised by Sabia using a method that directly controls for

the unobservables associated with selection, and 4) measure the effect of state *policies*, rather than measure the effect of program receipt as he did.

3.2. State Policy Effects

Given the energy with which state and Federal policy makers debate the relative merits of mandating abstinence-only or comprehensive sex education, one would expect an equally vibrant literature evaluating the variety of state policies' effects on youth sexual behaviors and outcomes. However, the policy evaluation literature on the topic is remarkably sparse. To our knowledge only two studies have attempted to link state-level policies to actual outcomes. The first by Hogben, Chesson and Aral linked the impact of abstinence only requirements at the state level to STD rates in the U.S. (Hogben, Chesson, & Aral, 2010). Using a panel of state-level gonorrhea and chlamydia rates from 2001 to 2005, they found that states that mandate abstinence education had higher rates of STD than states with no mandate. They were, however, unable to control for unobservable characteristics of the states that might have been correlated with both adopting the abstinence-only mandate and with the STD rates.

The second study examined the relationship between state-level teen birth rates and 13 measures of average state classroom coverage of sex education topics (for example, HIV infection prevention, pregnancy prevention, STD prevention, and so forth) (Cavazos-Rehg et al., 2012). They found little consistent evidence of average educational effects on teen fertility. However, there were a number of factors that may have contributed to their null findings. First, they did not attempt

to characterize the actual state policies but rather relied on a bi-annual survey of school health educators to determine whether students were taught about specific issues; thus they could not evaluate state policy directly. They were also limited to 24 states. Finally, they attempted to control for unobservable characteristics of states using (essentially) fixed effects, which absorbed much of the variation in their data.

3.3. Difficulty in measuring state policy effects

The article by Cacazos-Rehg, et al. highlights one of the principle difficulties in conducting state policy analyses in this area: how to characterize the actual policy. State policies are complex, and there is no consistency in where a mandate might be found in legislative codes or in administrative rules. This issue was first addressed by Kirby and Scales in the early 1980s (D. Kirby & Scales, 1981). They noted then that policy characterization in the academic and advocacy literature was often based on irregular surveys and that there were a number of possible sources of confusion. These included ambiguity in the legislative language and heterogeneity in terms of exceptions and site of authority (directly dictated by the legislature or devolved to a state agency).

We found three sources of information on state sex education policies that bring the disparate laws and regulations into a unified framework and potentially allow policies to be tracked over time. The first is a series of articles in the Georgetown Journal of Gender and Law that cover 2001 to 2010 (e.g., (Natbony, 2010)). Unfortunately, while the law review authors summarize complex law, they

do not do so consistently across the entire time period. The second source of data originates from the Sexuality Information and Education Council of the United States (SIECUS), which published an annual report that, among other things, abstracts state laws and regulations related to sex education in a brief, simple and consistent format (SIECUS). These abstracts are available historically and could permit identification of key aspects of sex education laws for all states from 2002 to 2010; however, there is little consistency in the laws' language, and so the abstracts nonetheless would require significant interpretation.

A final source of information on state polices can be found in a series of monthly State Policy Briefs on sex and HIV education policies published by the Alan Guttmacher Institute ("State Policies in Brief - Sex and HIV Education," 2012). These reports are concise and consistent and are maintained historically back to the end of 2001, which allows a complete characterization of state laws over the decade of the 2000s. In addition, the staff at the Guttmacher Institute specialize in interpreting and synthesizing the various state policies, and the reports undergo continuous quality review (including retrospective corrections, when needed). Given the long time series available and specialized expertise in interpreting state laws and regulations at Guttmacher, we used this source of data to identify which states had laws that mandated or permitted sex education, HIV/STD education, contraception education and abstinence-only education.

4. Conceptual Framework for State Policies

As discussed above, one of the barriers to empirical evaluation of state sex education laws is the difficulty in characterizing the regulations and distilling complex legislative and administrative language into parsimonious measures that are suitable for quantitative analysis. The range of issues that must be considered include:

- Does state law address sex education, or HIV/AIDS education, or both?
- Does state law require sex or HIV/AIDS education, merely permit it, or is it silent on the subject?
- Does state law dictate the details of what will be taught, prohibit some topics (e.g. contraception), or require some topics?
- Does state law require abstinence be covered/stressed or that abstinence be presented as the only acceptable approach to sexuality?
- Are state laws conditional (e.g., not requiring sex education but requiring that school districts cover contraception if they choose to offer sex education)?
- When are variations in the laws important and when are they of secondary or tertiary significance (e.g., should researchers care that the legislature sets policy or that the state department of education sets it)?

It is because of this complexity that we will rely upon the abstracts of state sex education laws prepared monthly by the Alan Guttmacher Institute in their on-

going data series titled "State Policies in Brief- Sexuality and HIV Education."[2] Staff at Guttmacher have developed consistent methods to abstract state laws on the subject and have defined a number of indicators for characteristics of the requirements.

Using the Guttmacher measures as an empirical basis and grouping sex and HIV/STD education together into what we term sexuality education broadly, we assume that states (either the legislatures or Departments of Education) choose their policies based on an underlying set of preferences and constraints. Figure 1 illustrates the options as we conceptualize them. We discuss this framework in terms of sexuality education, which again we define as sex education, HIV/STD education, or both. First, states must decide whether they will require school districts to teach sexuality education. Since no state expressly prohibits sexuality education, we treat silence on the topic as equivalent to a state explicitly saying that it is permitted. In addition, some states do not require sexuality education but do dictate what must be discussed if a district opts to offer it. However, since this position still leaves the decision whether to offer any content entirely in the hands of the local districts, we also classify those states as having chosen the "No Mandated Policy" arm of Figure 1.

Then, if a state has elected to require sexuality education, it must decide whether to dictate any of the terms of that education. First, states can choose to merely require education and leave all of the decisions about content up to the individual school districts. This local control is sometimes explicit in the legislative

[2] We would like to thank Elizabeth Nash from the Alan Guttmacher Institute for providing us with the January and June issues of these policy briefs from 2002 though 2012.

or administrative language or is implicitly in force when states require sexuality education but are silent beyond that. Second, states may require that school districts cover contraception. As a practical matter, no state requires contraception education and does not require abstinence education. Third, states may mandate content and require that districts cover/stress abstinence education but not require contraception education. These three policy options are represented in the second, third and fourth outcomes in Figure 1.

Thus, we conceptualize the state policy position as the outcome of some choice on the part of policy makers. These choices may be set, at least in part, with patterns of youth sexual behaviors, teen pregnancy rates, HIV/STD rates and so forth in mind. On a theoretical level, this position runs counter to the broad sweep of the policy evaluation literature on the subject which assumes state policies are exogenously determined and then includes policy measures in unadjusted OLS regressions on the outcomes of interest. Our framework at least admits the possibility of endogeneity of state policies. This possibility need not, of course, be empirically relevant. In the next section we discuss our youth outcomes models, how state policies will be included, and how we will test whether endogeneity bias is an empirical concern, and correct for it if necessary.

5. Model of Youth Sexual Behavioral Choices:

5.1 – Model Overview

We will assume that individual youth make deliberate choices about sexual activities by weighing the costs and the benefits of those choices and allow for state

sexuality education policies to play a role in this process. To operationalize this theoretical model, we assume that each student maximizes utility across two decision nodes. First, a student will choose whether to have sex by comparing the utility received from having sex to that received from not having sex, where

$$U_{1,i,s,t} = X^{O}_{i,t}\beta_1 + X^{U}_{s,t}\beta_{1,U} + P_{s,t}\beta_{1,P} + \mu_{1,t} + \varepsilon_{1,i,s,t} \quad (1)$$

is the utility associated with any sexual activity and

$$U_{0,i,s,t} = X^{O}_{i,t}\beta_0 + X^{U}_{s,t}\beta_{0,U} + P_{s,t}\beta_{0,P} + \mu_{0,t} + \varepsilon_{0,i,s,t} \quad (2)$$

is the utility associated with no sexual activity. Utility depends on observable characteristics of the youth ($X^{O}_{i,t}$), state sexuality education policies ($P_{s,t}$), a broad secular trend (μ_t), and state-specific environmental and cultural influences – which we will assume for the moment are unobservable ($X^{U}_{s,t}$). The i^{th} student will choose to have sex if

$$U_{1,i,s,t} > U_{0,i,s,t}. \quad (3)$$

Given that there is only one decision – sexually active or not – the condition in (3) can be empirically modeled using a probit where

$$(4) \qquad \Pr[U_{1,i,s,t} > U_{0,i,s,t}] = \Phi\left(X_{i,t}^{O}\beta + X_{s,t}^{U}\beta_{U} + P_{s,t}\beta_{P} + \mu_{t}\right)$$

In the second stage of the student's decision-making, we assume that once a student has decided to be sexually active, then she must decide what birth control options, if any, to choose. Again, this choice will be made by selecting the option that maximizes her expected utility:

$$(5) \qquad U_{j,i,s,t} = X_{i,t}^{O}\alpha_{j,0} + X_{s,t}^{U}\alpha_{j,U} + P_{s,t}\alpha_{j,P} + \mu_{j,t} + \varepsilon_{j,i,s,t}$$

where the *j* subscripts now designate the birth control option, where *j= none, condom*, *hormonal*, and the other variables are the same that appear in (1) and (2) above. In this case, the choice is more complex and inherently non-ordered because there is no latent index value that crosses multiple thresholds such that the value associated with hormonal birth control is necessarily higher than the value associated with condoms or no birth control. In this case the probability that the student chooses the j^{th} birth control option is:

$$(6) \qquad \Pr[y_{j,i,s,t} = j] = \frac{e^{X_{i,t}^{O}\alpha_{j,0} + X_{s,t}^{U}\alpha_{j,U} + P_{s,t}\alpha_{j,P} + \mu_{j,t}}}{1 + \sum_{j=0}^{2} X_{i,t}^{O}\alpha_{j,0} + X_{s,t}^{U}\alpha_{j,U} + P_{s,t}\alpha_{j,P} + \mu_{j,t}}$$

Here, $y_{j,i,s,t}$ represents the observed birth control decision. This is the classic Random Utility Model of McFadden (1974) and is estimated using a multinomial logit.

5.2 Econometric Issues - Endogeneity

Consider a general model of individual behavior that is intrinsically non-linear (recalling that there are two versions above, one for any sexual activity and one for contraceptive choice):

$$(7) \qquad y_{ist} = M\left(x^{o}_{ist}\beta + P_{st}\beta_{P} + x^{u}_{st}\beta_{u}\right) + \varepsilon_{ist}$$

recall that:

- y_{ist} is the non-linear sexual behavior choice (discussed above) for the *i*th youth in state *s* and year *t*;
- x^{o}_{ist} are the observable characteristics of the individual youth;
- P_{st} are (potentially) endogenous policies of state *s* in year *t* that affect the individual's sexual choices;
- x^{u}_{st} are unobservable characteristics of state s in year t that are correlated with P_{st}.

For our purposes, P_{st} are the sex education policies set by the states. These will be determined in part by such things as the culture of sexuality of the students in the state, which are part of x^{u}_{st}. Given that, for example, this culture of sexuality also affects the choices of the individual students then x^{u}_{st} is also an important predictor of y_{ist}. However, since x^{u}_{st} is unobservable by assumption, it must be omitted in any actual regression of (7) above. Thus in actual empirical application, we can only estimate:

$$(8) \qquad y_{ist} = M\left(x^{o}_{ist}\beta + P_{st}\beta_P\right) + \eta_{ist}$$

and since by assumption P_{st} is correlated with x^{u}_{st} the estimated parameters on the policies will be biased such that $p\lim\hat{\beta}_P \neq \beta_P$.

5.2.1 A Common Solution

One common solution to this problem of omitted unobservable state characteristics would be to assume that

$$(9) \qquad x^{u}_{st} = x^{u}_{s}.$$

In other words, researchers often assume that the unobservable factors are constant over time within state, so that the fixed effects regression

$$(10) \qquad y_{ist} = M\left(x^{o}_{ist}\beta + P_{st}\beta_P + \mu_s\right) + \eta_{ist}$$

is free from the omitted variables problem associated with x^{u}_{st} because the included fixed effects μ_s subsume all time-invariant state factors.

However, this solution requires that the assumption in (9) is correct. If this assumption is wrong, and there are time-varying unobservables that should be included in (7) then there is still bias present in (10). For example, consider that some states may have a general trend towards less religiosity, while others may not. If this is the case, and if the general religious environment is predictive of youth sexual behavior, then there would be a trend in some states toward more sexual activity due to this unobservable, and this trend would not be present in other states. Of course, as long as the change in culture were always moving in the same direction and at the same pace in each state (religiosity may increase in some and

decrease in others, as long as it moves in the same direction and amount within state), then as state-specific time trend would suffice. We could then estimate:

$$(11) \qquad y_{ist} = M\left(x_{ist}^{o}\beta + P_{st}\beta_P + \mu_{st}\right) + \eta_{ist}$$

But, what if the unobservable factors do not change in a monotonic (and constant) way within state over time? For example, one might assume that underlying labor market conditions could affect the degree to which parents are able to monitor their high school child's sexual behavior. If so, the opportunity cost of sexual activity to the youth will vary with the state-specific business cycle – sometimes rising and sometimes falling over time. In addition, it is plausible that such changes in the opportunity cost of sexual activity may change in ways not captured by observable factors such as state level unemployment rates. If this example were accurate, then μ_{st} will not be monotonically correlated with the x_{st}^{u} and thus state-specific time trends will still yield parameter estimates on the P_{st} that suffer from endogeneity (omitted variables) bias.

5.2.2. Instrumental Variables for State Policy Unobservable Variables

For this reason, researchers often opt for instrumental variables as the solution to the problem of omitted unobservable state variables that would (in our model) influence both P_{st} and y_{ist} (youth sexual behavior). If it were possible to obtain some estimate of the x_{st}^{u} to include in the regression model such that (7) could be estimated directly, then bias could be avoided. One approach to this is to use Two-Stage Residual Inclusion (2SRI), which is the version of 2SLS that is

consistent for non-linear models. 2SRI corrects endogeneity from omitted variables by estimating x_{st}^{u} and then including these consistent estimates in the equation of interest, which for us is equation (7).

To see how this method works, recall that any two correlated variables can be related to each other if there is a third variable that is correlated with one (and not the other), as

$$(12) \qquad P_{ist} = r\left(z_{ist}\alpha\right) + x_{st}^{u}$$

where r(.) is a linear or non-linear correlation term.

Here $z_{ist} = \left[x_{ist}^{o} \quad w_{st}\right]$ is a vector containing both the observable variables, x_{ist}^{o}, in the behavioral model (which are at the individual level in our data) and the state level variables that serve as instruments, w_{st} (which are at the state level in our data); the instruments must satisfy the requirements that they are:

i. uncorrelated with x_{st}^{u},
ii. "strong" instruments, and
iii. excludable from (7).

For more details on these conditions see (Terza, Basu, & Rathouz, 2008; Terza, Bradford, & Dismuke, 2008). Since the efficiency with which the α are estimated is not at issue, we can assume that (12) is linear and proceed by considering the first stage regression equation

$$(13) \qquad P_{ist} = z_{ist}\alpha + x_{st}^{u}.$$

Once we recover estimates of α note that $\hat{P}_{st} = z_{st}\hat{\alpha}$ so that

$$P_{ist} - \hat{P}_{ist} = z_{ist}\alpha + x_{st}^{u} - z_{ist}\hat{\alpha} \equiv \hat{\upsilon}_{st}$$

and as long as (13) is correctly specified where $\alpha = \hat{\alpha}$ then

$$(14) \qquad \hat{\upsilon}_{st} = x^{u}_{st}$$

In other words, the residual from this first stage regression is an estimate of the state-level unobservables that are the root of the problem in estimating (7).[3] Also, as long as z_{st} vary over time, then the estimates for x^{u}_{st} will also be time varying within state as well.

With estimates of $\hat{\upsilon}_{st} = x^{u}_{st}$ at the state level in hand, these can be merged onto the individual level data. Then, (7) may be estimated directly and without any endogeneity bias – and also without the need for state-specific time trends, which are reflected in $\hat{\upsilon}_{st}$.

5.2.3 A Problem with Standard IV and a Solution

The previous section lays out a traditional IV approach to solving the problem associated with endogenous state policies (even though it is framed in the somewhat less commonly used 2SRI approach). One set of candidate instruments for state *s* would be the sex education policies of the states bordering state *s*. The policy diffusion literature has shown that border states' policies can be predictive of own-state policy. Further, border state policies should not be predictive of youth sexual choices in the state of interest. Thus, one might believe that border state policies would be viable instruments.

[3] As stated above, we recognize that there may still be individual-level (student) unobservables present (such as household income) in the second stage error term. Since we only have instruments for the state-level unobservables, (14) will not correct for the individual level omitted variables. However, the first stage residual will still correctly capture all state unobservables and so control the endogeneity for state policies, which are our parameters of interest.

However, recall that one of the conditions of being a candidate for an IV is that the instruments w_{st} contained in z_{ist} are excludable from (7). It is possible that using border state policies for instruments may fail this criterion. There may be regional cultural variables that influence both youth sexual behaviors in the state of interest and border state policies. If so, even the usual IV approach will not actually eliminate endogeneity bias. For example, consider the Southeast. We may want to predict Alabama's sexuality education policies using its border states' sexuality education policies (including: Tennessee, Mississippi, Georgia, and Florida). Although youth behaviors in Alabama should not be affected by any border state policy, it is possible that some regional characteristics, such as religiosity or political conservativism, common to all these states influence both youth sexual behaviors in Alabama and policy adoption in the border states. If this were the case, the border state policy decision would include the regional influences and would therefore not be exogenous to Alabama youths' behavior.

However, if we could purge the regional influences from the border state policy decisions, this problem could be averted. One way to accomplish this would be to recognize that the average of a set of border state policies will include the regional influence, which is constant across this set of border states in each time period. Thus, each border state policy minus the average of the border state policies will difference out the regional influences, as:

$$(15) \quad \Delta P_{jt} = P_{jt} - \bar{P}_{st}$$

Here, *j* indexes one of the border states for state *s*, and $\bar{P}_{st}$ represents the average policy in the states that border state *s*. Now, recall that equation (13) above – which

established the basis for the non-linear IV (2SRI) – is a relationship that will hold between any three variables that are correlated in the manner discussed above. Thus, in principle, we could include all of the ΔP_{jt} as instruments. However, since states have different numbers of border states, this would be inconvenient. So, we will use the modal ΔP_{jt} from all of state *s* border states as our instrument set, w_{st}.[4]

The specific policies we use as instruments to calculate modal ΔP_{jt} include border state measures of: 1) sex education; 2) HIV/STD education; 3) covering/stressing abstinence if sex education is taught; 4) covering/stressing abstinence if HIV/STD education is taught; 5) covering contraception if sex education is taught; and 6) covering contraception (condoms) if HIV/STD education is taught. These instruments are supported by two arguments. First, the literature on policy diffusion finds that states are more likely to adopt policies when their neighbors have previously adopted them (Berry & Berry, 1990). Second, while the border states may have adopted policies because of the behaviors of their own residents, they will not have done so because of the behaviors of the residents of state *s* (except for the common regional influences, which our "difference in border state averages" method eliminates). Thus, the ΔP_{jt}'s pass the conceptual test for valid instruments. As an empirical matter, they also pass the usual tests for weak instruments, with partial-F statistics well over 200 in each of our models.

[4] If there were two modes, we used the maximum of the two. Also, one state in our data, Maine, technically only has one border state, New Hampshire. For the purposes of this research, we classified New Hampshire, Vermont and Massachusetts as "bordering" Maine.

After estimating (13) using a LPM, we can recover the residual such that (14) again obtains, and we can estimate the model in (7) using 2SRI without concern that unobserved cultural influences still might plague our estimates.

5.2.4. Preferred 2SRI Estimation of Endogenous Policies

The second stage of the model thus proceeds by estimating the augmented maximum likelihood estimators for

(4a) $$\Pr[U_{1,i,s,t} > U_{0,i,s,t}] = \Phi\left(X^{O}_{i,t}\beta + P_{s,t}\beta_{P} + \mu_{t} + \hat{\upsilon}_{i,s,t}\right)$$

(6a) $$\Pr[y_{j,i,s,t} = j] = \frac{e^{X^{O}_{i,t}\alpha_{j,0} + P_{s,t}\alpha_{j,P} + \mu_{j,t} + \hat{\upsilon}_{i,s,t}}}{1 + \sum_{j=0}^{2} X^{O}_{i,t}\alpha_{j,0} + P_{s,t}\alpha_{j,P} + \mu_{j,t} + \hat{\upsilon}_{i,s,t}}$$

which are then free from endogeneity bias. They are also free of omitted variables bias associated with missing state-level variables and missing regional variables. As a technical note, unlike 2SLS in linear models, 2SRI requires that the actual values of $P_{s,t}$ (not the predicted values) be included in (4a) and (6a) along with the predicted $\hat{\upsilon}_{i,s,t}$.

Finally, all models are estimated using Stata's svy: menu of commands to account for the two-stage sample design and clustering. Since we are pooling data from many states, we also want to account for clustering at the state level. Merely combining the data into a single data set and estimating via svy: commands would

not accomplish the required clustering since each state uses the same PSU identifier (i.e., each state will have PSU units labeled "1", "2", etc.). Therefore, we create pseudo-PSUs, by generating unique state-PSU identifiers using the state FIPS code and YRBS PSU identifiers. With PSUs defined for each state, we proceed with the svy: commands in the standard way. Thus, our models control for clustering at the state level and for clustering based on the within-state multi-stage sampling design.

6. Data and Variable Specification

The primary data for our analysis are taken from the Youth Risk Behavior Surveillance (YRBS) System. This bi-annual survey was developed by the CDC beginning in 1990 and voluntarily conducted by states that opt into the system in the Spring of each odd-numbered year (February through May). Within each participating state, schools are chosen in a two-stage sampling design, and students in each school are administered a nationally-standardized survey instrument (though states have the option of dropping items that they do not wish to ask and also adding additional questions). When states have achieved adequate sample sizes and response rates, each observation is given a sampling weight based upon the Primary Sampling Unit (PSU) and within-PSU stratum. Only weighted data are released for analysis.

State participation varies each year, and the number of states that provide weighted (i.e. accessible) data also varies. In 1991, only nine states provided weighted data. By 2009, the number of available states had risen to 42. We obtained data on 39 states that participated for at least two years from the 2003

through 2009 cycles.[5] This time frame coincided with available data on state sex education policies. We extracted variables for each student describing basic socio-demographic characteristics including: age, race / ethnicity (separate indicators for African-American, Hispanic and other race status, with Caucasian as the excluded group), gender (female=1), current grade, and self-assessed overweight status (somewhat or very overweight=1).

In addition, students were asked a number of questions regarding recent sexual activity. These include whether the student has had sex in the past three months and the primary method of birth control at last sex. We use these questions to construct our two dependent variables: a binary indicator for whether the student had sex in the last three months; and a multinomial variable measuring the birth control choice at last sex (0= no birth control, 1 = condom, 2= hormonal birth control), conditional on having sex in the last three months. Recall that the birth control measure is multinomial, not ordered since there is nothing inherently "greater" about choosing condoms over hormonal birth control, for example.[6] Table 1 reports descriptive statistics. In our sample approximately 33 percent of the students reported being sexually active in the three months prior to the survey, and of those sexually active youth, about 74 percent reported using contraception (either condom or hormonal birth control) at their last sexual encounter.

[5] These states were: Alabama, Alaska, Arizona, Arkansas, Connecticut, Delaware, Florida, Idaho, Illinois, Indiana, Iowa, Kentucky, Louisiana, Massachusetts, Maine, Maryland, Michigan, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, New York, North Carolina, North Dakota, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, and Wyoming.
[6] The YRBS actually asks about several types of birth control: birth control pills, condoms, Depo-Provera, withdrawal, some other method, not sure, and no method. We combined "birth control pills" and "Depo-Provera" into a single "hormonal" category due to the low frequency of Depo-Provera use. Finally, we grouped "withdrawal" and "not sure" into the "no birth control" category.

We capture the state sexuality education environment using the base Alan Guttmacher Institute data. We will define sexuality education as encompassing sex education, HIV/STD education, or both. We measure the policy environment using three variables based on the conceptual framework illustrated in Figure 1, where

$$P_{s,t}^{A} = \begin{cases} = 1 & \textit{if state requires sexuality education but not content} \\ = 0 & \textit{otherwise} \end{cases}$$

$$P_{s,t}^{B} = \begin{cases} = 1 & \textit{if state requires sexuality education and contraception education} \\ = 0 & \textit{otherwise} \end{cases}$$

$$P_{s,t}^{C} = \begin{cases} = 1 & \textit{if state requires sexuality education and abstinence content} \\ = 0 & \textit{otherwise} \end{cases}$$

However, it is unclear *how* students get sex education in schools. Are the discussions primarily in health classes devoted to pregnancy prevention or in health classes devoted specifically to disease prevention? States have different regulations for each. So, we choose to be as general as possible with regard to the policy measures. Instead of differentiating between sex and HIV/STD education, we include both in our measure of state policies. For example, our measure of local control (the state requiring sexuality education, but not mandating content) will capture states that require sex education, HIV/STD education, or both and do not dictate content. A relatively small portion of our sample (14.5 percent, which are actually drawn from only eight states in 2003 and four states beginning in 2006) utilizes the local control option, so we will be cautious about the conclusions we draw from this set of states. About 70 percent of the states in our sample that require sexuality education and mandate abstinence education, while almost 44

percent mandate sexuality education and contraceptive coverage. It is important to note that the states mandating abstinence or contraceptive education content in sexuality education are not mutually exclusive categories.

Finally, recall that the difference between (4) and (6) and (4a) and (6a) is the assumption implicit in the first two equations that the policy variables are exogenously determined; in the second set of equations we assume the policy variables are endogenously determined. The latter case is an application of 2SRI. One useful trait of the 2SRI model is that it embeds a direct test of the presence of endogeneity bias. If the first stage error is statistically significant in (4a) or (6a), then this implies that omitted variables are important factors in determining the outcome. In that case, omitting them (i.e., by not including the estimated error terms) would lead to endogeneity bias. Thus, we are able to differentiate between the exogenous policy model in (4) and (6) and the endogenous policy model in (4a) and (6a).

7. Results

Before delving into the regression modeling results, it is helpful to examine gross differences in average youth behaviors across states that do and do not have the various sexuality education policies. Table 2 presents the results of simple t-tests on the hypotheses that the average rates of any sexual contact in the past three months and the rates of using any birth control (hormonal or condom) at last sex is the same in states that do (Law=1) and do not (Law=0) have each policy. The top number in each cell is the difference in state mean outcomes.

States that have a mandate but leave content up to local districts (column 1) and states that have a mandate and require contraception education (column 2) have statistically significantly higher rates of youth sex and lower rates of any birth control conditional on youth choosing to have sex. Additionally, we see a reduction in the frequency of youth being sexually active but still see a decrease in any birth control use when youth are sexually active for states that mandate districts offer sexuality education and cover/stress abstinence (column 3).

Thus, on an aggregate level, the impact of sex education policy appears to be mixed. However, the question is whether these mixed results will hold in more detailed multivariate regression models – particularly those that control for the potential endogeneity of the policies themselves. This is the question we explore in Tables 3-7.

Table 3 presents the first-stage results from the 2SRI models. Tables 4 and 6 present the coefficients from the probit and multinomial logit models. Although we are not interested in interpreting the coefficients from the nonlinear probit and multinomial logit models, we include these tables to present the results of the test for policy endogeneity. Recall that if the predicted residuals are significant in the second stage regressions, this indicates policy endogeneity. Tables 5 and 7 present the marginal effects of the key policy variables from the various models, rather than their coefficients. Marginal effects are interpreted as the change in the probability of a positive outcome (for equations (4) and (4a)) or in the probability of each outcome (for equations (6) and (6a)) given a one unit increase in the variable of interest. While each model includes all of the variables discussed above (and

described in each table's footnote), we only present the marginal effects of the key policy variables in Tables 5 and 7 for ease of exposition; the full set of marginal effects are available from the authors upon request.

The first stage of the 2SRI models are presented in Table 3. These results indicate that the instruments are "strong" since they are both correlated with the potentially endogenous policy variables (they all have large t-statistics individually, and are jointly significant in each first stage model) and they also pass the usual tests for weak instruments, with partial-F statistics well over 200 in each of our models.

Table 4 presents the coefficients for the impact of state policies on the probability of any sex in the last three months, assuming exogenous policies in column 1 and endogenous policies in column 2. The purpose of this set of results is to check for the presence of policy endogeneity. Since all of the first stage residuals are significant (column 2), we do find evidence of policy endogeneity.

We present the marginal effects of the impact of each policy on the probability of any sexual activity in the previous three months in Table 5. Since the results in Table 4 confirmed that the policies are endogenous, we focus our interpretation on the marginal effect in column 2, which assumes endogenous policies. Local control, or requiring sexuality education but not directing the content, decreases the probability of sexual activity in the previous three months by -17 percent. Recall, that by the end of our time period only a few of the states in our sample adopt this policy strategy; therefore, we are cautious in interpreting this result. Requiring sexuality education and mandating abstinence content raises the

probability of sexual activity in the past three months by +6 percent, while mandating sexuality education and requiring contraceptive content decreases the likelihood of sex in the past three months by -10 percent.

The coefficients from the multinomial logit models for contraceptive choice are reported in Table 6. Again, we find evidence that the policies are endogenous since the first stage residuals are significant in the behavioral regressions (column 2). For this reason, we will again focus on the marginal effects for the 2SRI models that assume policy endogeneity.

We present the marginal effects for the policy variables from the multinomial logit regressions predicting contraceptive choice in Table 7. Since we found that the policies are endogenous based on the results in Table 6, we will only discuss the marginal effects assuming policy endogeneity in the second column of Table 7. Requiring sexuality education but leaving the content up to local districts raises the probability of condom use at last sex for sexually active youth by +13 percent but has no effect on the probability of hormonal birth control use. Mandating sexuality education and abstinence content has no effect on the probability of condom use at last sex but decreases the likelihood that a sexually active youth used hormonal birth control at last sex by -3.1 percent. Finally, requiring sexuality education and contraceptive content raises the probability of condom use by +8.2 percent and hormonal birth control use by +6.6 percent at last sex, conditional on youth being sexually active.

We conducted sensitivity analyses to check the robustness of our results. First, we estimated separate models for males and females. Based on the

coefficients, we found similar results for males and females, and the coefficients from models estimated on those sub-samples were qualitatively identical to the full sample results. The one exception to this was that the male sub-sample only responds (positively) to sexuality education with contraceptive content with regard to condom use. Sexuality education with local control and sexuality education with abstinence content did not affect male condom use. We also ran a separate sensitivity analysis that broke the sample up into Caucasian and non-Caucasian groups. Like the first sensitivity analysis, the results were generally similar across the sub-samples by race and (with one exception) the same as those estimated on the full sample coefficients. We did find that the Caucasian sub-sample only increased hormonal birth control use in states that require sexuality education with contraceptive content, which differed from our full sample and non-Caucasian sample results.

9. Discussion

Requirements that schools offer sexuality education – either for pregnancy prevention or disease prevention – have been the subject of long-standing and contentious policy debates in the United States. In recent decades, one of the primary areas of disagreement and policy diversity is the requirement that schools cover or stress abstinence as the only acceptable approach to teen sexuality. This stance has been ensconced in federal and many states' education laws. Despite the ongoing controversy, however, there is very little in the way of rigorous policy impact evaluation on the subject. To address this problem, we examined data on

over 300,000 high school youth in 39 states from the 2003 through 2009 waves of the Youth Risk Behavior Surveillance System, collected in cooperation between the CDC and state departments of education.

Overall, we find that details of state policies matter. In our preferred models, we characterize policies as being: 1) mandated sexuality education with local control over content; 2) mandated sexuality education with a requirement to teach abstinence; or 3) mandated sexuality education with a requirement to teach about contraception. In conducting the analyses, we also explore whether state policies can be treated as exogenous or whether omitted unobservable characteristics of the state introduce endogeneity bias. Our results suggest that with the detailed policy variables, endogeneity bias is a concern, and so we correct for it in our preferred models using an instrumental variables estimator.

We find evidence that mandating sexuality education with local control of the content decreases the probability that high school youth had sex within the three months prior to each survey and that requiring sexuality education and contraceptive content also decreases this probability. However, since only a few of the states in our sample opt for local control, we are more confident in this result for the policy of mandating sexuality education with contraceptive content. Although we find that these policies are protective against sexual activity in the prior three months, requiring sexuality education with abstinence content increased the likelihood of sex in the past three months. Obviously, most policy makers want to design educational requirements that reduce, rather than increase, the rate of teenage sexual activity in order to lower the chances of unintended pregnancies and

sexually transmitted diseases. Our findings suggest that this goal is best met by requiring school districts to offer sexuality education that includes contraceptive content.

However, reducing the level of youth sexual activity is not the only policy goal states and districts have. Conditional on being sexually active, public health officials should want to improve the chances that a student chooses some method of pregnancy prevention (condom or hormonal) and disease prevention (condom). Requiring sexuality education but leaving the content up to local control helps accomplish both goals of pregnancy and disease prevention by increasing condom use. However, this conclusion is based on only a few states with this policy. Again, we find that requiring sexuality education with abstinence content can be harmful since it decreases the probability of hormonal birth control use at last sex for sexually active youth, although we find that this policy has no effect on the likelihood of condom use at last sex. As with the sexual activity outcome, we find that mandating sexuality education and requiring contraceptive content is beneficial with regard to pregnancy and disease prevention. The probability of both condom and hormonal birth control use generally increases with this policy stance.

In terms of policy implications, our results suggest that mandating sexuality education and leaving the content up to local control can be beneficial with regard to decreasing sexual activity and increasing condom use; however, we are concerned about suggesting this policy option due to the fact that these conclusions are based on observations from only four states by the end of our sample period. We do find more consistent policy implications when comparing requiring sexuality

education and abstinence content versus requiring sexuality education and contraceptive content. We find that the former is associated with higher levels of sexual activity and lower levels of hormonal birth control use. The latter both decreases sexual activity and increases condom and hormonal birth control use. For policy makers interested in decreasing rates of sexual activity while simultaneously increasing the likelihood of contraceptive use of youth who are sexually, our results suggest that requiring sexuality education (either sex of HIV/STD) and including contraceptive content should help achieve this goal.

Ultimately, we find that state policies regarding sex and HIV/STD education do have statistically significant effects that are meaningful in magnitude from a public health perspective. In some sense, this suggests that the debates that policy makers, advocates and community leaders have had with one another over the past several decades have been worth having. Real behavioral changes, and public health consequences, are at stake. When we examine data over a moderately long time frame taken from the majority of states, we find that requiring sexuality education and contraceptive content is protective with regard to sexual activity and contraceptive use and that requiring sexuality education and abstinence content actually increases sexual activity and decreases some types of contraceptive use.

Figure 1: Characterizing State Sexuality Education Policy

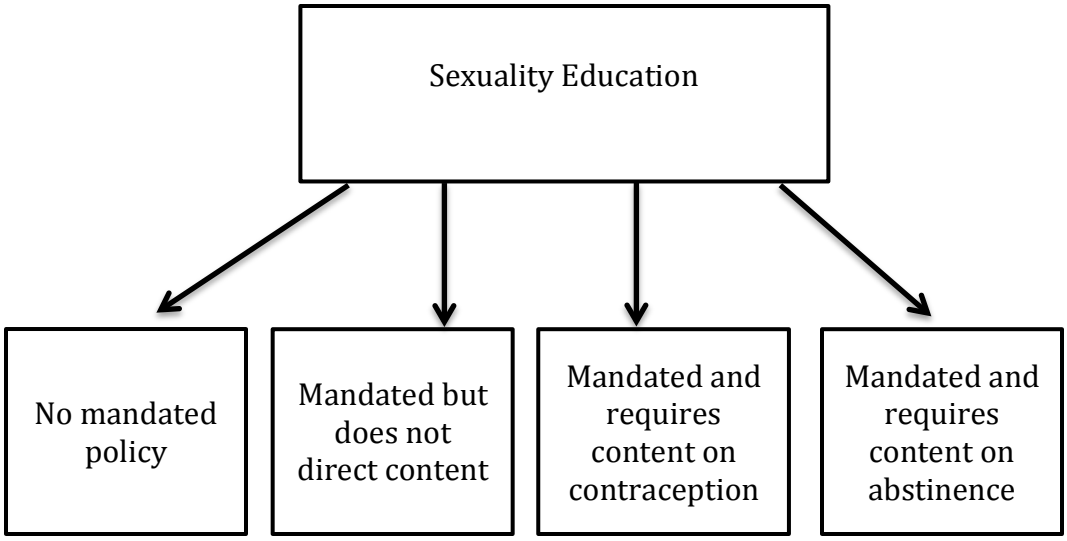

Table 1: Variable Means and Standard Deviations

	Mean	S.D.
Student has had sex within past 3 months	0.332	0.471
Student used birth control at last sexual encounter	0.742	0.438
State requires sex/HIV ed but not content	0.145	0.352
State requires sex/HIV ed and mandates abstinence ed	0.705	0.456
State requires sex/HIV ed and mandates contraceptive ed	0.439	0.496
Student age	15.90	1.266
Student is female	0.510	0.500
Student is African American	0.118	0.323
Student is Hispanic	0.162	0.369
Student is other race	0.102	0.302
Student self-assessed somewhat or very overweight	0.267	0.442
Time	5.352	2.216
Mode border states requiring sex education	-0.0481	0.316
Mode border states requiring HIV education	0.207	0.215
Mode border states requiring abstinence education in HIV ed	0.0683	0.256
Mode border states requiring contraceptive education in HIV ed	-0.0499	0.297
Mode border states requiring abstinence education in sex ed	0.0594	0.280
Mode border states requiring contraceptive education in sex ed	-0.0653	0.248
Observations	369798	

Table 2: T-Tests for Changes in Rates of Sexual Activity, Birth Control Use and Sexual Initiation, by State Requiring Sex/HIV Education

	(1) Requires Sex/HIV Education But Has No Content Requirement	(2) Requires Sex/HIV Education and Has Contraceptive Requirement	(3) Requires Sex/HIV Education and Has Abstinence Requirement
	$\mu_{Law=1} - \mu_{Law=0}$ (t-statistic)	$\mu_{Law=1} - \mu_{Law=0}$ (t-statistic)	$\mu_{Law=1} - \mu_{Law=0}$ (t-statistic)
Student has had sex within past 3 months	.007***	.007***	-.003*
	(3.03)	(4.18)	(1.67)
Student used birth control at last sexual encounter	-.011***	-.013***	-.008***
	(3.40)	(5.63)	(3.08)
Observations	314986	314986	314986

Pooled data from 2003, 2005, 2007, and 2009 Youth Risk Behavioral Survey state data.
* p<0.10, ** p<0.05, *** p<0.01

Table 3: First Stage Linear Probability Models for Endogenous Policy 2SRI Regressions

	Sex/HIV Ed - No Content	Must Cover Contraception	Must Cover Abstinence
Mode of ΔP_{jt} for requiring sex education	-0.026***	-0.25***	-0.17***
	(-12.15)	(-88.96)	(-62.48)
Mode of ΔP_{jt} for requiring HIV education	-0.23***	-0.035***	-0.32***
	(-90.09)	(-10.65)	(-101.29)
Mode of ΔP_{jt} for requiring abstinence education in HIV ed	0.19***	-0.11***	-0.18***
	(79.14)	(-36.44)	(-59.99)
Mode for ΔP_{jt} for requiring contraceptive education in HIV ed	0.30***	-0.96***	-0.81***
	(129.22)	(-324.58)	(-285.10)
Mode of ΔP_{jt} for requiring abstinence education in sex ed	-0.20***	0.12***	0.11***
	(-91.50)	(42.00)	(42.73)
Mode of ΔP_{jt} for requiring contraceptive education in sex ed	0.18***	0.39***	0.98***
	(57.31)	(94.83)	(250.64)
Student age	0.0070***	-0.021***	-0.013***
	(16.39)	(-38.80)	(-25.55)
Student is female	0.0068***	0.00081	-0.00072
	(6.27)	(0.58)	(-0.54)
Student is African American	-0.033***	0.15***	0.12***
	(-19.26)	(66.29)	(58.83)
Student is Hispanic	-0.0062***	0.15***	0.032***
	(-3.99)	(76.22)	(16.64)
Student is other race	-0.014***	0.060***	-0.011***
	(-7.43)	(25.51)	(-4.99)
Student self-assessed somewhat or very overweight	-0.0033***	-0.016***	-0.0031**
	(-2.72)	(-10.42)	(-2.05)
time	-0.024***	0.0083***	0.019***
	(-95.34)	(26.21)	(62.58)
Constant	0.24***	0.66***	0.89***
	(33.63)	(73.15)	(102.64)
N	360836	360836	360836
F	5709.1	12005.4	9246.5

* p<0.10, ** p<0.05, *** p<0.01

Table 4: Probit Coefficients for Probability of Any Sex in Last 3 Months

	(1) Exogenous Policies b/t	(2) Endogenous Policies b/t
State requires sex/HIV ed but not content	-0.060***	-0.50***
	(-4.83)	(-5.30)
State requires sex/HIV ed and mandates abstinence ed	0.0083	0.17***
	(0.64)	(4.10)
State requires sex/HIV ed and mandates contraceptive ed	-0.020	-0.29***
	(-1.52)	(-4.83)
Student age	0.28***	0.27***
	(64.65)	(63.51)
Student is female	0.078***	0.081***
	(8.83)	(9.21)
Student is African American	0.35***	0.36***
	(24.74)	(24.30)
Student is Hispanic	0.16***	0.19***
	(10.82)	(11.26)
Student is other race	0.00066	0.016
	(0.04)	(1.03)
Student self-assessed somewhat or very overweight	-0.13***	-0.14***
	(-14.63)	(-15.11)
Time	0.0041	-0.0083**
	(1.62)	(-2.42)
First stage residual for mandatory contraceptive education in sex ed		0.27***
		(4.45)
First stage residual for mandatory abstinence education in sex ed		-0.15***
		(-3.23)
First stage residual for sex education but no content requirement		0.45***
		(4.68)
Constant	-4.92***	-4.78***
	(-68.47)	(-59.39)
Observations	302296	302296

Survey weights and sampling units used in estimation.
* p<0.10, ** p<0.05, *** p<0.01

Table 5: Probit State Policy Marginal Effects for Probability of Any Sex in Last 3 Months
(Calculated at the mean of the data using coefficients from Table 3)

	(1) Exogenous Policies b/t	(2) Endogenous Policies b/t
State requires sex/HIV ed but not content	-0.021***	-0.17***
	(-4.82)	(-5.30)
State requires sex/HIV ed and mandates abstinence ed	0.0029	0.060***
	(0.64)	(4.11)
State requires sex/HIV ed and mandates contraceptive ed	-0.0070	-0.10***
	(-1.52)	(-4.83)
Observations	302296	302296

Survey weights and sampling units used in estimation.
* p<0.10, ** p<0.05, *** p<0.01

Table 6: Multinomial Logit Coefficients for Birth Control Choice

	Exogenous Policy		Endogenous Policy	
	Pr[Condom]	Pr[Hormonal BC]	Pr[Condom]	Pr[Hormonal BC]
State requires sex/HIV ed but not content	0.21***	0.12***	0.90***	1.07***
	(6.64)	(2.74)	(4.36)	(3.50)
State requires sex/HIV ed and mandates abstinence ed	0.022	-0.054	-0.24**	-0.47***
	(0.80)	(-1.34)	(-2.43)	(-3.25)
State requires sex/HIV ed and mandates contraceptive ed	0.20***	0.25***	0.70***	1.13***
	(5.94)	(5.33)	(5.17)	(5.68)
Student age	-0.051***	0.32***	-0.047***	0.33***
	(-4.53)	(18.77)	(-4.09)	(19.61)
Student is female	-0.35***	0.35***	-0.35***	0.35***
	(-15.23)	(10.42)	(-15.32)	(10.16)
Student is African American	-0.060*	-0.87***	-0.084**	-0.92***
	(-1.78)	(-14.14)	(-2.42)	(-14.72)
Student is Hispanic	-0.39***	-0.79***	-0.44***	-0.86***
	(-11.09)	(-12.97)	(-11.06)	(-13.53)
Student is other race	-0.33***	-0.59***	-0.36***	-0.64***
	(-7.86)	(-9.29)	(-8.40)	(-10.05)
Student self-assessed somewhat or very overweight	-0.20***	-0.20***	-0.19***	-0.19***
	(-7.82)	(-4.81)	(-7.49)	(-4.56)
Time	-0.025***	-0.030***	-0.0070	-0.0050
	(-4.38)	(-3.47)	(-0.86)	(-0.43)
First stage residual for mandatory contraceptive ed			-0.55***	-1.01***
			(-3.99)	(-5.04)
First stage residual for mandatory abstinence ed			0.22**	0.37**
			(2.06)	(2.43)
First stage residual for sexuality ed but no content requirement			-0.71***	-0.93***
			(-3.33)	(-2.94)
Constant	2.04***	-5.82***	1.76***	-6.32***
	(10.61)	(-20.22)	(8.58)	(-21.06)
Observations	100346		100346	

Survey weights and sampling units used in estimation.
* p<0.10, ** p<0.05, *** p<0.01

Table 7: Multinomial Logit State Policy Marginal Effects for Birth Control Choice
(Calculated at the mean of the data using coefficients from Table 5)

	Exogenous Policies		Endogenous Policies	
	Pr[Condom]	Pr[Hormonal BC]	Pr[Condom]	Pr[Hormonal BC]
	b/t	b/t	b/t	b/t
State requires sex/HIV ed but not content	0.040***	-0.0021	0.13***	0.046
	(6.02)	(-0.49)	(2.95)	(1.55)
State requires sex/HIV ed and mandates abstinence ed	0.0089	-0.0071*	-0.022	-0.031**
	(1.57)	(-1.91)	(-1.04)	(-2.23)
State requires sex/HIV ed and mandates contraceptive ed	0.028***	0.012***	0.082***	0.066***
	(4.08)	(2.70)	(2.82)	(3.48)
Observations	100346		100346	

Survey weights and sampling units used in estimation.
* p<0.10, ** p<0.05, *** p<0.01

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