Does Curriculum Matter? The Impact of HIV/AIDS vs. Comprehensive Sex Education on Fertility*

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Abstract

How do sex education and its curriculum affect fertility? We study this question using a natural experiment in which the AIDS epidemic prompted states to mandate either abstinence-focused or comprehensive sex education in schools. We compare cohorts of women in treated states who were in school when the mandates were introduced to those who had recently graduated, relative to women in states without mandates. We show that teen births increased by 6.3 per 1,000 women in states mandating abstinence-focused HIV/AIDS education, bringing forward the timing of first births without affecting lifetime fertility. In contrast, we do not find fertility effects in states that mandated comprehensive sex education. The findings suggest that abstinence-focused curricula may unintentionally increase teen births by destigmatizing sexual activity while failing to provide information on contraception.

JEL codes: I18, J13, J18

Keywords: Teen fertility; sex education; abstinence-based sex education; education mandates.

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1 Introduction

Teen birth rates in the U.S. have steadily declined since the second half of the twentieth century, falling by about 85% from 96 births per 1,000 teen girls in 1957 to 13 births per 1,000 in 2023.[1] Several factors may explain this trend, including improved access to contraception (Goldin and Katz, 2002; Bailey, 2006; Lindo and Packham, 2017; Myers, 2017; Kelly et al., 2020), shifting gender norms (Akerlof et al., 1996; Kearney and Levine, 2015b), and welfare cuts (Kearney and Levine, 2015a). The introduction of sex education in schools may have also contributed to the decline. Yet the impact of sex education on teen fertility is theoretically ambiguous, and differences in what states require schools to teach may affect teen behavior in different ways. Comprehensive sex education programs may reduce teen pregnancy by promoting informed decision-making, but could instead increase births if the programs normalize sexual activity. Abstinence-focused programs may also reduce pregnancy by discouraging sexual activity, but could increase births if teenagers engage in sex without adequate knowledge of contraception.

The debate over abstinence-focused versus comprehensive sex education remains heated in the U.S., yet evidence on how these approaches affect teen pregnancy is limited due to three key challenges. First, causal identification is difficult because sex education is often introduced endogenously, making it difficult to separate policy effects from underlying trends. Second, many studies lack variation in curricula, relying on small school-level samples or examining piecemeal changes to existing programs. Finally, no systematic database exists on sex education mandates and the exact timing of their introduction, limiting the scope for policy analysis.

This paper brings new evidence to the debate by studying state mandates that introduced sex education during the AIDS epidemic. At the time, policymakers wanted to counter

[1] Source: `https://www.congress.gov/crs-product/R45184`.

the widespread confusion about how HIV/AIDS is transmitted. Between 1987 and 1988, 13 states passed HIV/AIDS-specific education mandates, while an additional 8 states and Washington D.C. passed comprehensive sex education mandates. These policies brought sex education into many classrooms for the first time—only four states had sex education mandates prior to this period, marking a pivotal moment in the history of sex education policy.

The policy response to the AIDS epidemic provides a unique setting to evaluate the effects of sex education curricula on teen fertility. Curricula varied depending on the type of mandate that states introduced. HIV/AIDS-specific mandates emphasized abstinence-based instruction that included basic information on HIV/AIDS, but promoted abstinence as the only 100% effective method and typically omitted information on condom use. In contrast, comprehensive sex education mandates integrated HIV/AIDS instruction into a broader framework of sexual health covering anatomy, contraception, and sexually transmitted infections. The variation in curricula across states provides quasi-experimental variation in sex education content, and the public health crisis provides plausibly exogenous variation in the timing of mandates, which together form the basis for our causal identification.

We implement a difference-in-differences strategy, comparing cohorts of women in treated states who were in school when the mandates were implemented to slightly older cohorts of women who had already graduated, relative to cohorts in control states without mandates. Treated states passed either HIV/AIDS-specific or comprehensive sex education mandates between 1987 and 1988, while control states either never passed a mandate or did not pass a mandate until at least 1998. Identification assumes that women in treated and control states would have followed similar trends in outcomes in the absence of the mandates. We show that this parallel trends assumption holds over the pre-mandate period.

To conduct this analysis, a key data contribution is to compile a novel dataset on HIV/AIDS and comprehensive sex education mandates, which we build by searching through

archival state databases. We use the National Survey of Family Growth (NSFG) for data on sexual behavior and the National Vital Statistics System (NVSS) for data on births.

We find that HIV/AIDS-specific mandates *increased* teen births by 6.3 births per 1,000 women aged 15 to 19 (a 2.9 % increase on a base of 218 births per 1,000 teenage women) for cohorts still attending school relative to already-graduated cohorts, compared to women in control states. The mandates brought forward the timing of first births for treated cohorts without affecting whether they had any children or the number of children they had. We do not find fertility effects in states that mandated HIV/AIDS instruction within comprehensive sex education programs.

Our findings suggest that curriculum content matters: abstinence-based HIV/AIDS education can unintentionally increase teen childbearing, whereas more comprehensive curricula have no impact on teen childbearing. We present suggestive evidence that teenagers who received abstinence-focused instruction were more likely to engage in sex and less likely to use contraception than those who received comprehensive sex education. A possible explanation is that abstinence-focused programs frame sex as a taboo and omit information on contraception, inadvertently leading to teenagers becoming sexually active without knowing how to prevent pregnancy. In contrast, comprehensive sex education programs reduce the risk of early sexual initiation by emphasizing the associated risks and further reduce the risk of unplanned pregnancies by teaching teenagers how to use contraception effectively.

To rule out local AIDS incidence as a potential confounder, we show that our results are robust to the inclusion of state-by-year controls for local AIDS incidence. Local AIDS incidence also gradually increased in the late 1980s, so it is unlikely to drive the sharp increase in teen births among cohorts who were in school. Consistent with our findings, Spencer (2024) finds that while local AIDS incidence increased births for white women aged 30 to 44, it had no direct impact on teen births.

A large literature studies the decline in teen birth rates in the U.S. over the past six

decades (Akerlof et al., 1996; Goldin and Katz, 2002; Bailey, 2006; Kearney and Levine, 2015b; Lindo and Packham, 2017; Kelly et al., 2020; Myers, 2017). Kearney and Levine (2015a) identify the role of welfare cuts, family planning expansions, and unemployment in lowering teen births during the 1990s. While this work has studied many drivers of the long-run decline, we perhaps surprisingly find that sex education contributed to the temporary *increase* in teen births during the late 1980s and early 1990s.

A second body of work investigates whether sex education programs impact teen sexual behavior (Dawson, 1986; Marsiglio and Mott, 1986; Oettinger, 1999; Kohler et al., 2008; Lindberg and Maddow-Zimet, 2012), but provides limited causal evidence due to endogenous selection: teenagers more likely to engage in risky behaviors may also be more likely to receive sex education than their less risk-prone peers. These studies typically compare the outcomes of individuals who did and did not receive sex education, controlling for observables. Comparing outcomes between siblings, Oettinger (1999) finds that participation in sex education programs introduced in the 1970s is associated with an increased likelihood of earlier sexual activity and pregnancy.

Recent experimental or quasi-experimental studies aim to address endogenous selection into sex education programs, but face limitations related to sample size, identification, and limited policy bite. Kirby (2008) reviews 56 studies of U.S. sex education programs. Most of the studies rely on small samples focused on school- or district-level interventions, limiting the generalizability of their findings. Of the nine abstinence programs evaluated, only three delayed sexual initiation or reduced sexual activity, whereas two-thirds of the 48 comprehensive programs produced favorable outcomes, including later sexual initiation and increased contraception use. Other studies employ identification strategies that may bias estimates. Using an instrumental-variables approach, Sabia (2006) finds sex education in the late 1990s did not affect the health outcomes of teenagers; however, the instruments, such as the share of never-married single men and the proportion of students enrolled in private schools, may

violate the exclusion restriction necessary for causal inference. Atkins and Bradford (2021) instruments for state-level sex education policies using those of neighboring states and finds that abstinence-based programs in the 2000s increased sexual activity and reduced contraception use, while comprehensive programs had the opposite effect. Yet, the possibility of policy spillovers or cultural transmission across state borders raises concerns about the validity of this strategy. Closest to our approach, Carr and Packham (2017) use a difference-in-differences design to study abstinence-based programs introduced in five states in the 2000s and report no significant effects on teen birth or abortion rates.

We contribute to the literature on sex education programs by leveraging plausibly exogenous variation in the timing of mandates to estimate the causal effects of sex education programs on adolescent outcomes. Because many states introduced sex education requirements during this period, our analysis also captures large-scale policy shifts rather than incremental curriculum changes. Our approach allows us to study mandates that substantially shaped what students learned in schools. Importantly, we focus on an era when classroom-based instruction was likely the primary source of information about sex, minimizing transmission of sex education from confounding sources. While our setting offers a clean environment to study the effects of classroom-based sex education in a pre-Internet era, one limitation is that our findings may not generalize to the present day, when adolescents have broad access to information online.

Our findings also relate to the literature studying the effects of health education provision on adolescent behavior. Prior U.S. studies have shown that teenagers respond to information on the difficulties of being a teen mother (Kearney and Levine, 2015b), contraception use (Buckles and Hungerman, 2018), and the dangers of smoking and vaping (Song and Park, 2021; Noar et al., 2022). In the context of sub-Saharan Africa, two randomized controlled trials of abstinence-based AIDS programs find that these programs did not decrease teen pregnancy (Duflo et al., 2015; Dupas, 2011). Duflo et al. (2015) show that HIV/AIDS

programs focused on abstinence before marriage led to more early pregnancies within marriage and fewer early pregnancies outside of wedlock, as more girls switch to monogamous relationships–where unprotected sex is more likely–due to increased perceived STI risk from casual relationships. Our findings contribute to this literature by evaluating HIV/AIDS education programs in a developed context.

The remainder of the paper is organized as follows. Section 2 provides background information on sex and HIV/AIDS education mandates. Section 3.1 describes the data, and section 3.2 outlines the empirical strategy. Section 4 presents the results, section 5 discusses mechanisms and limitations. Section 6 concludes.

2 Historical Context

2.1 The AIDS Epidemic and State Sex Education Mandates

Over the course of the 1980s, the AIDS epidemic escalated into a major public health crisis. The first reported AIDS case in the U.S. occurred in 1981. Early in the epidemic, a limited understanding of AIDS and its transmission—through the exchange of bodily fluids—fueled widespread uncertainty. Most early cases were among gay men and drug users, and stigma surrounding these two groups further compounded misconceptions about transmission.

The AIDS epidemic sparked a national reassessment of the role and content of sex education in American schools. In a 1986 report, the U.S. Surgeon General C. Everett Koop stressed the urgent need for sex education in schools to address the misconceptions surrounding HIV/AIDS.[2] Although three states and D.C. had enacted sex education mandates in the 1970s, and some schools offered instruction voluntarily, topics such as homosexuality and non-reproductive sexual activity remained contentious. Following the Surgeon General's

[2]In his report, he wrote, "There is now no doubt that we need sex education in schools and that it must include information on heterosexual and homosexual relationships. ... We have to be as explicit as necessary to get the message across. You can't talk of the dangers of snake poisoning and not mention snakes."

report, 13 states passed HIV/AIDS-specific education mandates, while an additional 8 states and Washington D.C. incorporated HIV/AIDS education into comprehensive sex education mandates between 1987 and 1988 (see Table 1). As a result of the mandates, HIV/AIDS prevention and transmission became required curriculum, meaning that some sexual content previously omitted or downplayed in classrooms had to be taught.

Figure 1 shows a sharp rise in the share of each birth cohort receiving HIV/AIDS education before age 18, beginning with those born around 1969.[3] Individuals in these cohorts were 18 years old or younger and still in school in 1987, when states first began mandating HIV/AIDS education. While only about 20% of those born in 1969 reported receiving such instruction, the share rose to 95% by the 1980 cohort. This national trend is consistent with the introduction of mandates driving increased HIV/AIDS instruction in schools. By 1976 birth cohorts and onward, about 90% reported receiving instruction—suggesting voluntary adoption in schools even in non-mandate states.

2.2 HIV/AIDS vs. Comprehensive Sex Education Mandates

Whether a state adopted an HIV/AIDS-specific mandate or a comprehensive sex education mandate determined the content of instruction taught in schools. We searched archival databases to collect the relevant state statutes, which we reproduce in Appendix Section B. At a minimum, both HIV/AIDS-specific and comprehensive sex education mandates required basic information on HIV and AIDS to be taught in classrooms, including the transmission and prevention of HIV.

While HIV/AIDS-specific mandates promoted abstinence until marriage, comprehensive mandates aimed to provide students with information to make informed choices and reduce risk. States with HIV/AIDS-specific mandates required abstinence-based instruction that

[3]Data are from the National Survey of Family Growth (NSFG), the only dataset we know of that consistently tracks sex education during this period.

emphasized abstinence as the primary or sole method of prevention against pregnancy or sexually transmitted diseases, such as AIDS. For example, Florida's 1988 statute states: "Throughout instruction in Acquired Immune Deficiency Syndrome, a school shall (a) teach abstinence from sexual activity outside of marriage as the expected standard for all school age children, (b) include that abstinence from sexual activity is a certain way to avoid out-of-wedlock pregnancy..."; New York's 1987 emergency measure requires that content "shall stress abstinence as the most appropriate and effective premarital protection against AIDS."

In contrast, comprehensive sex education mandates embedded AIDS instruction within a broader curriculum on sexuality and relationships, covering topics such as anatomy and contraception. For example, Iowa's 1988 statute required content on AIDS to be combined with content on "current crucial health issues, human sexuality, self-esteem, stress management, and interpersonal relationships," while D.C.'s comprehensive sex education mandate required "instruction on human sexuality and reproduction which shall include... information on human anatomy, physical changes during adolescence, menstruation, intercourse, pregnancy, childbirth, ..., contraception, abortion, ..."

The mandated first age of instruction and frequency of sex education classes varied by state. Many states left these decisions to local discretion, while some, like Iowa and Delaware, mandated age-appropriate instruction from kindergarten through grade 12, and others, like Alabama and West Virginia, began in grades 5 or 6. Given that younger students received less explicit instruction and over half of states did not specify a starting grade, we do not analyze variation in the timing of first instruction.

These mandates generally applied only to public schools; private schools retained autonomy over their curriculum, though they were encouraged to provide AIDS education. Historical data on sexual activity and births do not report whether individuals attended private or public schools, so we cannot separately examine outcomes. We also lack detailed information on school-level curricula and textbooks, preventing us from verifying compliance

with state mandates or evaluating the effectiveness of specific instructional approaches.

2.3 Historical Trends in U.S. Teen Birth Rates

The U.S. teen birth rate remains high by international standards, with 17 births per 1,000 women aged 15 to 19 in 2022, compared to rates ranging from around 6 to 11 births per 1,000 in countries such as Canada, the U.K., and Australia (UNICEF, 2024). Although rates have fallen from a peak of 96.3 births per 1,000 teen girls in 1957, temporary increases occurred in the late 1980s—coinciding with HIV/AIDS education mandates—and again in the mid-2000s (see Appendix Figure A.1).

3 Data and Empirical Strategy

3.1 Data

State Laws Mandating Comprehensive Sex Education and HIV/AIDS Education. We assemble a state-level panel on the effective dates of HIV/AIDS education and comprehensive sex education mandates (see Table 1). Using information from the Alan Guttmacher Institute (Alan Guttmacher Institute, 2023), we identify states that adopted these mandates and verify the year in which each mandate became binding using archival state statute databases.[4] Table 1 shows that 21 states and D.C. adopted HIV/AIDS-specific or comprehensive mandates between 1987 and 1988.

Sex Education and Sexual Behavior. To the best of our knowledge, the National Survey of Family Growth (NSFG) is the only survey that consistently collected information on respondents' exposure to sex education during the relevant period. We use restricted individual-level NSFG data with masked state identifiers. Although we do not observe

[4]Kentucky and Montana passed mandates, but we were unable to verify their effective dates and exclude these two states from our sample.

each respondent's state of residence, we know whether and when their state implemented HIV/AIDS and sex education mandates. The NSFG also collected responses on teen sexual behavior, including whether they had sex by age 18, whether they used protection at first sex, and their fertility and marriage by age 18.

Fertility Outcomes. Our main outcome of interest is age-specific first birth rates, which measure rates of first births before each age for each birth cohort in each county. We use the all-county natality files from the National Center for Health Statistics (NCHS), which includes information on the age of the mother, birth order of the child, and county of birth. We also obtain data on the size of the female population from the Survey of Epidemiology and End Results (SEER).

The age-specific first birth rate by age j for county c for cohorts who turned 18 in y, denoted $FirstBirthRatej_{cy}$, is defined as follows:

$$FirstBirthRatej_{cy} = \frac{\sum_{a=15}^{j} FirstBirth_{acy}}{Population18_{cy}}, \tag{1}$$

where $FirstBirth_{acy}$ is the number of first births at age a for women in county c who turned 18 in y, and $Population18_{cy}$ is the female population at age 18 for the cohort of women in county c who turned 18 in y. The numerator sums the number of first births to women of each county and birth cohort within the specified age range.

We compute age-specific total birth rates following the same construction, summing all births to women of each county and birth cohort within the specified age range and dividing by the female population of age 18 in the corresponding country.

Abortions. We calculate teen abortion rates (number of abortions per 1,000 women aged 15–19) for each state and each year, using abortion data from CDC's Abortion Surveillance reports. The CDC consistently reports the number of abortions by women ages 15–19 for 24 reporting states over our estimation period.

State and County-Level Variables. We control for state-level unemployment and social welfare programs using the National Welfare Data from the University of Kentucky Center for Poverty Research. We also obtain county-level republican vote share in the 1988 presidential election from ICPSR. Data on AIDS incidence is not available at the state or county level. Instead, we aggregate Center for Disease Control and Prevention (CDC) data on AIDS cases at the metropolitan statistical areas (MSAs) to the state level. Over 80% of reported AIDS cases were in MSAs, so our state-level measure captures the majority of AIDS cases being reported in the U.S. at the time.

3.2 Empirical Strategy

Treatment and Control States. We identify 21 treated states that introduced HIV/AIDS education mandates effective in 1987 and 1988, as shown in Table 1.[5] To examine the impact of different curricula, we divide treated states into the 13 states that only passed HIV/AIDS education mandates and the 8 states that coupled HIV/AIDS education with a broader comprehensive sex education mandate. These latter states enacted a sex education mandate prior to or in the same year as the HIV/AIDS mandate.[6]

We define the control group as states that either never introduced HIV/AIDS education mandates or introduced mandates only effective in 1998 or later, at least a decade after the first treatment mandates. This restriction prevents contamination of the control group from exposure to HIV/AIDS mandates. The control group includes twenty states. We exclude from our main estimation sample states that introduced mandates effective between 1989 and 1997, as these states may have already begun offering HIV/AIDS education in schools before enacting the mandate, complicating the timing of exposure.

[5]We exclude Washington D.C. from our estimation sample due to limited data availability. Appendix Figure A.6 Panel A provides a map of treatment and control states.

[6]The states with sex education mandates were Delaware, Georgia, Iowa, Maryland, Nevada, New Hampshire, Rhode Island, and West Virginia.

Table 2 reports summary statistics for treatment and control states in our baseline sample. Treatment and control states are similar in terms of AIDS incidence rates, population sizes, median household income, share of welfare recipients (AFDC and TANF), share rural, share below poverty line, and share black. However, treated states have higher unemployment rates (7.3 vs. 6.4 percent, $p = .061$) and lower republican vote shares in the 1984 presidential election (59 vs. 63 percent, $p = .08$).

Reassuringly, we find no clear evidence of selection on observables between states adopting only HIV/AIDS mandates and those adopting comprehensive sex education mandates. States with only HIV/AIDS education mandates appear broadly similar to those that adopted comprehensive sex education mandates across most characteristics, with the exception that the latter group tends to have smaller populations.

Event studies. The full-count natality data give us statistical power to estimate the following event study regressions:

$$\begin{aligned} FirstBirthRatej_{cy} = &\sum_{k \neq -1} \beta_{1k} \left[Treat_{s(c)} \times \mathbb{1}(k = y - MandateYear_{s(c)}) \times \left(1 - CompSexEd_{s(c)}\right) \right] \\ &+ \sum_{k \neq -1} \beta_{2k} \left[Treat_{s(c)} \times \mathbb{1}(k = y - MandateYear_{s(c)}) \times CompSexEd_{s(c)} \right] \\ &+ \delta_c + \delta_y + \gamma X_{s(c)y} + \varepsilon_{cy}, \quad (2) \end{aligned}$$

where $FirstBirthRatej_{cy}$ is the age-specific first birth rate by age j in county c for cohorts who turned 18 in year y. $Treat_{s(c)}$ is a dummy for state s introducing either a HIV/AIDS-specific or comprehensive sex education mandate in 1987 or 1988, and $CompSexEd_{s(c)}$ is a dummy for state s mandating a comprehensive sex education mandate. δ_c and δ_t are county and birth cohort fixed effects, and $X_{s(c)y}$ are state-level controls. Regressions are weighted by county-cohort population at age 18, and standard errors are clustered at the state level.

k measures the number of years that a given cohort spent in school after the mandate

was introduced, and is calculated as the cohort's assumed year of graduation y (year at age 18) minus the year the mandate was implemented $MandateYear_{s(c)}$. Cohorts with $k < 0$ have already graduated high school when the mandate comes into effect and serve as the control group. As k for $k > 0$ increases, cohorts receive more years of HIV/AIDS education and from an earlier age.

The coefficients of interest are the β_{1k}s and β_{2k}s. The coefficients measure the effect of HIV/AIDS-specific education and comprehensive sex education, respectively, on birth rates for cohorts that attended school for k years after the mandate went into effect. We restrict the observation window to cohorts that graduated 8 years before to 10 years after the introduction of the mandate. We omit the cohort that graduated one year prior to the introduction of the mandate ($k = -1$), so that the β_{1k}s and β_{2k}s can be interpreted relative to this pre-mandate cohort as a baseline. Cohorts with $k \in \{0, 3\}$ are ages 18 to 15 in descending order when the mandate is introduced, and receive between zero and three years of HIV/AIDS education. We refer to cohorts with $k > 3$ as "fully treated" because they begin to receive HIV/AIDS education by at least the age of 15.[7]

To account for other policies and socioeconomic changes that could have affected sex education, teen sexual activity, and fertility, we control for unemployment rate, share of welfare recipients, welfare benefit levels, share of food stamp recipients, and share of households under the poverty line at the state level. We additionally control for AIDS incidence at the state level, and report the results in the Appendix.

Identification relies on the parallel trends assumption, which in our context requires that birth rates in treated and control states would have evolved in parallel in the absence of

[7]HIV/AIDS education mandates differed greatly across states regarding the earliest grade of mandatory classes. Some states did not explicitly mandate an earliest grade, leaving the decision up to school districts, while other states included earliest grades ranging from kindergarten to grades 8. We don't exploit the earliest grade of introduction according to state mandates both because the grade is not specified in many states and the content aimed at younger children typically does not explicitly discuss topics related to sexual health.

HIV/AIDS education mandates. We examine this assumption by testing for pre-trends in the event study graphs. We examine additional threats to identification related to selection into treatment in Sections 4.3. For example, treated states have high AIDS incidences, which may directly impact teen fertility, and are more liberal, so schools may have offered sex education without state legislation.

Difference-in-Differences. Our sample sizes are more limited for data on reported sex education, sexual behaviors, and abortions. Hence, we use a difference-in-differences approach to compare outcomes between women who are attending school when HIV/AIDS mandates are introduced and women who had graduated, in treated versus control states. For teen sexual behaviors, we estimate:

$$Y_{isy} = \beta_1 \left[Treat_s \times Post_{sy} \times (1 - CompSexEd_s) \right] + \beta_2 \left[Treat_s \times Post_{sy} \times CompSexEd_s \right] + \delta_s + \delta_t + \gamma X_{isy} + \varepsilon_{isy}, \quad (3)$$

where Y_{isy} are outcomes for individual i from state s who turned 18 in y; $Treat_s$ is a dummy for state s introducing a HIV/AIDS-specific or comprehensive sex education mandate; $Post_{sy}$ is a dummy for cohort y in state s still in school when the mandate came into effect (i.e., aged 18 or younger); $CompSexEd_s$ is a dummy variable for state s mandating a comprehensive sex education mandate; δ_s and δ_t are state and birth cohort fixed effects; and X_{isy} are controls.

We restrict the estimation sample to a 10-year window around the mandates, such that our coefficient of interest β estimates the average effect of HIV/AIDS education mandates over 5 years. We apply survey weights and cluster standard errors at the state level. We include controls for race, age at the time of survey, and self-reported religious attendance at age 14.

We have calendar-year data on abortions, hence we augment Equation 3 to include state-year measures of exposure, and replace cohort fixed effects with year fixed effects.

4 Impact of Mandates on Fertility

4.1 Baseline Effects on Fertility

Teen Births. Figure 2 reports the results from estimating equation (2) for the share of each cohort experiencing a first birth between ages 15 and 19. We separately report results for births in treated states that passed HIV/AIDS-specific mandates and in those that passed comprehensive sex education mandates, compared to control states.

The average treatment effect suggests that HIV/AIDS-specific mandates increased teen first births by 6.3 per 1000 women aged 15 to 19 (2.9%, mean = 218 births per 1000 women) for the first five not-yet-graduated cohorts relative to already-graduated cohorts. The largest increase in teen births are observed for cohorts who were close to graduation—those in grades 10 to 12 (ages 16 to 18)—at the time of mandate. These cohorts were at the highest risk of being sexually active and becoming pregnant when the mandate was introduced. For these women, the likelihood of a teen birth rises with each additional year of exposure to HIV/AIDS education, consistent with a dosage effect. For cohorts in grades 9 and below at the time of the mandates, the effect of HIV/AIDS education on teen births is positive but smaller in magnitude, and estimated with less precision.

In contrast, our estimates show that comprehensive sex education mandates did not increase teen first births. We note a statistically insignificant pre-trend for cohorts graduating 3 to 6 years before the mandate became effective, indicating that these states were experiencing a relative increase in teens having first births prior to the mandates. The null post-mandate effect implies that comprehensive sex education may have even contributed to a deceleration in teen birth rates observed in states that adopted comprehensive sex education mandates.

Why does abstinence-based HIV/AIDS education appear to raise teenage childbearing, while comprehensive sex education does not? Exposure to abstinence-based HIV/AIDS education may increase teenage childbearing by framing sex as a taboo, without providing

practical information on contraception or sexual health. Teens may become sexually active out of curiosity, but are unprepared to prevent pregnancy. In contrast, comprehensive sex education programs teach teenagers about contraception and the risks of early sexual initiation, allowing them to make informed decisions. While such programs may also normalize sexual activity, they reduce the risk of unplanned pregnancies by teaching how to use contraception effectively. We explore these potential channels driving the observed increase in teen births for states with HIV/AIDS-specific mandates in Section 5.

Lifetime Fertility. We next examine whether HIV/AIDS-specific mandates not only increased teen births among not-yet-graduated cohorts, but also affected the total number of births these women had over their lifetimes. Figure 3 presents results from equation (2) : Panel A shows the share of each cohort having a first birth by age 44, while Panel B shows total births through age 44.

Panel A shows that neither HIV/AIDS-specific nor comprehensive sex education mandates affected the likelihood of women exposed to mandates having a child by age 44. The increase in teen births was offset by a decline in first births occurring later in life among treated cohorts, resulting in no net change in whether or not women had children over their reproductive lifespan. HIV/AIDS-specific and comprehensive sex education mandates also had no significant impact on the total number of children born to women in not-yet-graduated cohorts compared to already-graduated cohorts, as shown in Panel B.

Overall, the mandates brought forward the timing of first births without increasing lifetime fertility. Women in treated cohorts were more likely to become teenage mothers, but were not more likely than women in control cohorts to have children at all or to have subsequent births.

4.2 Decomposing the Overall Increase in Teen Births

To examine heterogeneous effects, we present group-specific teen first birth results by race, urban versus rural residence, and political leaning. Panel A compares states with HIV/AIDS-specific mandates to control states, while Panel B compares states with comprehensive sex education mandates to control states. In discussing our findings, we mainly focus on results for states with HIV/AIDS-specific mandates.

By Race. Figure 4 decomposes the changes in teen first births by race. In states with only HIV/AIDS-specific mandates, we find larger increases in first births among Black teenagers compared to White teenagers, statistically significant at the 5 percent level. The estimates suggest a 5.7% increase in teen first births among Black women (15 births per 1000 black women aged 15 to 19, mean = 261 births per 1,000 black women), compared to 2.2% among white women (4 additional births per 1,000 white women aged 15 to 19, mean = 202 births per 1,000 white women). In states that also implemented sex education mandates, we do not find significant increases in teen births for either race.

One possible explanation for why Black teenagers experienced larger increases in teen births compared to White teenagers is that abstinence-based HIV/AIDS education in school may have been their first significant source of information about sex. Oettinger (1999) finds that less-informed teenagers, for example, those without older siblings, are more likely to be sexually active. If Black teenagers had fewer alternative sources of sexual health information, they may have entered these programs less informed, making them more susceptible to the unintended effects of abstinence-focused education.

By Political Orientation. Figure 5 presents the results for Republican-leaning counties, where the Republican Party received more than 50% of the vote in the 1988 presidential election, compared to Democratic-leaning counties.

Among states implementing HIV/AIDS-specific mandates, we find large increases in teen births of 5.7% (12 births per 1000 women, mean = 209 births per 1,000 women) in Democrat-

leaning counties, compared to an increase of 1.5% (3.3 births per 1,000 women, mean = 222 births per 1000 women) in Republican-leaning counties. This result may be surprising; teenagers in more conservative counties may be less-informed about sex prior to the mandates, so we would expect the mandates to have a larger impact in Republican-leaning areas. However, in Republican-leaning areas, higher enrollment in exempt private religious schools may have limited the reach and impact of the mandates.

By Rural and Urban Counties. Figure A.3 presents results by women living in rural versus urban areas. Given that AIDS cases were largely concentrated in urban areas, HIV/AIDS education may have felt more relevant, and thus more impactful, for women living in urban areas. Conversely, sex education mandates might have had larger effects in rural areas, where access to sexual health information outside of schools is more limited.

In states with HIV/AIDS-specific mandates, teen birth rates increased in both urban and rural counties. Among women in urban areas, teen births rose by 3.5% (7.3 additional births, from a baseline of 211 per 1,000 women), while in rural areas, the increase was 1.2% (3.1 additional births, from a baseline of 267 per 1,000 women). However, this urban-rural difference is not statistically significant. Cohorts still in school in urban counties (ages 18 and under) at the time of the mandate experienced an increase in teen births, pointing to an immediate fertility response. In contrast, in rural counties, only slightly younger cohorts (ages 16 and under) saw an increase, suggesting a delayed response, likely due to slower policy roll-out. Overall, the rise in teen births in rural areas indicates that local AIDS incidence is unlikely to be the main factor driving these fertility patterns.

4.3 Sensitivity Analysis

Local AIDS Incidence. One concern is that local AIDS prevalence may confound our estimates. If rising local AIDS incidence led women to marry and have children earlier, as a way to avoid the perceived risk of contracting AIDS through premarital sex, and if these

increases coincided with the introduction of sex education mandates, then our estimates might overstate the impact of the mandates on teen birth rates.

To account for the possibility that treated and control states experienced different patterns of local AIDS exposure, we include state-by-year controls for AIDS incidence. Figure A.4 shows that our results remain robust to the inclusion of these controls. In support of our evidence, Spencer (2024) finds that local AIDS incidence increased birth rates among white women aged 30 to 44 by encouraging monogamy as a way of reducing AIDS risk, but had no direct effect on the behavior or birth rates of teenage women.

To further validate our findings, Figure A.5 plots trends in AIDS incidence for treated states and control states to assess the timing of local AIDS cases. Although local AIDS incidence gradually increased beginning in the early 1980s, there is no sharp increase in AIDS cases around 1987 and 1988 when we observe a sharp increase in teen births. This time trend suggests that AIDS incidence is unlikely to be driving our main results. In Figure A.3, we also document a rise in teen births in rural areas, which suggests local AIDS incidence is not the primary factor causing increased teen fertility.

5 Discussion

5.1 Mechanisms: What drove the rise in teen births?

We investigate the possible mechanisms underlying the rise in teen births among women in states mandating HIV education with an abstinence-based focus. Table 3 reports the estimated coefficients from estimating equation (3) for various adolescent outcomes.

The point estimates in Column 1 of Table 3 suggest that not-yet graduated cohorts in states that introduced any mandate were 22.4 percentage points (30%, mean = 75.7p.p.) more likely to have had sex by age 18 than recently-graduated cohorts, relative to control states. In states that incorporated HIV/AIDS education into a comprehensive program, the

increase was smaller, at 15.4 percentage points. However, the difference between treatment groups is not statistically significant. Consistent with Oettinger (1999) and Atkins and Bradford (2021), our findings suggest that abstinence-focused sex education may increase teenage sexual activity by providing new information to students and reducing the stigma around sex, while failing to teach students about potential risks of early sexual initiation.

Estimates related to contraceptive education, contraception use, and abortions (Columns 2 to 5) are not statistically significant, so we interpret these results as suggestive rather than conclusive. There are three main takeaways. First, treated cohorts in states with sex education mandates appear more likely to have received instruction on birth control compared to control cohorts in states without mandates (Table 3, Column 2), suggesting that these policies translated into curriculum changes. The effect appears stronger in states with comprehensive sex education, consistent with comprehensive sex education policies being more likely to require instruction on contraceptive methods than abstinence-focused HIV/AIDS policies.

Second, adolescents in states mandating sex education were more likely to use birth control during their first sexual encounter, with the highest rates in states mandating comprehensive sex education (Table 3, Columns 3 and 4). Comprehensive sex education appears to promote safer sexual behaviors through providing information on risk reduction. Third, we find that abortions declined by 2.6 per 1,000 women aged 15 to 19 (6.5%, mean = 40) in states mandating comprehensive sex education relative to those mandating HIV/AIDS education. Fewer unintended pregnancies in states with comprehensive sex education programs, in turn, translate into fewer abortions in these states.

The effects of sex education on teen sexual behavior and pregnancy depend on the program type. Both comprehensive and abstinence-focused programs appear to destigmatize sex, resulting in higher levels of sexual activity compared to states without sex education. Abstinence-focused programs result in even higher levels of sexual activity compared to com-

prehensive programs, which emphasize the risks of early sexual initiation. Comprehensive programs also teach about contraception, whereas abstinence-based programs omit this information, contributing to higher teen pregnancy rates in states with abstinence-focused programs.

5.2 Benchmarking Fertility Results and Limitations

Previous studies of abstinence-based and comprehensive sex education programs suggest that their effectiveness varies widely: some have no impact on teen behavior (Sabia, 2006), others achieve favorable outcomes (Kirby, 2008), and others have unintended consequences (Oettinger, 1999). Using a plausibly exogenous identification strategy of a large-scale change to U.S. sex education policy, we show that sex education mandates with an abstinence focus increase teenage sexual activity, while a more comprehensive curriculum can partially offset this effect by emphasizing the risks of early sexual initiation. A key insight is that abstinence programs have limited efficacy; they are unlikely to reduce sexual activity and unintended pregnancies, consistent with Kirby (2008) and Atkins and Bradford (2021).

Our empirical approach builds on Carr and Packham (2017) but offers new insights due to differences in context and research design. While Carr and Packham (2017) find that abstinence-based mandates introduced in five states during the 2000s had no impact on teen births, we find that abstinence-based HIV/AIDS mandates introduced in the late 1980s increased teen births. These differences highlight the contributions of our study. First, whereas Carr and Packham (2017) examine policy changes in states with existing mandates, our analysis considers the initial implementation of sex education mandates. Our design allows us to measure the impact of introducing entirely new curriculum material and identify effects that may be missed in analyses of incremental reforms. Second, by focusing on the 1980s when adolescents had limited access to sexual content outside of school, we can more precisely isolate the effects of school-based instruction and mitigate confounding factors,

such as social media and the Internet, present in studies of later reforms.

The magnitude of our baseline finding in Figure 2 is within the range reported in previous studies. We find that HIV/AIDS mandates increased first births by 2.9%, while comprehensive sex education mandates had no impact on first births. Oettinger (1999) simulates how teen sexual behavior would change under universal sex education at age 15 for youths who had not previously received any sex education. In this scenario, the maximum predicted increase in the fraction of women who are sexually active is about 5% at age 16, with smaller increases in pregnancy. These modest predicted effects are consistent with the magnitude of our estimates.

Studies of other policies impacting teen childbearing show similarly modest effects, if at all. Kearney and Levine (2009) find that expanded access to Medicaid family planning in the 1990s and early 2000s reduced teen childbearing by roughly 4%. Likewise, Kearney and Levine (2015b) show that higher local exposure to MTV's 16 and Pregnant lowered teen births by about 4.3%. These findings suggest that both policy and media interventions can influence teen fertility, but the effects are generally modest, similar to those estimated in our study.

There are several limitations to consider when interpreting our findings. One limitation of our analysis is that state-level sex education mandates reflect intended policy but may not fully capture what is actually implemented in classrooms. While mandates aim to standardize content across public schools, implementation can vary widely across public versus private schools, school districts, and individual teachers. For example, some educators in states with HIV/AIDS-focused mandates may still have taught more comprehensive sex education, while schools in states without formal mandates might have independently offered sex education programs. This variability introduces potential measurement error in our treatment classification. Second, we lack detailed data on the specific content or quality of sex education curricula taught to students. As a result, we are unable to evaluate the

effects of sex education at a more granular level to understand how different instructional approaches affect adolescent outcomes. Finally, due to the limited nature of available data on teen sexual behavior and contraception use, we can only provide suggestive evidence on the mechanisms underlying our findings.

6 Conclusion

This paper highlights how abstinence-based sex education may have unintended consequences for teen sexual activity and fertility. We exploit the introduction of HIV/AIDS-specific and comprehensive sex education mandates during the AIDS epidemic to study how sex education impacts adolescent outcomes. We find that abstinence-based HIV/AIDS mandates led to 6.3 additional births per 1,000 women aged 15 to 19 among cohorts still in school at the time of implementation compared to recently graduated cohorts, relative to cohorts in control states. HIV/AIDS mandates lowered the age at first birth without increasing either the number of women who became mothers or the number of children that they had.

We find no significant increase in teen fertility in states that implemented comprehensive sex education, suggesting that providing broader instruction on contraception and sexual health risks may counteract the destigmatization of sexual activity associated with abstinence-based curricula. We provide suggestive evidence that comprehensive sex education delays sexual initiation and promotes contraception use compared to abstinence-focused programs, leading to fewer teen pregnancies, abortions, and births.

Our results should be interpreted with caution in context of contemporary debates on sex education. We study HIV/AIDS education mandates introduced the late 1980s, a period where teenagers had relatively limited access to information about sex outside of schools and their local communities. Adolescents can now access a vast array of information on their smart phones, which may attenuate the impact of formal sex education. Nevertheless,

our findings are consistent with Atkins and Bradford (2021), who find that abstinence-based programs implemented in the 2000s increased sexual activity and reduced contraception use.

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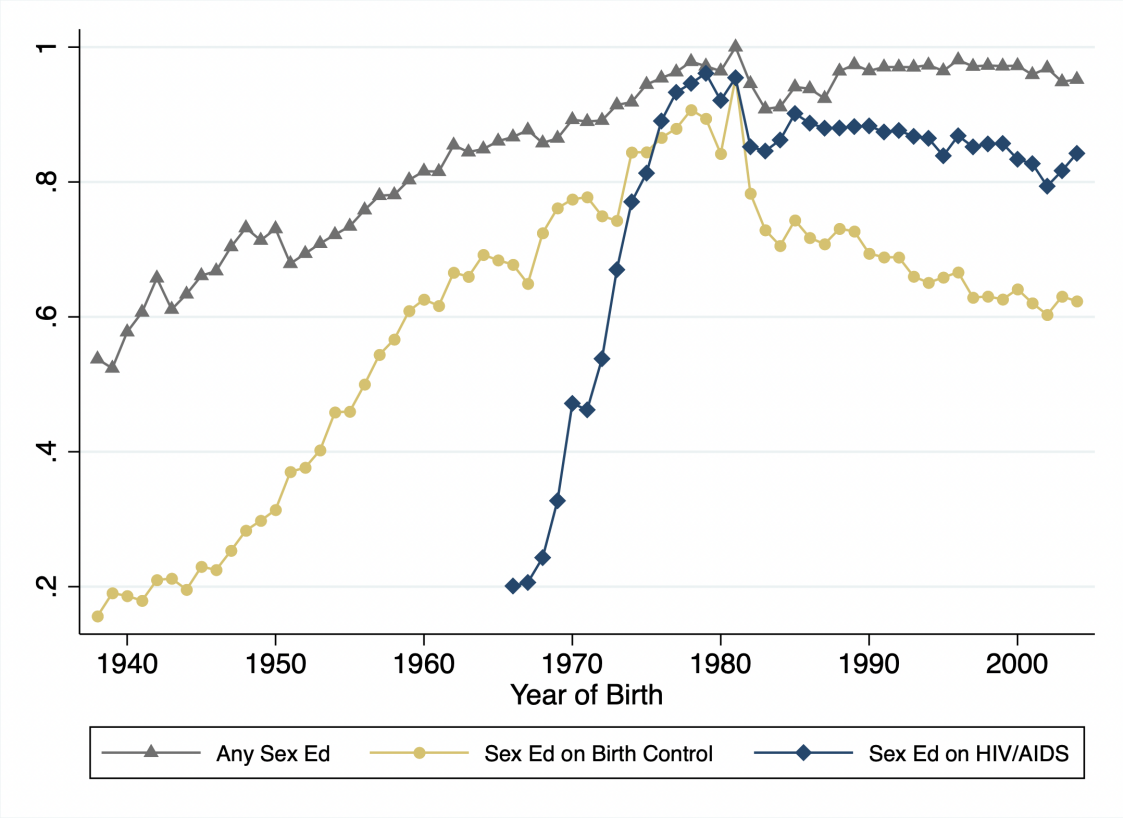
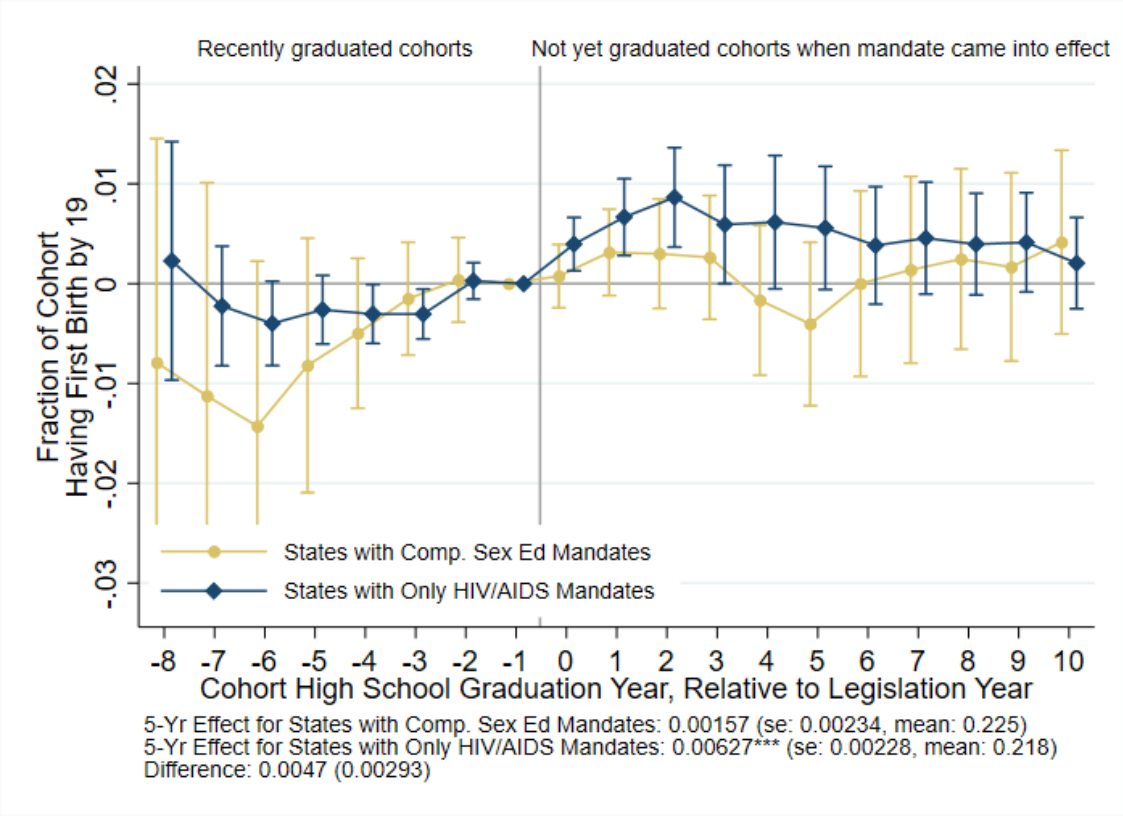
Figure 1: Trends in Reported Sex Education by Birth Cohort



Note: The graph plots the share of each birth cohort who reported having received sex and/or HIV/AIDS education before age 18. Data from the National Survey of Family Growth.

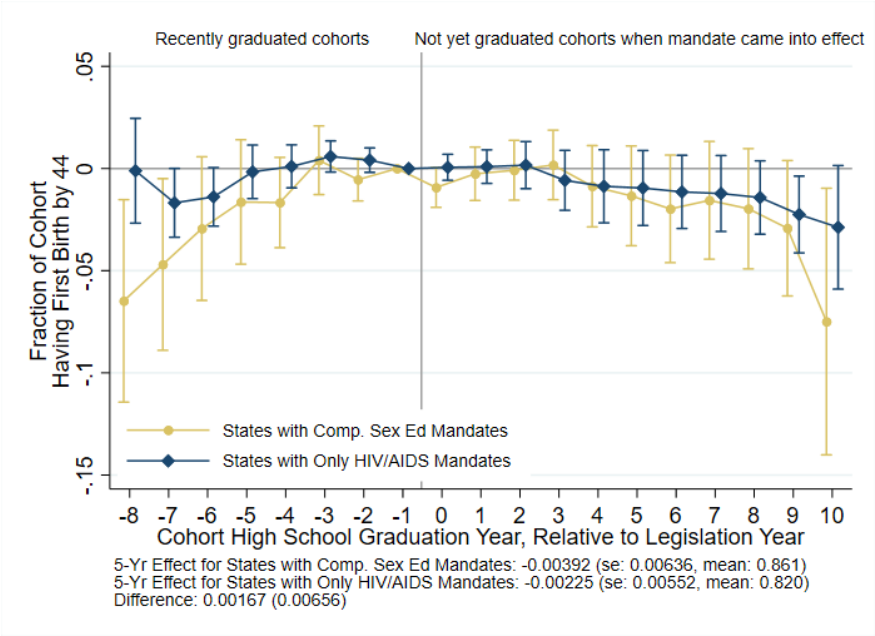
Figure 2: Effect of HIV/AIDS-specific and Sex Education Mandates on Teen First Births



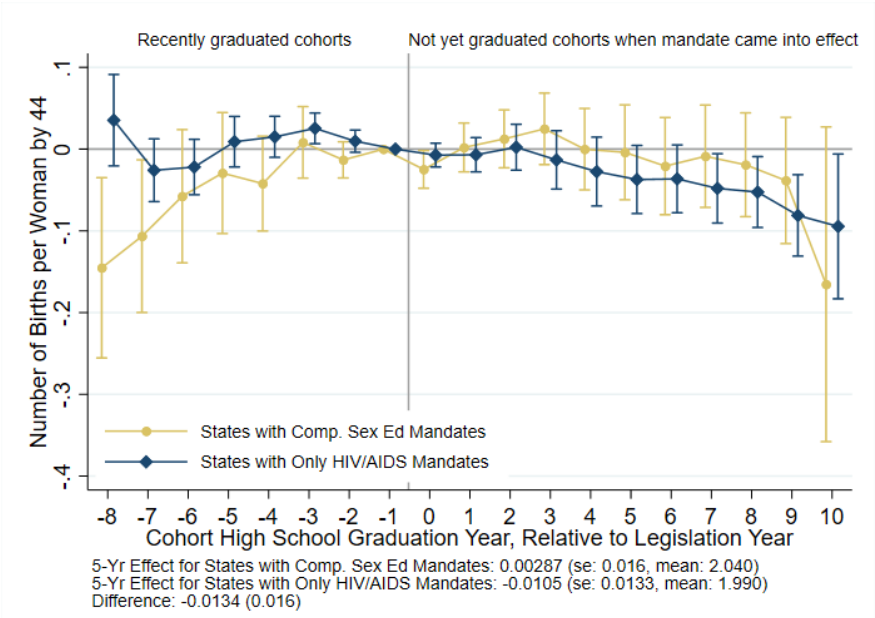
Note: The graph plots coefficient estimates $\{\beta_{1k}, \beta_{2k}\}$ based on Equation 2 for cohorts of women who were $18-k$ years old when the mandate came into effect. The outcome is the cohort share of first births between ages 15-19 at the county-cohort level. We compare outcomes in treated states with only HIV/AIDS-specific mandates in 1987-1988 (in blue) and in treated states which had comprehensive sex education mandates versus control states (in yellow) to control states that did not have HIV/AIDS mandates by 1998. The estimate for the average of coefficients for cohorts 0 to 4 following the mandate (with corresponding standard error) is reported below the figure along with the mean outcome. The 95% confidence intervals are based on robust standard errors clustered at the state level.

Figure 3: Effect of HIV/AIDS-specific and Sex Education Mandates on Lifetime Fertility

(a) First Births by Age 44



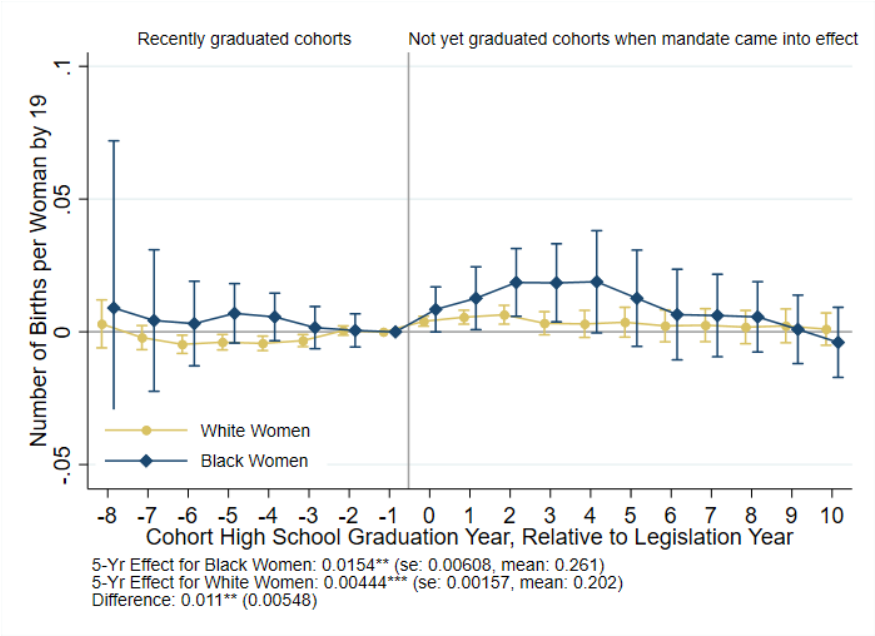
(b) Total Births by Age 44



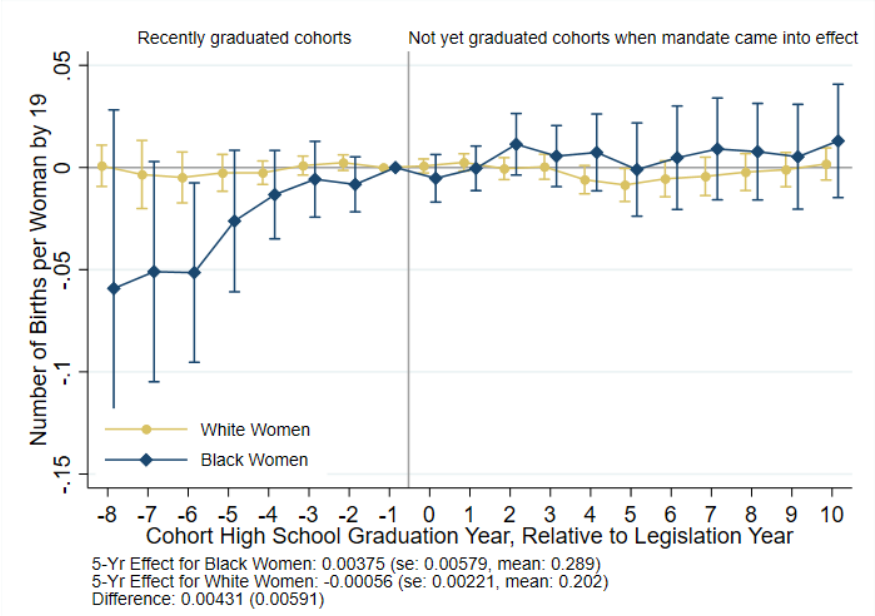
Note: The graph plots coefficient estimates $\{\beta_{1k}, \beta_{2k}\}$ based on Equation 2 for cohorts of women who were $18-k$ years old when the mandate came into effect. The county-cohort level outcomes are the cohort share of first births between ages 15-44 (Panel A) and the cohort share of all births between ages 15-44 (Panel B). We compare outcomes in treated states with only HIV/AIDS-specific mandates in 1987-1988 (in blue) and in treated states which had comprehensive sex education mandates versus control states (in yellow) to control states that did not have HIV/AIDS mandates by 1998. The estimate for the average of coefficients for cohorts 0 to 4 following the mandate (with corresponding standard error) is reported below the figure along with the mean outcome. The 95% confidence intervals are based on robust standard errors clustered at the state level.

Figure 4: Effect on Teen First Births **by Race**

(a) Treated States with Only HIV/AIDS Mandates



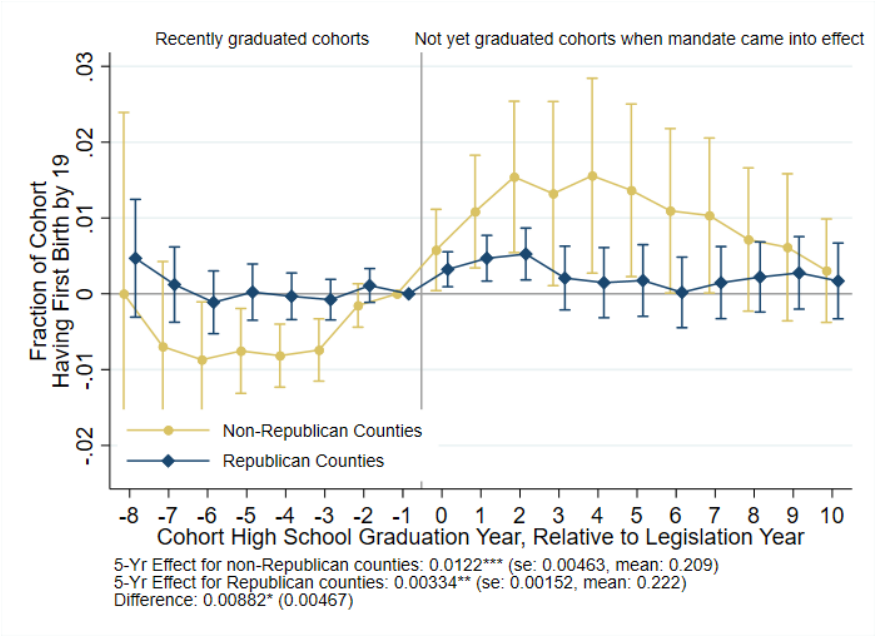
(b) Treated States with Comprehensive Sex Ed Mandates



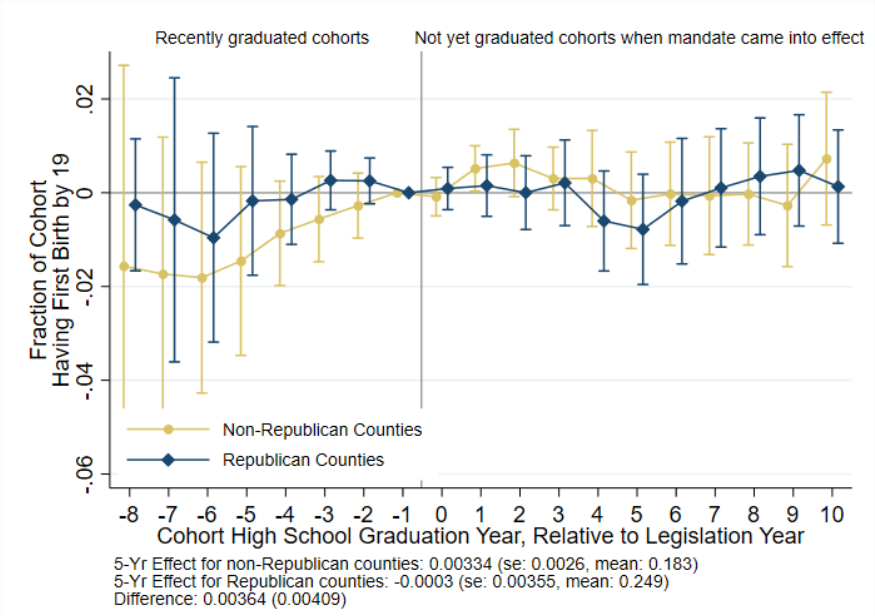
Note: The graph plots coefficient estimates $\{\beta_{1k}, \beta_{2k}\}$ based on Equation 2 for cohorts of Black women (in blue) and white women (in yellow) who were $18 - k$ years old when the mandate came into effect. The estimation sample in Subfigure (a) includes treated states with only HIV/AIDS-specific mandates in 1987-1988 and control states with did not have HIV/AIDS mandates by 1998, in Subfigure (b) treated states which also had sex education mandates and control states. The outcome is the cohort share of first births between ages 15-19 at the county-cohort level. The race-specific estimate for the average of coefficients for cohorts 0 to 4 following the mandate (with corresponding standard error) is reported below the figure along with the mean outcome. The 95% confidence intervals are based on robust standard errors clustered at the state level.

Figure 5: Effect on Teen First Births **by Political Leaning**

(a) Treated States with Only HIV/AIDS Mandates



(b) Treated States with Comprehensive Sex Ed Mandates



Note: The graph plots coefficient estimates $\{\beta_{1k}, \beta_{2k}\}$ based on Equation 2 for cohorts of women in Republican-leaning counties (in blue) and women in non-Republican-leaning counties (in yellow) who were $18-k$ years old when the mandate came into effect. The estimation sample in Subfigure (a) includes treated states with only HIV/AIDS-specific mandates in 1987-1988 and control states with did not have HIV/AIDS mandates by 1998, in Subfigure (b) treated states which also had sex education mandates and control states. The outcome is the cohort share of first births between ages 15-19 at the county-cohort level. The group-specific estimate for the average of coefficients for cohorts 0 to 4 following the mandate (with corresponding standard error) is reported below the figure along with the mean outcome. The 95% confidence intervals are based on robust standard errors clustered at the state level.

Table 1: Sex and HIV/AIDS Education Mandates

State	Sex Education	Effective Year	HIV/AIDS Education	Effective Year
Alabama	No		Yes	1987
Alaska	No		No	
Arizona	No		No	
Arkansas	No		No	
California	Yes	2016	Yes	1992
Colorado	No		No	
Connecticut	No		Yes	1988
Delaware	Yes	1987	Yes	1987
Florida	Yes	1990	Yes	1988
Georgia	Yes	1988	Yes	1988
Hawaii	Yes	1995	Yes	1995
Idaho	No		No	
Illinois	No		Yes	1988
Indiana	No		Yes	1988
Iowa	Yes	1988	Yes	1988
Kansas	Yes	2005	No	
Kentucky	Yes	-	Yes	-
Louisiana	No		No	
Maine	Yes	2002	Yes	2002
Maryland	Yes	1970	Yes	1987
Massachusetts	No		No	
Michigan	No		Yes	1987
Minnesota	Yes	1995	Yes	1988
Mississippi	Yes	1998	No	
Missouri	No		Yes	1988
Montana	Yes	-	Yes	-
Nebraska	No		No	
Nevada	Yes	1987	Yes	1987
New Hampshire	Yes	1973	Yes	1988
New Jersey	Yes	1983	Yes	1990
New Mexico	Yes	2009	Yes	1988
New York	No		Yes	1987
North Carolina	Yes	1995	Yes	1987
North Dakota	Yes	2011	No	
Ohio	Yes	1975	Yes	1999
Oklahoma	No		Yes	1995
Oregon	Yes	2009	Yes	2009
Pennsylvania	No		Yes	1999
Rhode Island	Yes	1987	Yes	1987
South Carolina	Yes	1988	No	
South Dakota	No		No	
Tennessee	Yes	1991	Yes	1989
Texas	Yes	1998	Yes	1998
Utah	Yes	2001	Yes	1988
Vermont	Yes	1989	Yes	1989
Virginia	No		No	
Washington	Yes	2008	Yes	1988
West Virginia	Yes	1988	Yes	1988
Wisconsin	No		Yes	1990
Wyoming	No		No	

Source: Assembled from archival state databases.

Table 2: Summary Statistics

	(1) Control States	(2) Treatment States	(3) Treatment States	(4) Treatment States	(5)	(6)
		All	Only HIV/AIDS Mandates	Comprehensive Sex Ed Mandates	p-value (1) vs (2)	p-value (3) vs (4)
Pre-1987 AIDS Incidence	0.012	0.018	0.022	0.010	0.39	0.24
	(0.015)	(0.027)	(0.033)	(0.0089)		
Population	4,189,998	4,776,569	6,342,286	2,232,279	0.65	0.01**
	(3,986,572)	(4,229,081)	(4,572,473)	(1,818,790)		
Unemployment Rate	6.3	7.3	7.7	6.7	0.051*	0.21
	(1.5)	(1.7)	(1.8)	(1.4)		
Median Household Income	14,669	15,329	15,029	15,815	0.34	0.4
	(2,289)	(2,080)	(2,208)	(1,887)		
Share AFDC/TANF Recipients	0.038	0.041	0.042	0.039	0.49	0.64
	(0.017)	(0.014)	(0.015)	(0.014)		
Share Rural	0.35	0.30	0.28	0.33	0.26	0.43
	(0.14)	(0.14)	(0.11)	(0.18)		
Share Below Poverty Line	0.13	.012	0.12	0.11	0.29	0.54
	(0.040)	(0.031)	(0.033)	(0.030)		
Share Black	0.098	0.10	0.10	0.10	0.89	0.94
	(0.11)	(0.087)	(0.079)	(0.10)		
Share Republican Vote in 1984	63	59	60	58	0.08*	0.59
	(5.4)	(6.0)	(6.0)	(6.3)		
Unique States	20	21	13	8		

Note: Covariates are measured in 1980, unless otherwise noted. Data from CDC Wonder AIDS Database, University of Kentucky National Welfare Data, and the 1980 Census.

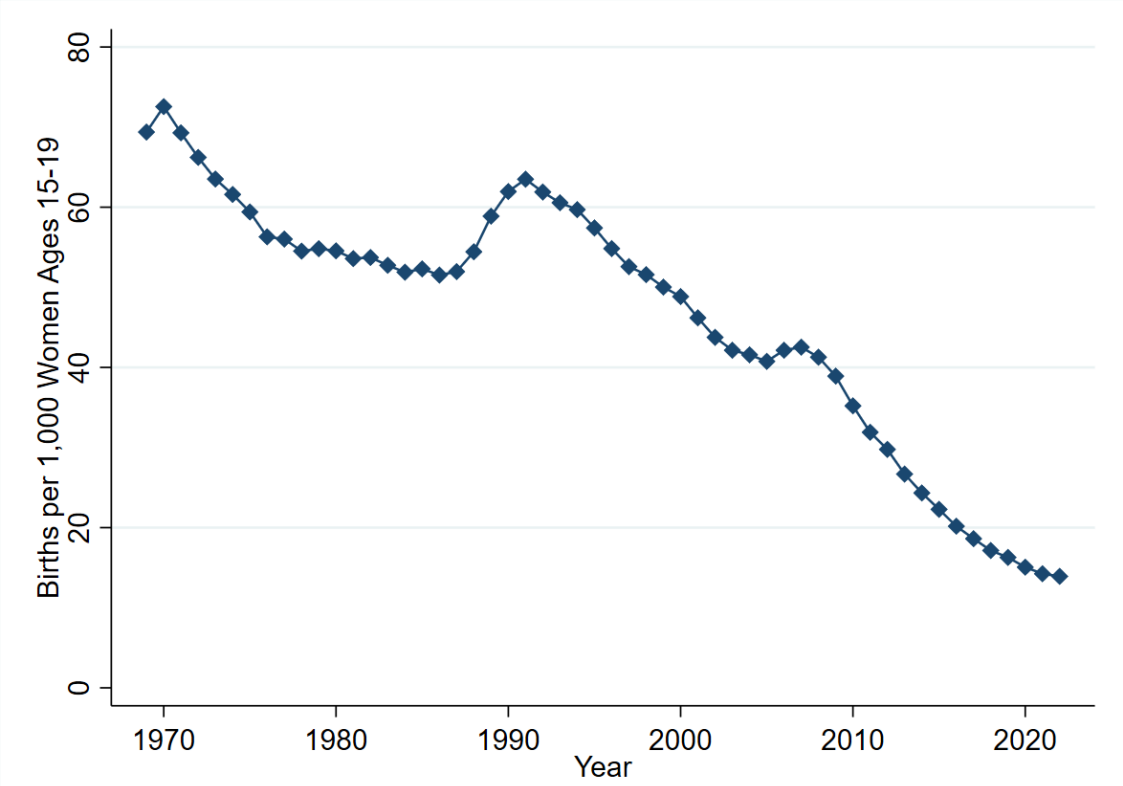
Table 3: Mechansims

VARIABLES	(1) Had Sex by 18 (p.p.)	(2) Had Sex Ed on Birth Control (p.p.)	(3) Used Birth Control (p.p.)	(4) Used Condom (p.p.)	(5) Abortions (/1000 women)
Treat × Post	22.4***	4.00	16.7	20.7	0.207
	(7.75)	(6.48)	(11.5)	(15.4)	(0.710)
Treat × Post	-6.99	13.6	5.38	2.90	-2.641**
× Comp. Sex Ed	(10.1)	(10.4)	(13.9)	(27.6)	(1.103)
Mean Outcome	75.7	82.4	63.8	46.8	39.7
Observations	4,002	3,987	2,914	2,914	288

Note: The table reports coefficient estimates $\{\beta_1, \beta_2\}$ based on Equation 3. We compare adolescent outcomes of cohorts who were still in school to those who had recently-graduated in treated (states with only HIV/AIDS education and states with comprehensive sex education) versus control states. Outcomes include whether respondents had sex by age 18 (column 1), received any sex education (column 2), used birth control at first sex (column 3), used condoms at first sex (column 4), and abortions per 1000 women aged 15–19 (column 5). Data from the National Survey of Family Growth (NSFG, columns 1 to 4) and CDC's Abortion Surveillance reports (column 5). For column (5), the CDC sample includes the 24 states that consistently reported abortions for women ages 15–19 between 1982–1993. Standard errors clustered at the state level. *** p<0.01, ** p<0.05, * p<0.1.

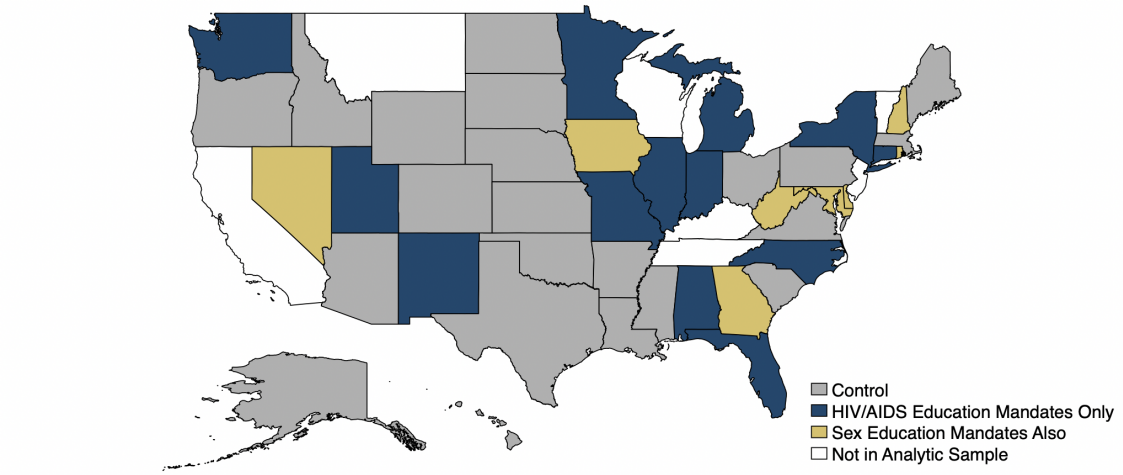
A Supplementary Figures and Tables

Figure A.1: Trends in Teen Births



Note: The graph plots the number of births per 1,000 women ages 15-19. Data on births from NVSS, data on population from SEER.

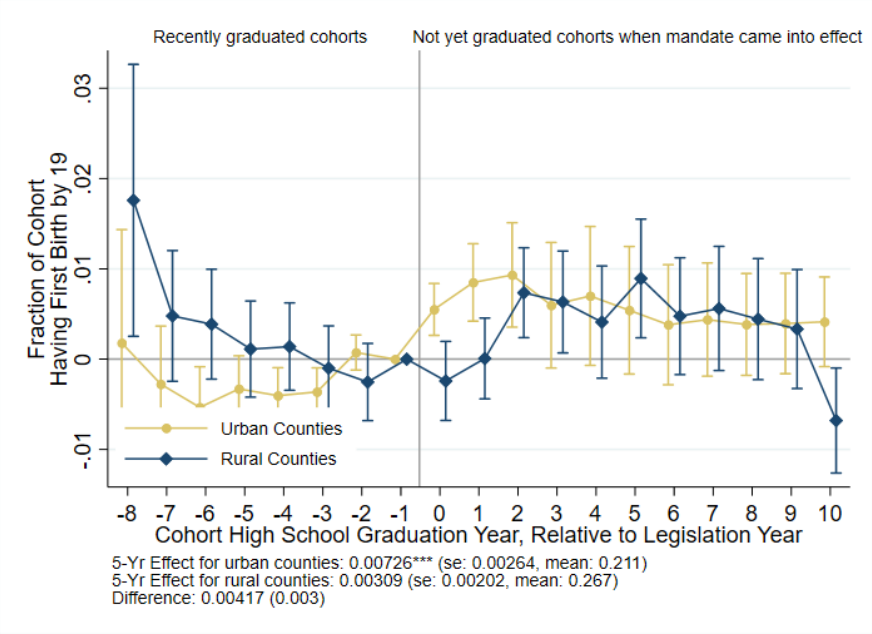
Figure A.2: Map of Treatment and Control States



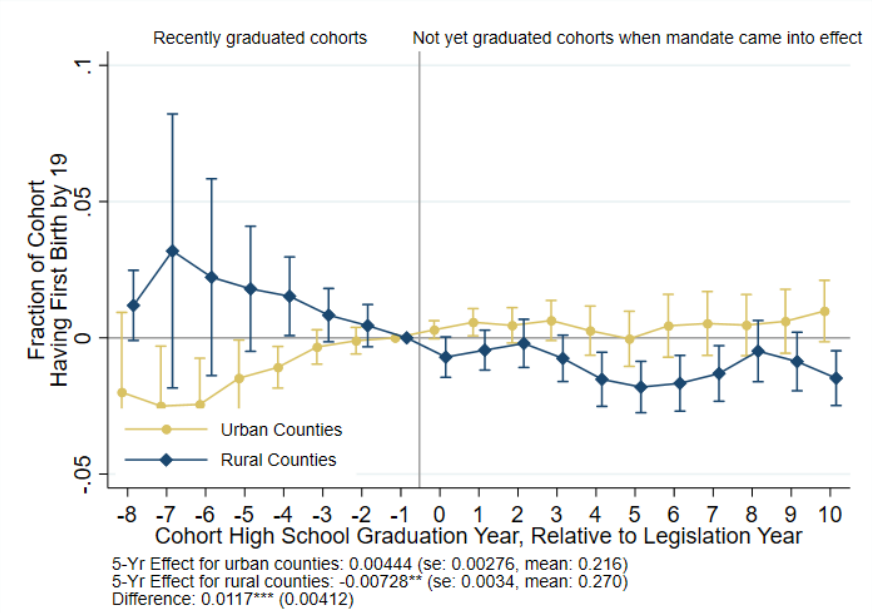
Note: Treatment states introduced either a HIV/AIDS-specific mandate (in navy blue) or a comprehensive sex education mandate (in yellow) from 1987 to 1988, while control states introduced a mandate in 1998 or later, or never introduced any mandate (in grey). States not in the sample are shaded in white.

Figure A.3: Effect on Teen First Births **by Urban and Rural Areas**

(a) Treated States with Only HIV/AIDS Mandates

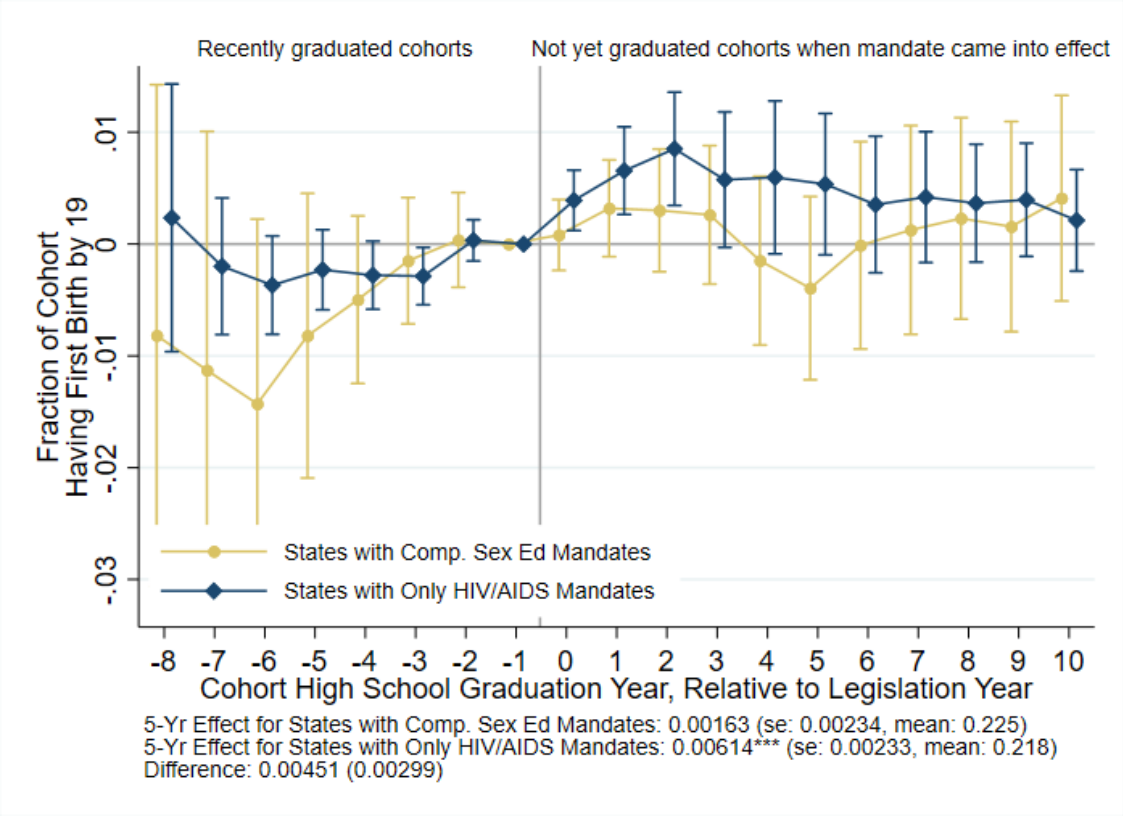


(b) Treated States with Comprehensive Sex Ed Mandates



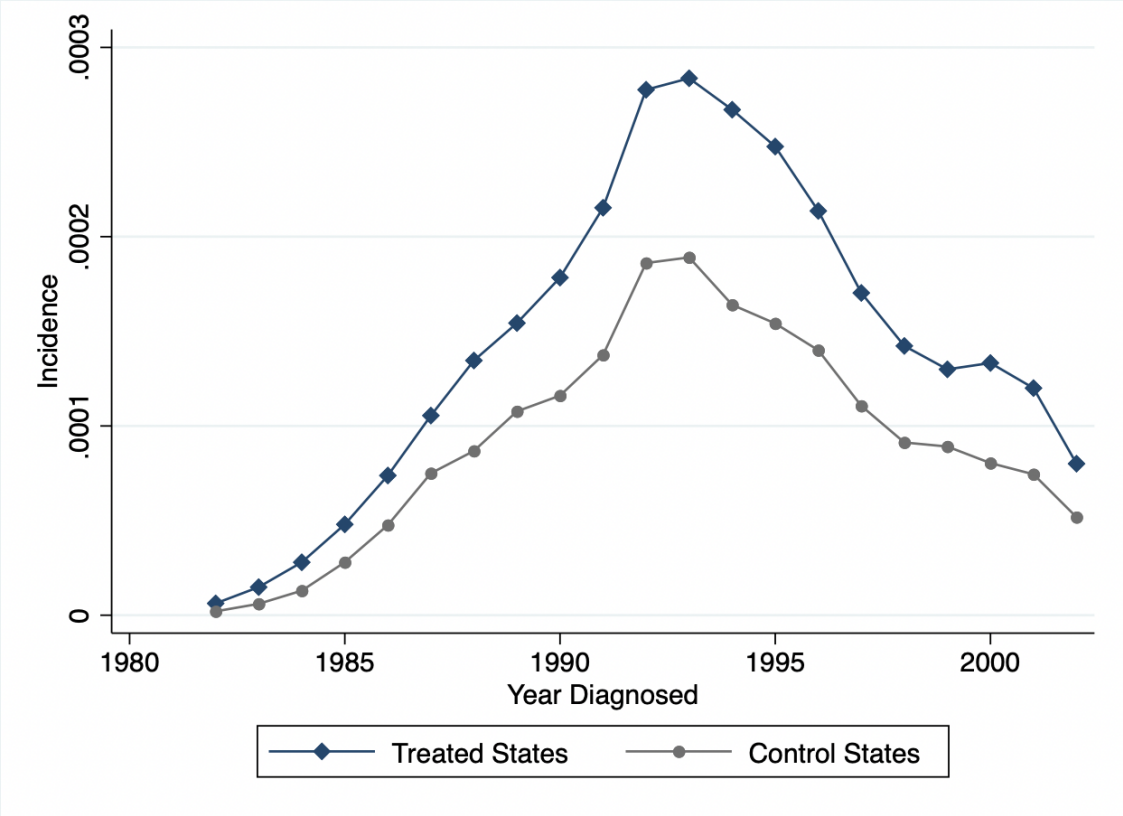
Note: The graph plots coefficient estimates $\{\beta_{1k}, \beta_{2k}\}$ based on Equation 2 for cohorts of rural women (in blue) and urban women (in yellow) who were $18-k$ years old when the mandate came into effect. The estimation sample in Subfigure (a) includes treated states with only HIV/AIDS-specific mandates in 1987-1988 and control states with did not have HIV/AIDS mandates by 1998, in Subfigure (b) treated states which also had sex education mandates and control states. Rural counties are defined as those with above-median rurality. The outcome is the cohort share of first births between ages 15-19 at the county-cohort level. The group-specific estimate for the average of coefficients for cohorts 0 to 4 following the mandate (with corresponding standard error) is reported below the figure along with the mean outcome. The 95% confidence intervals are based on robust standard errors clustered at the state level.

Figure A.4: AIDS Incidence Control



Note: The graph plots coefficient estimates β_k based on Equation 2, which compare birth rates in treated states with only HIV/AIDS-specific mandates in 1987-1988 versus control states with did not have HIV/AIDS mandates by 1998 (in blue), and in treated states which also had sex education mandates versus control states (in yellow), for cohorts of women who were $18 - k$ years old when the mandate came into effect. The dependent variable is the rate of first births between ages 15-19 at the county-cohort level. The 95% confidence intervals are based on robust standard errors clustered at the state level.

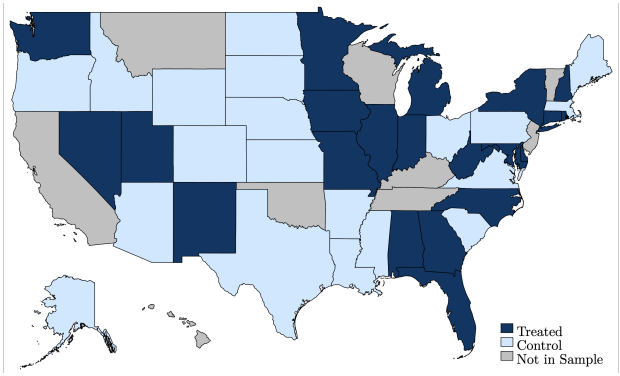
Figure A.5: AIDS Incidence in Treated vs. Control States



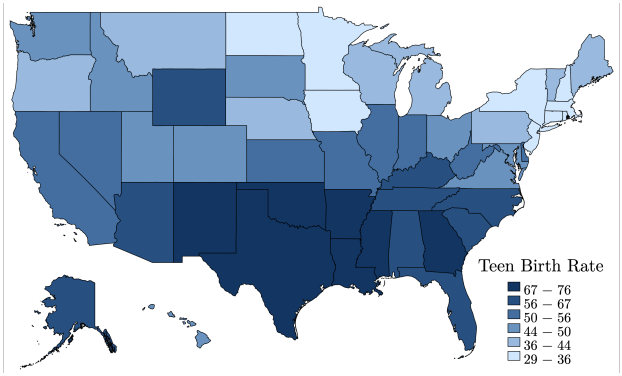
Note: Treated states are thse with HIV/AIDS-specific mandates effective in 1987-1988, control states are those with no HIV/AIDS mandates by 1998. AIDS incidence is the total number of AIDS cases (in MSAs) per 1,000 population. Data on AIDS cases from CDC Wonder AIDS Database.

Figure A.6: Geographic Variation in Treatment, Teen Birth Rates, and AIDS Cases

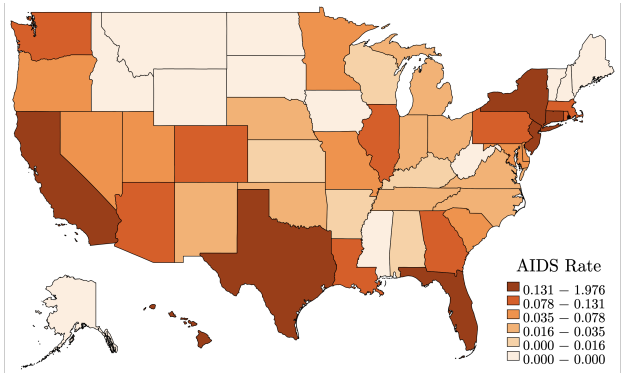
(a) 1987-1988 HIV/AIDS Education Mandates



(b) 1985 Teen Birth Rate



(c) 1980-1985 AIDS Rate



Notes: Figure 1a is a map showing states that introduced HIV/AIDS education mandates in 1987-1988 in navy blue, states that never introduced HIV/AIDS education mandates or from 1998 onwards in light blue, and states not in the sample in gray. Figure 1b is a heat map of 1985 teen birth rates, i.e., the births by mothers between the ages of 15-19 in 1985 divided by the female population aged 15-19 multiplied by 1000. Figure 1c is a heat map of the 1980-1985 AIDS Rate, i.e., the cumulative number of reported AIDS cases between 1980 to 1985 divided by the state population in 1985 multiplied by 1000.
Sources: CDC Vital Statistics Birth Data, CDC Wonder.

B Sex Education Policy Mandates

13 States with HIV/AIDS-Specific Policies

1. **Alabama** required AIDS education starting in 1987 from fifth grade onward. A 1975 state code (Code of Alabama, 1975, §16-40A-2) requires that any sex education materials taught in schools should emphasize abstinence as "the only completely effective protection against unintended pregnancy, sexually transmitted diseases and infections, and human immunodeficiency virus (HIV) when transmitted sexually."

2. Effective in 1988, **Connecticut** passed C.G.S.A. § 10-19 requiring "ongoing and systematic instruction on acquired immune deficiency syndrome, as taught by legally qualified teachers. The content and scheduling of the instruction shall be within the discretion of the local or regional board of education." The earliest grade of instruction is not specified.

3. **Florida** introduced Section 381.608, Florida Statutes in 1988. A one-half credit course must be taken by all students in either the 9th or 10th grade. The statute reads: "Throughout instruction in Acquired Immune Deficiency Syndrome, ... a school shall (a) Teach abstinence from sexual activity outside of marriage as the expected standard for all school age children. (b) Include that abstinence from sexual activity is a certain way to avoid out-of-wedlock pregnancy, sexually transmitted diseases, and other associated health problems."

4. **Illinois** introduced Public Act 85-680, effective in 1988, required instruction on "the prevention, transmission, and spread of AIDS" from grades 6 to 12.

5. In 1988, **Indiana** introduced IN ST 20-10.1-4-10 requiring schools to "include in its curriculum instruction concerning the disease known as Acquired Immune Deficiency

Syndrome (AIDS)". The content of instruction and grades in which it is taught is left to the discretion of schools.

6. **Michigan** amended Section 1169 of Act No. 451 of the Public Acts of 1976 to read: "the principal modes by which ... acquired immunodeficiency syndrome, are spread and the best methods for the restriction and prevention of these diseases shall be taught in every public school in this state". The curricula content must be approved by local school boards, no earliest grade is stated.

7. **Minnesota** passed Chapter 718-H.F.No. 2245 in 1988 requiring school districts to have a HIV/AIDS program targeting adolescents.

8. **Missouri** approved V.A.M.S. 191.668 for educational programs in public schools on "the transmission and prevention and treatment of the HIV virus... educational programs shall stress moral responsibility in and restraint from sexual activity".

9. **New Mexico** passed 6.12.2.10 in 1988 requiring age-appropriate instruction about HIV to all students from elementary to senior high school grades. The instructional program shall include, but not necessarily be limited to: (a) definition of HIV and acquired immune deficiency syndrome (AIDS); (b) the symptoms and prognosis of HIV and AIDS; (c) how the virus is spread; (d) how the virus is not spread; (e) ways to reduce the risks of getting HIV/AIDS, stressing abstinence; (f) societal implications for this disease; (g) local resources for appropriate medical care; and (h) ability to demonstrate refusal skills, overcome peer pressure, and use decision-making skills.

10. **New York** amended NYCRR §135.3 in 1987 as an emergency measure requiring age-appropriate instruction from K to 12. The content "shall stress abstinence as the most appropriate and effective premarital protection against AIDS".

11. **North Carolina** passed 115C-81 in 1987 mandating instruction on "prevention of AIDS virus infection... in public schools... emphasizing parental involvement, abstinence from sex and drugs, ...".

12. **Utah** amended 53A-13-101 in 1988 that there should be instruction on "the prevention of communicable disease, including acquired immunodeficiency syndrome. That instruction shall stress the importance of abstinence from all sexual activity before marriage and fidelity after marriage as methods of prevention of acquired immunodeficiency syndrome". Instruction should range from grades eight through twelve.

13. **Washington** added a new section to chapter 70.24 RCW in 1988 that requires public schools to establish an AIDS education program. The section notes that "the program of AIDS prevention education shall stress the life-threatening dangers of contracting AIDS and shall stress that abstinence from sexual activity is the only means for prevention of the spread or contraction of the AIDS virus through sexual contact".

8 States & D.C. with Comprehensive Sex Education Policies

1. **Delaware** passed Delaware Administrative Code title 14, § 851 in 1988 on a "K-12 Comprehensive Health Education and Family Life Education Policy" that "establishes a foundation for understanding the relationships between personal behavior and health". Schools are required to include health education "inclusive of a comprehensive sexuality education and an HIV prevention program that stresses the benefits of abstinence from high-risk behaviors".

2. **Georgia** enacted Ga. Code Ann., § 20-2-143 in 1988. The act required "a course of study in sex education and AIDS prevention instruction" in public schools, including instruction "relating to the handling of peer pressure, promotion of high self-esteem, local community values, and abstinence from sexual activity as an effective method of

prevention of pregnancy, sexually transmitted diseases, and acquired immune deficiency syndrome".

3. **Iowa** approved Acts 1988 (72 G.A.) ch. 1018, §§ 1 in 1988. Age-appropriate instruction from kindergarten through grade twelve should include content on "sexually transmitted diseases and acquired immune deficiency syndrome, current crucial health issues, human sexuality, self-esteem, stress management, and interpersonal relationships".

4. **Maryland** introduction regulation on family life education in 1970, and passed regulation on HIV/AIDS prevention education in 1987. These regulation were later repealed and combined under COMAR 13A.04.18 in 1991.

5. **Nevada** amended Nev. Rev. Stat. Ann. § 389.036 in 1987 to include a course on "factual instruction concerning acquired immune deficiency syndrome" and "instruction on the human reproductive system, related communicable diseases and sexual responsibility".

6. **New Hampshire** inserted Chapter 141-F in their statutes in 1988 requiring the development of course related to human immunodeficiency virus. Earlier in 1973, chapter 242:1 and 189:10 required schools to teach "physiology and hygiene insofar as it relates to the effect of alcohol and other drugs and venereal diseases on the human system".

7. **Rhode Island** passed 16-22-17 in 1987 mandating an AIDS education program which "provide students with accurate information and instruction on AIDS transmission and prevention, and ... shall also address abstinence from sexual activity as the preferred means of prevention". Rhode Island also passed 16-22-18 to establish the content of health and family life courses. Courses are required to include programs on "the prevention of pregnancy, sexually transmitted diseases, and sexual violence ... that increases student awareness of the fact that consent is required before sexual activity".

8. **West Virginia** passed West Virginia Code §18-2-9 in 1988 requiring age-appropriate comprehensive sex education instruction from grades six through twelve. The content should include: "the prevention, transmission, and spread of acquired immune deficiency syndrome and other sexually transmitted diseases".

9. **D.C.** amended Section 707 in 1979 to require "instruction on human sexuality and reproduction which shall include... information on human anatomy, physical changes during adolescence, menstruation, intercourse, pregnancy, childbirth, lactation, venereal disease, contraception, abortion, homosexuality, reduction of infant mortality, improvement of pregnancy outcomes, and awareness and prevention of rape and other sex offenses". The course content should be age-appropriate and taught to grade less Pre-K through twelve. In 1988, D.C. amended Title 5 of Chapter 24 such that schools were also required to provide students with AIDS education.