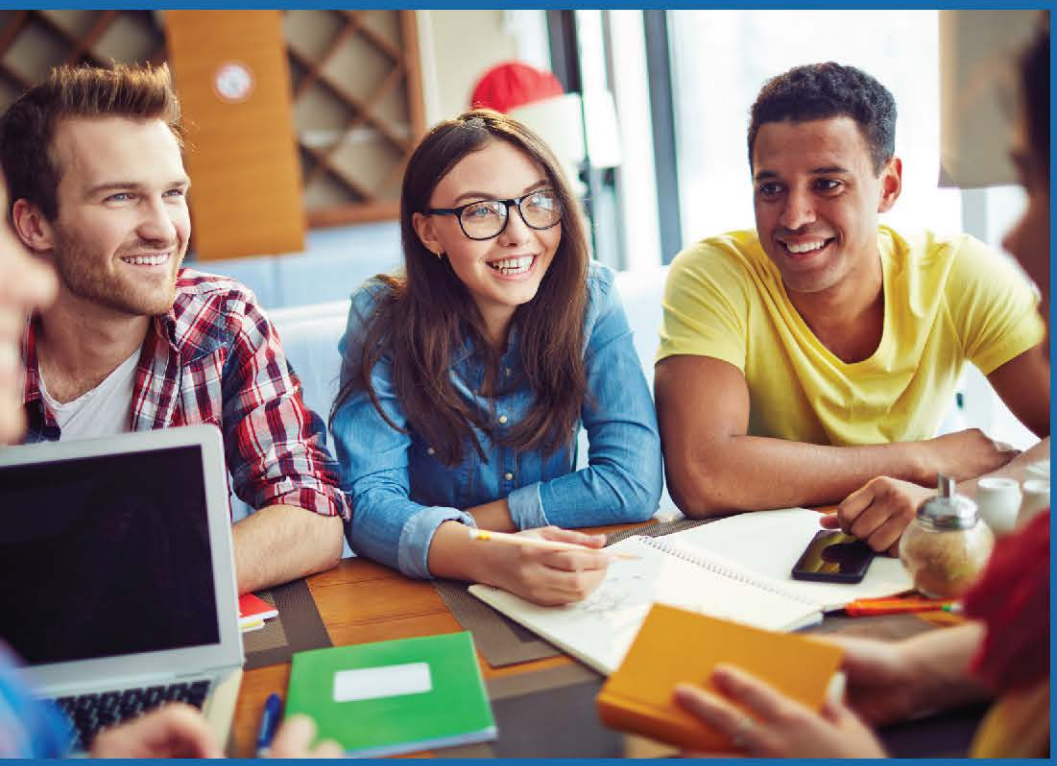

Economic Benefits of Delayed Sexual Activity

OPRE Report Number 2021-22

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ECONOMIC BENEFITS OF DELAYED SEXUAL ACTIVITY

OPRE Report 2021-22

February 2021

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Contents

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Tables

Figure

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OVERVIEW

The avoidance of sexual activity among youth not only prevents unplanned pregnancies and sexually transmitted infections but can also promote healthy outcomes and contribute to the positive development of youth. Research has shown, in particular, that delayed initiation of sexual intercourse can lead to increases in high school graduation, short-term gains in mental health, and improved relationship quality in early adulthood. Overall, rates of reported sexual activity among youth have declined in recent decades and are at their lowest since the early 1990s, with the decrease most pronounced during the past decade. Still, estimates from 2019 show that 38 percent of high school–age youth had ever had sex. In addition, among sexually experienced youth, estimates suggest that 60 percent wished that they had waited longer before having had sex.

In fall 2017, the U.S. Department of Health and Human Services (HHS) contracted with Mathematica to conduct an economic analysis of delayed sexual activity among adolescents in the United States. This analysis, referred to as the Savings from Sexual Avoidance and Empowerment over Risks (SSAvER) project, aims to quantify in economic terms the benefits of adolescents' delaying voluntary sexual activity. In comparison to prior studies on the savings and costs of teen pregnancy and unintended childbearing, the SSAvER project is unique, first, by examining the savings and costs of delayed sexual activity as a precursor to these outcomes and, second, by considering other potential savings and costs associated with delayed sexual activity, such as savings from improved relationship stability or reduced substance use.

The study provides summary estimates of the net lifetime per capita benefit of delayed voluntary sexual activity. To produce these estimates, the SSAvER team examined the relationship between delayed sexual activity and a wide range of later behaviors and outcomes, known as the "ingredients" for the economic analysis. The team then estimated the net benefit of the predicted changes in the ingredients in dollar terms. Finally, the team combined these estimates across ingredients to produce an overall summary per capita estimate of the net lifetime benefit of delayed voluntary sexual activity. The team produced separate summary estimates (1) for males versus females, (2) for different age cutoffs used to define delay, and (3) using different sets of assumptions about the extent of the predicted change for each ingredient, accounting for uncertainty in the estimated relationships between delay in sexual activity and the ingredients. Further, the team estimated benefits from three perspectives: that of the adolescents, that of other taxpayers, and that of society as a whole. The resulting estimates reflect the specific ingredients included in the analysis and do not necessarily reflect all possible savings and costs associated with delayed sexual activity. It is important to note that additional, excluded benefits could cause the estimates to increase or decrease.[i]

[i] Benefits could be excluded if either an ingredient is excluded from the analysis or a benefit associated with an included ingredient is excluded when valuing that ingredient.

Based on the specific ingredients included in the analysis, the results show that the economic benefits of delayed sexual activity vary depending on the population, age cutoff, perspective, and assumptions used for the analysis. As shown in the tables below:

Population: Estimated benefits are consistently higher for females than for males.

Age cutoff: The results show no clear pattern based on the age cutoff used to define delayed sexual activity. The analyses do not yield estimates of the incremental effect of each additional year of delay (this was infeasible based on the available data). Rather, the estimates show the net benefit of initiating sex before or after selected ages (15, 18, 20, 22, and age at first marriage)

Perspective: Benefits are greatest from the perspective of society as a whole. For the most part, these benefits accrue primarily to the individual adolescents who choose to delay sex. Other taxpayers accrue a smaller net benefit.

Assumptions: As expected, more stringent assumptions yield smaller estimates of net benefits.

Choosing a couple of specific examples, using less stringent assumptions, and the perspective of society, the analysis indicates a net benefit of $43,437 for females and $26,204 for males from delaying voluntary sexual activity to age 18 or later; and a net benefit of $64,707 for females, and no benefit for males, from delaying voluntary sexual activity until the age of first marriage. Other combinations of population, age cutoff, perspective, and assumptions yield a range of estimates, shown in Tables 1 and 2. Reductions in teen pregnancy and unintended pregnancy in adulthood account for some—but not all—of the estimated net benefit.

Table 1. Net benefit to society of delayed voluntary sexual activity

	Sample		
Age cutoff used to define delay	Females	Males	Full sample
More stringent estimation approach			
Age 15 or later	9,118	0	3,174
Age 18 or later	9,751	914	6,326
Age 20 or later	3,978	3,182	4,154
Age 22 or later	3,414	2,994	3,108
Age at first marriage	0	0	0
Less stringent estimation approach			
Age 15 or later	52,109	27,861	36,840
Age 18 or later	43,437	26,204	34,204
Age 20 or later	54,829	51,341	51,788
Age 22 or later	64,171	41,038	51,111
Age at first marriage	64,707	-150	30,631

Note: All values are in 2018 dollars. Estimates include the net benefits associated with the 17 outcomes included in the SSAvER economic analysis. Additional, excluded benefits could cause estimates to increase or decrease.

Table 2. Net benefit of delayed voluntary sexual activity, by perspective

Age cutoff used to define delay	Perspective		
	Individuals	Taxpayers	Society
More stringent estimation approach			
Age 15 or later	1,507	1,360	3,174
Age 18 or later	3,198	1,964	6,326
Age 20 or later	2,200	1,512	4,154
Age 22 or later	1,745	1,016	3,108
Age at first marriage	0	0	0
Less stringent estimation approach			
Age 15 or later	23,021	11,133	36,840
Age 18 or later	19,997	10,304	34,204
Age 20 or later	33,905	15,361	51,788
Age 22 or later	34,040	14,847	51,111
Age at first marriage	17,737	8,803	30,631

Note: All values are in 2018 dollars. Estimates include the net benefits associated with the 17 outcomes included in the SSAvER economic analysis. Additional, excluded benefits could cause estimates to increase or decrease.

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I. INTRODUCTION

Economic analysis is a method to calculate the potential savings and costs tied to changes in specific policies, programs, or behaviors. For example, studies have calculated the potential savings and costs tied to reductions in cigarette smoking (for example, Rumberger et al. 2010). These studies calculate the savings that could result from improved health and reduced medical expenses, the costs that could result from reduced revenue for cigarette manufacturers and retailers, and the costs or savings that could result from differences in the workplace productivity of smokers and nonsmokers. Other studies have used economic analysis methods to calculate the potential savings and costs of declines in behaviors such as underage drinking (Sacks et al. 2015) and outcomes such as unintended pregnancy (Monea and Thomas 2011).

In fall 2017, the U.S. Department of Health and Human Services (HHS) contracted with Mathematica to conduct an economic analysis of delayed sexual activity among adolescents in the United States. This analysis, referred to as the Savings from Sexual Avoidance and Empowerment over Risks (SSAvER) project, aims to calculate in economic terms what happens if an adolescent delays voluntary sexual activity until they are older—for example, waiting until age 18 or older to have sexual activity, waiting until age 20 or older, or waiting until marriage. Many prior studies have calculated the potential savings and costs associated with reductions in teen pregnancy and unintended childbearing (for example, Maynard and Hoffman 2008; Monea and Thomas 2011; Power to Decide 2013, 2018). The SSAvER project differs from these prior studies by focusing on delayed sexual activity as a precursor to teen pregnancy and unintended childbearing.

In addition, the project differs from previous research by accounting for other savings and costs that might result from delayed sexual activity, such as savings from improved relationship stability, increased educational attainment, or reduced substance use. The avoidance of sexual activity among youth not only prevents unplanned pregnancies and sexually transmitted infections (STIs) but can also promote healthy outcomes and contribute to the positive development of youth. Research has shown, in particular, that delayed initiation of sexual intercourse can lead to increases in high school graduation, short-term gains in mental health, and improved relationship quality in early adulthood (Rotz et al. 2020). Overall, rates of reported sexual activity among youth have declined in recent decades and are at their lowest since the early 1990s, with the decrease most pronounced during the past decade (Twenge and Park 2019). Still, estimates from 2019 show that 38 percent of high school–age youth had ever had sex (Centers for Disease Control and Prevention 2020; Kann et al. 2018). In addition, among sexually experienced youth, estimates suggest that 60 percent wished that they had waited longer before having had sex (Albert 2012).

This study provides summary estimates of the net lifetime benefit that accrues when a single adolescent chooses to delay voluntary sexual activity. These estimates are useful for valuing the type of changes in behavior that are likely in response to federally funded and other sexual risk avoidance and teen pregnancy prevention programs (Lugo-Gil et al. 2018; Juras et al. 2019). As such, they can be used to inform decision making by program providers and policymakers. The analysis does not account for the additional benefits and costs that might accrue if all or a

substantial share of adolescents chose to delay sex, as might occur over long periods or in response to substantial shifts in social norms. If a large number of adolescents simultaneously chose to delay sex, there might be additional costs and benefits associated with delay. For example, a resulting decline in the absolute number of births in the United States could have benefits (such as reduced competition for limited educational opportunities and resources) as well as costs (such as reducing the number of tax-paying workers in the long run).Our analysis does not capture these. But such large changes occur over decades and result from a multitude of explanations rather than from a single policy or program. For example, the decline in youth sexual activity from 2007 to 2017 was likely caused by myriad factors, including changes in adolescents' romantic relationships, alcohol consumption, earnings, and use of computers (Lei and South 2020).

This report is the second of two reports produced by the SSAvER team. In an earlier report (Rotz et al. 2020), the team synthesized existing research on the benefits of delayed sexual activity. The team used this synthesis to inform its economic analysis, the results of which are detailed in the remainder of this report. The rest of this chapter presents the research questions the SSAvER project was designed to address and provides an overview of the team's analysis approach. Chapter II describes the data and methods the team used for the analysis. Chapters III details the findings. Chapter IV summarizes the findings and their implications. Appendices to the report present more detailed information on the study's data, methods, and findings.

A. Research questions

For this analysis, the SSAvER team examined the economic savings associated with delayed adolescent sexual activity. Specifically, the team expanded on earlier research on the economic savings of reductions in teen pregnancy and childbearing by incorporating information on other potential savings that might result from delayed adolescent sexual activity. In addition, the team considered savings from several perspectives: individual adolescents, taxpayers (for whom benefits accrue due to changes in taxes and government spending), and society as a whole (including adolescents, taxpayers, and other groups of people potentially influenced by changes in adolescents' behaviors). The team also examined the savings associated with different definitions of delay, including delaying sexual activity until marriage.

The SSAvER team designed an economic analysis intended to answer the following three main research questions:

1. What is the net economic benefit to society as a whole when an adolescent delays voluntary sexual activity?
2. How does the net benefit of delayed adolescent sexual activity vary according to the specific age cutoff used to define delay?
3. How much of the net benefit to society accrues to the individual adolescents who choose to delay sexual activity, and how much accrues to taxpayers?

As discussed later in the report, in answering these questions, the team also produced separate estimates of net economic benefit for males versus females, given evidence that the savings and costs of delayed voluntary sexual activity might vary by gender.

B. Overview of approach

To conduct the analysis, the SSAvER team first had to (1) select an overarching framework for the economic analysis, (2) develop operational definitions of delayed sexual activity, and (3) specify a time horizon and perspective for the analysis. In carrying out these steps, the team relied as much as possible on existing methods and resources, particularly earlier economic analyses of teen childbearing by Maynard and Hoffman (2008) and Power to Decide (2013). In addition, the team consulted with external substantive and methodological experts (as listed in the preface to this report). The SSAvER team used input from the experts to inform its approach but had ultimate responsibility for recommending whether and how to incorporate the experts' input. Chapter II of this report provides more detailed information on data and methods.

1. Analysis method

As an overarching framework for the analysis, the SSAvER team used the resource cost method, a common standard in the field of economic analysis (Levin and McEwan 2001). This method involves first identifying behaviors and outcomes that could be affected by delayed sexual activity, which constitute the inputs or "ingredients" that will factor into the cost calculation, and then associating a dollar value with changes in each ingredient. For this economic analysis of delayed sexual activity, the most obvious candidates were reductions in teen pregnancy and STIs, given the biological connection between delayed sexual activity and these outcomes. However, the team also considered potential savings and costs linked to a range of possible changes that might result from delayed sexual activity, including shifts in adolescent substance use, future relationship stability, and educational attainment. As discussed in greater detail in Chapter II, the team based its selection of these ingredients on earlier research (summarized in the project's earlier report, Rotz et al. 2020) as well as an analysis the team conducted of data from the National Longitudinal Study of Adolescent to Adult Health (Add Health). In total, the team considered 24 potential ingredients (as listed in Chapter II, Table II.2). The resulting estimates of net benefit are tied to these specific ingredients and do not necessarily reflect all potential savings and costs of delayed sexual activity.

For each ingredient, the SSAvER team also had to decide "how much" of the ingredient to include in the analysis. For example, as discussed in greater detail in Chapter II, the team identified underage drinking as one of the ingredients, given evidence of a correlation between the timing of first sexual activity and underage drinking. To include this ingredient in the analysis, the team had to estimate how much of a decline in the likelihood of underage drinking could potentially result from delayed sexual activity. As with any statistical analysis, the estimates involved some uncertainty. In part to account for this uncertainty, the SSAvER team combined estimates from four analytic methods, each with its own strengths and weaknesses, to examine the relationship between delayed sexual activity and each ingredient. In addition, the team developed two sets of rules to combine estimates across methods, reflecting approaches that were more and less stringent in accounting for the degree of uncertainty in the estimates.

2. Defining delayed sexual activity

The SSAvER team produced separate summary estimates of net benefit for five alternative age cutoffs: age 15 or later, age 18 or later, age 20 or later, age 22 or later, and the age at first marriage. The team did not make any assumptions about whether the net benefit increases or declines with age. For each estimate, the SSAvER team compared outcomes for all individuals who delayed sexual activity until the specified age to all individuals who did not do so. For example, the team generated the estimated benefit of delay until age 20 by comparing individuals who delayed sexual activity until age 20 (including those who delayed until 20, 21, 22, and so on) to individuals who initiated sexual activity before age 20 (including those who initiated at age 19, 18, 17, and so on). The estimates can be compared across age cutoffs to check for patterns by selected cutoff. However, the estimates are independent and cannot be combined or added together in a simple way.

For all five age cutoffs, the team defined delayed sexual activity as refraining from voluntary vaginal sexual intercourse. The team sought to isolate the savings and costs associated with voluntary (rather than involuntary) sexual activity because both the costs and policy implications of voluntary and involuntary sexual activity likely differ. The team decided to focus on vaginal sexual intercourse (and to exclude oral and anal sex) primarily for practical reasons related to the team's analysis of Add Health data. In particular, the Add Health survey questions on sexual activity referred most consistently to the timing of first vaginal intercourse. In deciding to focus on vaginal sexual intercourse, the team also relied on evidence suggesting that age at first vaginal intercourse captures the age at first oral, anal, or vaginal intercourse for 80 percent of all adolescents (Halpern and Haydon 2012) and for 70 percent of adolescents who either report having had same-sex partners or not otherwise identifying as heterosexual (Goldberg and Halpern 2017). These percentages imply that, for most adolescents, the timing of first vaginal intercourse is an accurate proxy for the timing of first sexual activity more broadly defined.

3. Time horizon and perspective

The results of an economic analysis can depend heavily on the time horizon and perspective used for the analysis. For an economic analysis of delayed sexual activity, time horizon refers to the period used to capture potential savings and costs—for example, focusing only on adolescence or focusing on a longer period extending into adulthood. Perspective refers to the group of individuals for whom savings and costs are calculated—for example, society as a whole, the individual adolescents who choose to delay sexual activity, or other groups of people potentially influenced by changes in adolescents' behaviors. The analyses estimate lifetime net benefits. To do this, the team first used Add Health data to capture potential savings and costs extending from adolescence through early- or mid-adulthood (when the Add Health respondents were in their 20s and early 30s). Then, the team extrapolated estimated savings and costs into the future when feasible. For perspective, the team examined savings or costs of delayed sexual activity for (1) individual adolescents, (2) taxpayers, and (3) society as a whole (including adolescents, taxpayers, and all other individuals potentially influenced by changes in adolescents' behaviors). For each perspective, the team also calculated separate estimates by the gender of the adolescent.

II. DATA AND METHODS

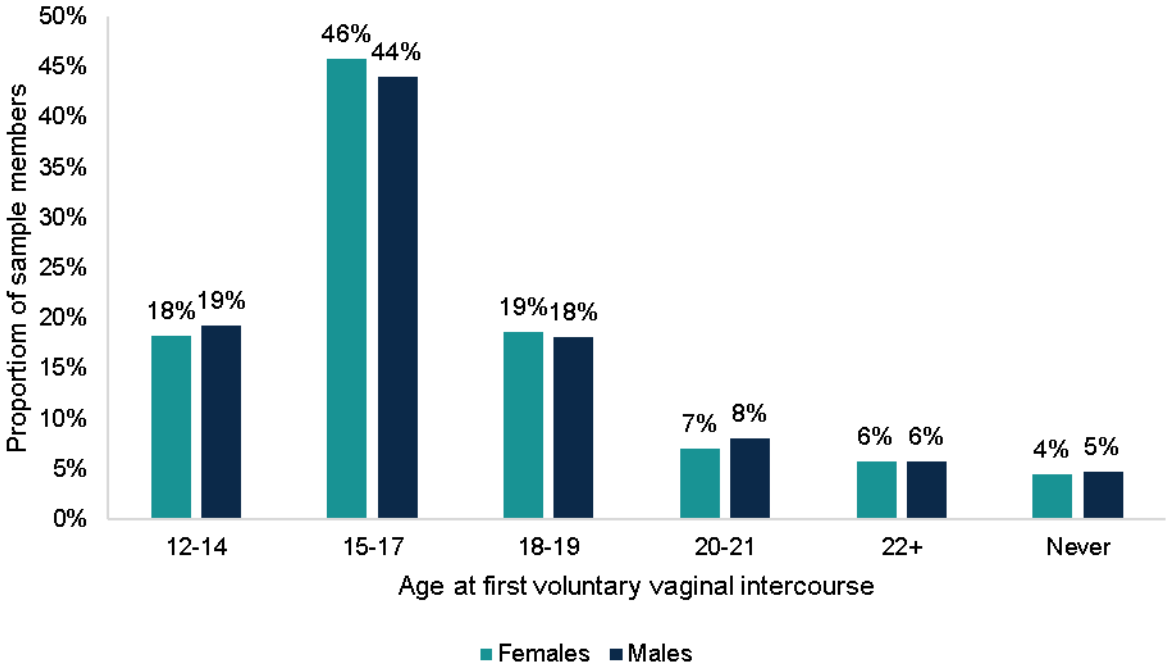
The SSAvER team's economic analysis of delayed sexual activity involved four main steps. First, the team used Add Health data and past research on the benefits of delayed sexual activity (see Rotz et al. 2020) to determine which ingredients to include in the analysis. Second, the team used Add Health data to measure the ingredients and examined the relationship between each ingredient and the timing of first sexual activity (Appendix A provides further details). Third, the team used existing research on economic analysis to estimate net monetary benefits for as many of the ingredients as possible. Fourth, the team developed two sets of decision rules (more and less stringent) for determining how much of each ingredient to include in the analysis when calculating summary estimates of the total net benefit of delayed sexual activity.

A. Ingredients for the economic analysis

The SSAvER team used Add Health to estimate the benefits of delayed sexual activity. Add Health follows a nationally representative sample of 20,475 adolescents who were enrolled in grades 7 to 12 during the 1994–1995 school year. The team selected Add Health for the analysis because it is the largest recent, longitudinal data set that is national in scope and that includes information on adolescent sexual activity (Ivankovich et al. 2013). For the SSAvER economic analysis, the team used Add Health data from four waves of interviews conducted during 1994–1995 (when respondents were ages 10 to 19), 1995–1996 (respondents ages 11 to 19), 2001–2002 (respondents ages 18 to 26), and 2008 (respondents ages to 24 to 32). Add Health collects information on respondents' social, economic, psychological, and physical well-being; romantic and sexual behavior; delinquency and substance abuse; reproductive health; sexual knowledge; and educational achievement. It also captures contextual factors, including those related to adolescents' families, neighborhoods, communities, friends, and schools. The nationally representative sample for this study's analyses is the set of 15,701 individuals who completed interviews in the first and fourth Add Health survey waves. A fifth wave of data collection was in progress during this analysis, but the associated data were not yet available.

As expected from a nationally representative survey, the Add Health sample included individuals who initiated sexual activity at a wide range of ages (Figure II.1). About one-fifth of the sample had initiated sexual activity at ages 12 to 14, and nearly half did so at ages 15, 16, or 17. These percentages are similar to those reported in the nationally representative Youth Risk Behavior Survey (YRBS) for high school students in the 1990s (Twenge and Park 2019). For the purpose of the analyses presented in this report, the SSAvER team excluded individuals from the Add Health data who reported initiating sexual activity before age 12 (N = 330) and individuals who experienced sexual abuse or rape at or before the age at which they reported having first engaged in sexual activity (N = 1,552). The team used these exclusions as a proxy for involuntary first sexual activity. For all of the analyses presented in this report, the SSAvER team used the Add Health sampling weights, which account for the complex survey design and result in estimates representative of a national population of students in grades 7 to 12 in 1994–1995.

Figure II.1. Age at first sex, by gender



Source: Add Health survey sample, individuals who responded to both Wave I and Wave IV surveys, excluding individuals who reported sexual initiation before age 12 or sexual abuse or rape at or before the age of sexual initiation. N = 12,987.

Sample characteristics measured at the time of the first survey wave provide additional contextual information on the study sample (Table II.1). Slightly less than half (46 percent) of the sample was female, and the average age was about 15. Roughly two-thirds of the sample members (68 percent) were White, 14 percent were Black, and the remainder (18 percent) were another race or identified as multiracial. Fourteen percent of the sample was Hispanic. Almost all sample members lived with their mothers, 73 percent lived with their fathers, and 70 percent lived with both parents. About 73 percent of the respondents reported that their parents were married at the time of the survey, with 22 percent reporting that their parents had previously been married. Nearly two-thirds of the adolescents (65 percent) reported feeling very close to their mothers, and 40 percent reported feeling very close to their fathers. The typical respondent's mother and father had a high school or some college education, with 29 percent of respondents' mothers and 34 percent of respondents' fathers having a college degree. About one in five households experienced substantial financial hardship: 17 percent of respondents' parents reported not having sufficient income to pay their bills, and 12 percent of respondents lived in a household in which some member received Supplemental Nutrition Assistance Program (SNAP) benefits in the month before the first Add Health survey. The average respondent lived in an area in which 7 percent of households were female-headed and a county with about 60 births for every 1,000 females age 15 to 19.

Table II.1. Add Health analysis sample characteristics at the time of the first Add Health survey wave

(percentage unless noted)	Full sample	Delayed sex until age 18	Did not delay sex until age 18	Difference
Percentage of sample	100	36	64	
Female	46	46	47	-1
Age (years)	15.0	15.1	15.0	0.1**
Race				
Black	14	9	17	-8***
White	68	71	66	5***
Other race	12	14	11	4***
Multiple races	6	5	6	-2***
Hispanic	14	14	13	0
Living with parent				
Lives with mother figure	95	97	94	3***
Lives with father figure	73	81	69	12***
Lives with both	70	78	65	13***
Parent marital status				
Parent is married	73	80	69	11***
Parent is single	5	3	6	-8***
Parent is separated, widowed, or divorced	22	17	25	-3***
Relationship with parents				
Teen feels very close to mother	65	68	63	5***
Teen feels very close to father	40	47	36	11***
Mother's educational attainment				
Less than high school	14	12	16	-3***
High school	39	35	42	-6***
Some college	17	17	18	-1
College degree	22	26	19	8***
More than college	7	9	6	3***
Father's educational attainment				
Less than high school	14	11	16	-5***
High school	35	31	38	-8***
Some college	16	16	16	0
College degree	23	28	21	7***
More than college	11	15	9	6***
Economic status				
Parent reports not enough money to pay bills	17	15	18	-3**
Household received SNAP last month	12	9	14	-6***
Community context				
Share of female-headed households in census block group	7	6	8	-2***
County-level teen birth rate[a]	59.2	56.9	60.5	-3.7***
Sample size	12,987	4,772	8,215	

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test.

[a] Births per 1,000 women, among women ages 15 to 19.
SNAP = Supplemental Nutrition Assistance Program.

Table II.1 also reveals substantial differences in sample characteristics among groups based on the timing of first sexual activity (also see Appendix A). For example, using age 18 or later as a cutoff, those who delayed sex are statistically significantly more likely to be White, live with a

father figure, and have a parent with a college degree. In total, all but 4 of the 29 sample characteristics included in Table II.1 show a statistically significant difference between groups. As discussed later in this chapter, the SSAvER team had to account for these differences when examining the relationship between the timing of first sexual activity and each ingredient included in the economic analysis.

As discussed in Chapter I, the SSAvER team sought to incorporate a broad range of ingredients into the economic analysis. From among the full range of possible variables, the SSAvER team selected ingredients that (1) could be measured in the Add Health data, (2) had evidence of an association with the timing of sexual activity from prior studies (see Rotz et al. 2020), (3) had the potential for linking to monetary values, and (4) were distinct enough from each other that their monetary values could be added together without substantially double-counting savings and costs. As an example of the avoidance of double counting, the team did not include unprotected sex as an ingredient, even though past studies had examined it. The key costs associated with unprotected sex would be those related to teenage and unintended pregnancy and STI transmission. But more comprehensive and direct measures of the costs associated with teenage and unintended pregnancy and STI transmission were already included in the analysis. Therefore, including costs associated with unprotected sex would lead these costs to be "double-counted" in the estimates of economic benefits. The selection process yielded a list of 24 ingredients in seven domains (Table II.2).

In part as a result of these selection criteria, the analysis did not include all possible savings and costs associated with delayed sexual activity. For example, the analysis did not include pregnancy outside of marriage as one of the ingredients. The majority (71 percent) of pregnancies outside of marriage are reported as unintended, and our analysis included an ingredient for unintended pregnancy (Finer and Zolna 2014). In addition, the largest costs associated with pregnancies among nonmarried women included those related to public benefit receipt and family instability and complexity (see McLanahan 2011). The SSAvER team captured the former directly through an ingredient measuring public benefit receipt, while many aspects of the latter were captured by the six ingredients selected within the relationships domain. In this way, many of the savings and costs associated with pregnancy outside of marriage were captured indirectly through other ingredients. However, the analysis does not directly account for the potential savings and costs of pregnancy outside of marriage.

Table II.2. Ingredients considered for the economic analysis

Domain	Ingredient	Measure
Pregnancy and childbearing	Teen pregnancy	An indicator variable equal to 1 if a person reports they became pregnant or got someone pregnant before they turned 20 and 0 otherwise.
	Unintended pregnancy in adulthood	An indicator variable equal to 1 if a person reports they became pregnant or got someone pregnant after they turned 20 and at a point in time when they did not want to have children and 0 otherwise.
	Childbearing before marriage	An indicator variable equal to 1 if a person ever had a child outside of marriage (regardless of age and whether planned or unplanned) and 0 otherwise.
Physical health	Diagnosed with HIV	An indicator variable equal to 1 if a person reports they were ever diagnosed with HIV and 0 otherwise.
	Diagnosed with another STI	An indicator variable equal to 1 if a person reports they were ever diagnosed with any STI other than HIV (survey respondents reported on diagnoses of chlamydia, gonorrhea, trichomoniasis, syphilis, genital herpes, genital warts, hepatitis B, human papilloma virus, and other STIs) and 0 otherwise.
Substance use	Underage drinking	An indicator variable equal to 1 if a person drank an entire alcoholic beverage for the first time before age 21 and 0 if the person never drank an entire alcoholic beverage or drank one for the first time at age 21 or later. This measure does not differentiate individuals based on the frequency or amount of alcohol consumption.
	Tobacco use (at any age)	An indicator variable equal to 1 if a person ever smoked regularly and 0 otherwise. Individuals who used tobacco infrequently (for example, once or twice) would be coded as 0.
	Substance use disorder	An indicator variable equal to 1 if a person ever reported having had multiple, concurrent issues with alcohol, marijuana, or other drugs and 0 otherwise.
Delinquent behavior and criminal activity	Youth involvement in justice system (other than for substance use)	An indicator variable equal to 1 if a person's first or last arrest (1) occurred before age 18 and (2) involved a crime other than an offense related to alcohol or drug use and 0 otherwise.
	Adult criminal convictions	An indicator variable equal to 1 if a person was convicted of a crime at age 18 or later and 0 otherwise.
Mental health	Depression	An indicator variable equal to 1 if a person scored at or above an average of 1.0 on nine items from the CESD in any survey wave and 0 otherwise. The CESD includes questions about symptoms of depression in the past week. Each symptom is scored 0 if it occurred "never or rarely," 1 if it occurred "sometimes," 2 if it occurred "a lot of the time," and 3 if it occurred "most of the time or all of the time."
	Anxiety diagnosis	An indicator variable equal to 1 if a person was ever diagnosed with an anxiety, panic, or stress disorder and 0 otherwise.
	Stress level	A five-point scale variable capturing how a person responds to stress.

Table II.2 *(continued)*

Domain	Ingredient	Measure
Path to economic self-sufficiency	Graduated from high school	An indicator variable equal to 1 if a person graduated from high school and 0 otherwise.
	Enrolled in postsecondary education	An indicator variable equal to 1 if a person enrolled in any postsecondary education program and 0 otherwise.
	Obtained four-year college degree	An indicator variable equal to 1 if a person obtained a four-year college degree and 0 otherwise.
	Adult earnings	A continuous variable indicating earnings at the Wave IV Add Health interview.
	Adult receipt of public assistance	For individuals interviewed at Wave III: An indicator variable equal to 1 if a person received public assistance at Wave III or between Waves III and IV, and 0 otherwise. For individuals not interviewed at Wave III: An indicator variable equal to 1 if a person received public assistance since 1995 and 0 otherwise.
Relationships	Number of serious relationships	A count variable measuring the number of romantic relationships a person has reported having (including relationships involving a pregnancy, marriage, or cohabitation and other relationships lasting at least six months).
	Relationship satisfaction	A five-point scale capturing satisfaction in a person's current or most recent romantic relationship. Respondents were asked to indicate their extent of agreement with seven statements about their current or most recent partner. This variable is missing for individuals who have never been in a romantic relationship.
	Intimate partner violence	An indicator variable equal to 1 if a person reports ever having been threatened by, assaulted by, or forced or coerced to have sex with a partner and 0 if the person reports only romantic relationships in which this did not occur (or reports having never been in a romantic relationship).
	Ever cohabited (outside of marriage)	An indicator variable equal to 1 if a person ever cohabited with someone they were not married to and 0 otherwise.
	Ever married	An indicator variable equal to 1 if a person ever got married and 0 otherwise.
	Ever divorced	An indicator variable equal to 1 if a person had a marriage end by divorce and 0 otherwise (including those who never married and those whose marriage ended with their spouse's death).

Note: See Appendix A for further details.

CESD = Center for Epidemiologic Studies Depression Scale; STI = sexually transmitted infection.

To determine how much of each ingredient should be included in the calculation of economic savings, the SSAvER team used the Add Health data to examine the relationship between delayed sexual activity and each ingredient. Earlier studies have examined the association between timing of first sexual activity and a wide range of outcomes, including education (for example, Frisco 2008; Rector and Johnson 2005); measures of crime and delinquency (for example, Armour and Haynie 2007; Donahue 2012); and mental health (for example, Jamieson and Wade 2011; Meier 2007). However, the timing of first sexual activity is influenced by many personal, family, and community characteristics, ranging from demographics, such as race/ethnicity and gender, to personal experiences, such as exposure to adverse childhood experiences or trauma. These same characteristics can also influence the life experiences and

outcomes that are the ingredients for the economic analysis—for example, educational attainment or the stability of romantic relationships in adulthood. Researchers must use analytic techniques to isolate the estimated relationship between delayed sexual activity and later outcomes from these other influences.

The SSAvER team used the following four analytic approaches to examine the relationship between delayed sexual activity and each ingredient. The team used these approaches because each has its own strengths and weaknesses (Appendix A provides further details).

1. **Propensity score matching.** Propensity score methods produce impact estimates by leveraging all available information on individuals' characteristics. To conduct a propensity score matching analysis, the SSAvER team matched each individual who delayed sexual activity to a similar individual who did not delay sexual activity. The team measured similarity based on the propensity score, an estimate of the probability that an individual will choose to delay sex based on their responses to the Add Health survey questions. Relative to simply comparing the full sample of individuals who delayed sexual activity with the full sample of those who did not, propensity score matching increases the similarity of the groups being compared and can therefore produce more rigorous estimates of causal relationships. However, an important drawback to using propensity score matching is that the method cannot account for some factors not measured in available data that could lead to misleading impact estimates. Nonetheless, past research has shown that propensity score matching can provide accurate estimates of causal relationships when the matching is carefully conducted and the propensity score is based on measures closely related to the outcomes of interest (Cook et al. 2008; Imbens and Wooldridge 2009).
2. **Comparison of siblings.** The team compared the ingredients for the economic analysis for siblings who initiated sexual activity at different ages. This analysis accounts for any factors that are the same for two siblings, including many factors that cannot be measured or observed. The analysis used a regression model to account further for observable factors that could vary across siblings, such as the quality of their relationships with their parents and friends, expected educational attainment, and cognitive ability. The analysis of siblings removed the potential for a large number of observed and unobserved factors to bias the impact estimates. However, this approach cannot separate the impacts of delayed sexual activity from the impacts of other unmeasured factors that could differ for two siblings from the same family (for example, those related to intelligence or personality). In addition, the analysis of siblings produced estimates that reflect effects only for individuals (1) with at least one sibling of the same gender and (2) with a sibling whose timing of sexual initiation differed from their own. The sample of individuals with a same-gender sibling in the Add Health data used for this analysis includes 1,969 individuals, out of a total analytic sample of 12,987 individuals.
3. **Instrumental variables: puberty.** Instrumental variable (IV) techniques allowed the SSAvER team to estimate impacts of delayed sexual activity by identifying and exploiting variation in individuals' timing of sexual activity that is "as good as random" (called instruments). The strength of the approach depends on (1) the extent to which the instruments predict delay in sexual activity and (2) the extent to which the instruments do not otherwise predict differences in the ingredients. Following the methods in a series of

papers by Sabia and Rees (2008, 2011, 2012), the SSAvER team used two sets of instruments measured in the first wave of Add Health. The first set, which this report terms the puberty instruments, are measures of physical development (for example, age at menarche) that predict delay in sexual activity. The effects estimated by using IVs apply only to the individuals whose probability of delaying sex is affected by the instruments. For example, individuals with very deeply held beliefs on delaying sexual activity may be no more or less likely to delay sexual activity if they go through puberty earlier or later in adolescence. Therefore, the IV estimates could not be interpreted as producing an estimate of the effect of delay in sex relevant to this group. In this way, the IV methods produce estimates that are conceptually different from the propensity score matching and sibling estimates, which measure the average effect of delayed sexual activity.

4. **Instrumental variables: policy.** In addition to the puberty instruments, the SSAvER team produced IV estimates by leveraging variation in school and community policy. This set of IVs, which this report terms policy instruments, are measures of the school and community context that might affect the choice to become sexually active. These include the number of family planning clinics per capita in the respondent's county, whether the respondent's school had a contraceptive-inclusive HIV education program, whether the respondent's school provided family planning services or referrals, and whether the respondent's school required pregnant students to transfer to a separate school.

Whenever feasible, the team used the four analysis methods to produce separate estimates for males and females and then averaged the gender-specific estimates to obtain a full-sample estimate for males and females combined. The team chose this approach because earlier studies have often found gender-specific patterns in the relationships between sexual initiation and the ingredients of interest for this analysis (for example, Spriggs and Halpern 2008; Sabia and Rees 2011; Vasilenko 2017). These patterns suggest that gender-specific analyses are both common in the field and important for understanding the economic benefits of delayed sexual activity.

B. Estimating the monetary benefits of ingredients

The next step of the economic analysis involved producing estimates of net benefits for as many of the ingredients as possible. In particular, this step required assigning a specific dollar amount to the value of each ingredient from the perspective of individual adolescents, taxpayers, and society as a whole. For example, the team had to assign a specific dollar amount to the value of avoiding a teen pregnancy and to make this assessment separately from the perspective of individual adolescents, taxpayers, and society as whole. As with any economic analysis, this step required the team to make assumptions about the savings and costs tied to each ingredient. To do so, the SSAvER team drew on existing estimates of net benefits available in the literature and then updated the estimates as needed for the purpose of the SSAvER analysis—for example, to account for changes in inflation or differences in the selected perspectives, discount rate, or time horizon. The resulting estimates therefore reflect available evidence in the literature but do not necessarily account for all possible savings and costs tied to each ingredient.

With this process, the team produced estimates of dollar-denominated net benefits for 17 of the 24 ingredients included in the analysis (listed below). The seven ingredients excluded from this step are (1) childbearing before marriage, (2) stress level, (3) number of serious relationships, (4)

relationship satisfaction, (5) marriage, (6) cohabitation outside of marriage, and (7) adult earnings. For the first six of these ingredients, the team could not estimate dollar-denominated net benefits from existing studies. The SSAvER team initially envisioned producing an estimate of net benefits for adult earnings that would serve as a summative measure of productivity; however, the team discovered that the estimated economic benefits were highly sensitive to the assumptions made about adult earnings. Moreover, the SSAvER team was able to capture earnings only in a single year, 2008, when respondents were between the age 24 and 32. Given that individuals would have been relatively early in their careers at those ages and that income might have been strongly affected by the Great Recession during 2008, the SSAvER team instead included monetary benefits linked to changes in productivity associated with several other ingredients, including those related to educational attainment, mental health, and substance use.

Each of the 17 ingredients included in this step of the analysis required slightly different assumptions and calculations; however, the team relied on the following assumptions across ingredients.

- The SSAvER team attempted to include the costs and benefits associated with each ingredient accruing over individuals' entire lifetimes. Following Maynard and Hoffman (2008), the team used an annual discount rate of 5 percent to account for the relative values of costs and benefits over time. All costs and benefits were discounted to the perspective of an adolescent at age 18. Although the costs and benefits include those that might accrue both before and after age 18, the choice of a single age is needed to make comparable the costs and benefits accruing at different points in time.
- All costs and benefits associated with medical care were transformed to 2018 dollars using the Consumer Price Index for medical expenditures (U.S. Bureau of Labor Statistics 2019a). All other costs and benefits were transformed to 2018 dollars using the Consumer Price Index for all goods (U.S. Bureau of Labor Statistics 2019b).
- All costs and benefits associated with mental health care and substance abuse treatment are allocated to individuals, taxpayers, others, and society based on the 2020 projections of medical expenditures from Mark et al. (2014). All other medical costs are allocated based on national medical expenditures as reported by the Centers for Medicare & Medicaid Services (2018).
- The team assumed that a tax rate of 35.3 percent applied to all earnings measures, which is appropriate for individuals in the bottom quarter of the income distribution. The tax rate reflected a 12.0 percent federal income tax (Internal Revenue Service 2018), a 10.9 percent average for state and local taxes (Institute on Taxation and Economic Policy 2015), a 9.8 percent payroll tax (Congressional Budget Office 2018), and a 2.6 percent excise tax (Congressional Budget Office 2018). The team did not include employment and payroll taxes paid by employers because these taxes are a transfer between employers and other taxpayers and therefore do not change the net benefits to customers, taxpayers (which includes employers), or society as a whole.

- In addition to wages, individuals received fringe benefits offered by employers to employees. These benefits have value to employees and are a major component of employment compensation. The team accounted for three common types of fringe benefits in this analysis: health insurance, retirement benefits, and legally required benefits such as workers' compensation insurance. In 2016, health, retirement, and legally required benefits were 12.2, 7.5, and 10.9 percent of wage and salary costs, respectively, as reported by employers (U.S. Department of Labor 2016). Therefore, the team adjusted all estimates related to earnings upward to account for these benefits.
- In valuing the receipt of public benefits, the team accounted for the costs associated with administering benefit programs. These costs are estimated as 7.2 percent of Temporary Assistance for Needy Families (TANF) benefits (Falk 2019); 7.3 percent of SNAP benefits (U.S. Department of Agriculture 2019); 4.9 percent of Medicaid costs (Centers for Medicare & Medicaid Services 2018); 8.7 percent of Women, Infants, and Children (WIC) benefits (Center on Budget and Policy Priorities [CBPP] 2018a); 4.4 percent of Children's Health Insurance Program (CHIP) costs (Medicaid Budget and Expenditure System/State CHIP Budget and Expenditure System 2016); and 10.0 percent of home energy assistance benefits (Administration for Children and Families 2013).

Net benefits are presented in two ways: (1) the total net benefit associated with the ingredient and (2) the net benefit that uses a trumping procedure to avoid double-counting, as recommended by the Washington State Institute for Public Policy (WSIPP) (2018). The trumping procedure uses prespecified rules to account for the fact that the benefits associated with two outcomes might overlap. In particular, when benefits are both directly and indirectly linked to an outcome, the direct benefit trumps the indirect benefit. For example, the trumping rules mean that the team did not include the benefits associated with changes in TANF receipt in estimating the monetary benefits from reductions in teen pregnancy because the analysis already included a direct measure of public benefit receipt. That is, the SSAvER team included the overall benefits of delayed sexual activity associated with public benefit receipt in the calculations, thereby capturing changes in TANF receipt for both individuals who experienced a teen pregnancy and those who did not. But the estimates of the benefit of an averted teen pregnancy did not include benefits associated with differences in TANF receipt. This approach ensured that the benefit from the impact of delaying sexual activity on TANF receipt was counted only once.

1. Teen pregnancy

Net benefit estimates for teen pregnancy include the benefits associated with avoiding a pregnancy at age 18, which is the median age of teen pregnancy (Martin et al. 2018). These estimates build on the work of Maynard and Hoffman (2008), who estimated the costs of teen childbearing by comparing outcomes for individuals who had a first birth in their teens to those who waited until their early 20s to become parents. Components of net costs include those related to productivity (differences in earnings for 15 years following a teen birth for the teen mother, the baby's father, and the teen mother's eventual spouse, if different from the baby's father); public benefit receipt (for the 15 years following a teen birth); and outcomes for children (namely, differences in these children's justice involvement as adolescents and adults, productivity [earnings] as adults, and placement into foster care). In addition to the adjustments

made for all public benefit measures, the SSAvER team adjusted the public assistance components of these estimates to account for changes in the relative generosity of cash assistance, food stamps, Medicaid, and housing assistance over time. This adjustment, based on data on benefit receipt in the Annual Social and Economic Supplement of the Current Population Survey (CPS), is particularly important given that the study examined a cohort of teens who became parents in the late 1970s and early 1980s. Maynard and Hoffman (2008) also did not include WIC benefits in their measure of net benefits. These were added using the average value of WIC benefits reported in Kline et al. (2018) and rates of WIC receipt among parents in their teens and early 20s from the Pregnancy Risk Assessment Monitoring System (Shulman et al. 2018). In addition, the SSAvER team deviated from Maynard and Hoffman (2008) by taking the perspective of a male or female teen affected by a pregnancy rather than that of a teen mother.

The SSAvER team then transformed these estimates of the costs of teen parenthood to costs of teen pregnancy. The team adjusted the net benefits of avoiding teen parenthood to include costs of prenatal, postnatal, and delivery care from Corry et al. (2013), accounting for differences in insurance coverage by age based on Pregnancy Risk Assessment Monitoring System data. Costs also include those for pregnancies not ending in birth. Research from Kost et al. (2017) indicates that 60.9 percent of teen pregnancies end in a birth, with 24.5 percent ending in abortion and 14.6 percent ending in miscarriage. The SSAvER net benefit estimates account for these probabilities, the medical costs associated with miscarriage and abortion (Trussell et al. 2013), and the share of those costs typically paid by women themselves, Medicaid, private insurance, and other sources (payments for abortions were based on Jerman et al. 2016 and Roberts et al. 2014; payments for miscarriage were based on public and private insurance rates, as reported by Centers for Disease Control and Prevention 2018, and on typical co-payments and coinsurance rates for outpatient surgical procedures, as reported by Claxton et al. 2018).

Table II.3 contains a summary of these estimates. After netting out the costs of public assistance benefits (to avoid double-counting, since these are accounted for elsewhere), the estimated net benefit of avoiding a teen pregnancy is $12,052 from the perspective of the individual adolescent, $10,881 from the perspectives of taxpayers, and $25,394 from the perspective of society as a whole.

It should be noted that, somewhat surprisingly, teen mothers have greater earnings than they would have had if they delayed childbearing until their early 20s, driving down the estimated net benefits of avoiding teen pregnancy. Though counterintuitive, this finding is consistent with Maynard and Hoffman's (2008) economic analysis of teen childbearing as well as with findings from Hotz et al. (2005) and Ashcraft et al. (2013). Hotz and coauthors posit that teen childbearing motivates women to enter the labor force earlier, which could increase lifetime earnings if women who first have children in their teens or early 20s tend to go into jobs with higher-than-average returns to labor market experience, or lower-than-average returns to education.

Table II.3. Net benefits associated with avoiding a teen pregnancy

Component	Net benefits		
	Teens who do not become pregnant or get someone pregnant	Taxpayers	Society
Medical care for pregnancies not ending in birth	133	78	337
Prenatal, postnatal, and delivery care	-73	1,153	445
Productivity			
Mothers' earnings	-2,854	-1,057	-3,912
Fathers' earnings	17,061	6,320	23,381
Mothers' spouses' earnings	-2,215	-821	-3,036
Earnings for children in adulthood	0	1,100	4,071
Public assistance payments	-9,288	9,649	543
Foster care	0	2,773	2,773
Incarceration of adolescent and adult children	0	1,335	1,335
Total	**2,764**	**20,530**	**25,937**
Total removing net benefits of other outcomes	**12,052**	**10,881**	**25,394**

Note: All values are in 2018 dollars. Mother refers to the teen mother, father refers to the father of the baby born to a teen mother, and mothers' spouse refers to the teen mother's eventual spouse, if different from the father of the baby born to the teen mother. In adjusting estimates to avoid double-counting, the team assumed that teen pregnancy did not affect educational attainment (see Hotz et al. 2005, Ashcraft et al. 2013).

2. Unintended pregnancy in adulthood

In addition to accounting for the benefits and costs associated with all pregnancies beginning before age 20, the SSAvER team accounted for the benefits and costs associated with any unintended pregnancies occurring when an individual was age 20 or older. Unintended pregnancies in adulthood included both mistimed pregnancies (that is, those that occurred sooner than desired) and unwanted pregnancies (that is, those that occurred when a family did not want additional children) (D'Angelo et al. 2004). Earlier research indicates that about 70 percent of all unintended pregnancies occur among nonmarried women, while the remainder occur among married women (Finer and Zolna 2014). Moreover, married and nonmarried women might face different costs associated with unintended pregnancy if, for example, the relationship between unintended pregnancy and public benefit receipt varies by marital status. Consistent with the focus of the analysis on capturing potential benefits and costs for a national sample of adolescents, the SSAvER team measured unintended pregnancy in adulthood for the full Add Health sample, regardless of marital status. However, to the extent that the prevalence and costs of unintended pregnancy vary between married and nonmarried parents, these differences are reflected in the Add Health data and estimates of net benefit (described below) and therefore are captured by the SSAvER team's analysis.

For this ingredient, net benefit estimates account for differences in costs paid for medical care and in public benefits. Costs of medical care are based on the probabilities of an unintended pregnancy ending in abortion, miscarriage, and live birth from Kost (2015), as well as on costs

and payments associated with each type of pregnancy outcome as detailed in Section B.1 of this chapter. In addition, the estimates of differences in medical costs are based on the assumptions that (1) each unintended pregnancy ending in a birth results in a family having 0.30 additional children in total (based on reports from Ventura et al. 2008) and (2) the average age of a mother with an unintended pregnancy (excluding teen pregnancies) is 25 (based on tabulations from Finer and Zolna 2016).

The net benefit estimates also account for changes in public assistance payments associated with a family increasing in size by 0.3 children. These differences are based on CPS data on cash assistance payments and information from CBPP (2018c) on food stamps, Kline et al. (2018) on WIC benefits, and the Kaiser Family Foundation (2019) on Medicaid.

After netting out the costs of public assistance benefits (to avoid double-counting, since these are accounted for elsewhere), the estimated net benefit of avoiding an unintended pregnancy is $550 from the perspective of an individual adolescent, $2,736 from the perspective of taxpayers, and $5,470 from the perspective of society as a whole (Table II.4).

Table II.4. Net benefits associated with avoiding an unintended pregnancy in adulthood

	Net benefits		
Component	Individuals who avoid an unintended pregnancy	Taxpayers	Society
Medical care for pregnancies not ending in birth	128	92	361
Prenatal, postnatal, and delivery care	421	2,644	5,109
Public assistance payments	-3,878	3,893	232
Total	**-3,328**	**6,629**	**5,702**
Total removing net benefits of other outcomes	**550**	**2,736**	**5,470**

Note: All values are in 2018 dollars.

3. Diagnosed with HIV

The SSAvER team's estimates of the net benefits of avoiding HIV transmission are based on Schackman et al. (2015). The estimates account for the expected costs of medical care for an individual with HIV from diagnosis to death. Like Schackman et al.'s estimates, the SSAvER team's estimates do not include any costs associated with reduced productivity from HIV (that is, individuals with HIV might spend less time working or be less effective at work). Although productivity effects are likely, the dynamic nature of HIV/AIDS treatment makes it difficult to predict prognoses for more-recent cohorts of individuals (Samji et al. 2013). The SSAvER team therefore excluded this cost but acknowledges that the exclusion leads to the undercounting of benefits associated with avoidance of HIV transmission.

The team adjusted Schackman et al.'s estimates to account for the age of the Add Health population. Although the Add Health data indicate whether individuals were diagnosed with HIV, the data do not permit the SSAvER team to pinpoint at what age a diagnosis occurred.

Given that the economic analysis methods require such information, the SSAvER team assumed that affected individuals were diagnosed with HIV at age 23. The team chose age 23 based on the assumption that a diagnosis was equally likely to occur at any point between sexual initiation and the final Add Health survey wave for which we have data. Changing this assumption would not have a large effect on the overall estimates of net benefits. The team assumed a post-diagnosis life expectancy of 48.5 years (Samji et al. 2013).

Based on these assumptions, the team estimated the net benefit of avoiding the transmission of HIV at $23,629 for an individual, $87,427 for taxpayers, and $236,290 for society as a whole (Table II.5). A large share of the net benefit to society accrues to insurance companies and other participants in insurance policies. The team separated these benefits from the benefits to taxpayers resulting from reduced Medicare and Medicaid treatment payments. None of these estimates require adjustment for double-counting with other ingredients included in the analysis.

Table II.5. Net benefits associated with avoiding HIV transmission

	Net benefits		
Component	Individuals who avoid HIV	Taxpayers	Society
Medical costs	23,629	87,427	236,290

Note: All values are in 2018 dollars. None of the included benefits is also accounted for by other ingredients.

4. Diagnosed with an STI other than HIV

The SSAvER team estimated the net benefits of avoiding seven common STIs other than HIV based on work by Owusu-Edusei et al. (2013). The seven infections included chlamydia, gonorrhea, hepatitis B virus, human papillomavirus, herpes simplex virus type 2, syphilis, and trichomoniasis. As for the calculations related to HIV, both Owusu-Edusei et al. (2013) and the SSAvER team focused on the medical costs associated with these infections, including costs associated with STI sequelae such as pelvic inflammatory disease (and its resultant effects on infertility), and included costs associated with the diseases over an individual's entire life. Owusu et al. applied a discount rate of 3 percent to represent all individuals and estimated lifetime costs at the time of diagnosis. For each STI, the SSAvER team adjusted Owusu-Edusei et al.'s assumed discount factor to match the SSAvER team's overall discounting approach and to account for when Add Health sample members were most likely to receive an STI diagnosis and experience symptoms. The specific adjustment was based on the literature on the timing of medical costs and diagnoses of STIs, drawing on Margolis et al. (1995) and Fisman et al. (2002). Our results are robust to small differences in assumptions about the timing of medical costs.

Based on the costs of individual STIs, the team calculated a weighted average of medical costs associated with any STI, with weights based on the relative incidence of each STI (Centers for Disease Control and Prevention 2013). These weighted averages imply a net benefit of avoiding an STI of $13 for an individual, $46 for taxpayers, and $125 for society as a whole (Table II.6). These values reflect that some instances of STIs have large associated medical costs, while costs

for others are smaller. None of these estimates require adjustment for double-counting with other ingredients included in the analysis.

Table II.6. Net benefits associated with avoiding STIs

Component	Net benefits		
	Individuals who avoid STIs	Taxpayers	Society
Medical costs for each STI			
Chlamydia	17	62	166
Gonorrhea	18	67	182
Hepatitis B virus	162	598	1,617
Human papillomavirus	9	35	94
Herpes simplex virus type 2	58	213	575
Syphilis	34	127	344
Trichomoniasis	2	8	20
Average weighted by relative incidence of infection	**13**	**46**	**125**

Note: All values are in 2018 dollars. None of the costs is also accounted for by other ingredients.
STI = sexually transmitted infection.

5. Underage drinking

The SSAvER team based the estimates of the net benefits of avoiding underage drinking on work by Sacks et al. (2015), who estimated annual social costs of underage drinking. The team aggregated the 26 cost components considered by Sacks and coauthors into those related to medical expenses, lost productivity, criminal justice costs, and other costs (for example, property damage). The team transformed these costs by assuming that individuals who drink underage do so from ages 18 to 20 and that there were 10 million underage drinkers in the reference year of the source study (Substance Abuse and Mental Health Services Administration 2011). The team used age 18 to 20 as the basis for the estimates because these are the ages at which underage drinking is most common, and because the largest proportion of costs for underage drinking come from reduced productivity (that is, underage drinkers spend less time working or are less effective at work). Accounting for drinking before age 18 would not substantially affect the team's estimated net benefits because younger adolescents are less likely to work and therefore would not contribute to a large extent to the assumed costs of reduced productivity.

After netting out costs to avoid double-counting, the estimated net benefit of avoiding underage drinking is $4,201 for an individual, $1,545 for taxpayers, and $6,567 for society as a whole (Table II.7).

Table II.7. Net benefits associated with avoiding underage drinking

Component	Net benefits		
	Individuals who avoid underage drinking	Taxpayers	Society
Total medical costs	122	962	1,354
Productivity	4,310	1,565	5,874
Criminal justice system	0	607	1,485
Other	0	20	756
Total	**4,432**	**3,153**	**9,470**
Total removing net benefits of other outcomes	**4,201**	**1,545**	**6,567**

Note: All values are in 2018 dollars.

6. Tobacco use

The SSAvER team based its estimates for tobacco use on Rumberger et al. (2010) and included two types of costs associated with smoking: health care expenditures and costs associated with reduced workplace productivity (for example, missing work because of poor health). In the case of smoking, an additional source of reduced productivity results from premature death. The SSAvER team assumed that smoking-related health care expenditures occurred between ages 40 and 69, the average life expectancy for a smoker in the United States (Jha et al. 2013). Given that Rumberger et al. (2010) provided separate cost estimates for current and former smokers, the SSAvER team assumed that individuals began smoking at age 23 and that 1 percent of smokers successfully quit each year, consistent with Gilpin and Pierce (2002). Based on these assumptions, the team estimated the net benefit of avoiding tobacco use as $75,913 for an individual, $34,053 for taxpayers, and $119,594 for society as a whole (Table II.8). None of these estimates require adjustment for double-counting with other ingredients included in the analysis.

Table II.8. Net benefits associated with avoiding tobacco use

Component	Net benefits		
	Individuals who avoid tobacco use	Taxpayers	Society
Total medical costs	1,817	6,722	18,167
Productivity	19,795	7,301	27,096
Premature death	54,301	20,030	74,331
Total	**75,913**	**34,053**	**119,594**

Note: All values are in 2018 dollars. None of the included costs is also accounted for by other ingredients.

7. Substance use disorders

The SSAvER team based the estimates of the net benefits of avoiding a substance use disorder on work by Cohen (1998). This research estimated the total costs associated with "heavy drug use" for individuals from age 14 to 60. The SSAvER team included cost components related to drug treatment costs, reduced productivity, medical costs, premature death, drug-related crime, and additional criminal activity precipitated by drug use. The team based its estimates on the assumption that individuals develop substance use disorders at age 23, the approximate midpoint between age 18 and the average age at which they completed the Wave IV Add Health survey (ages 24 to 32). Following Cohen, the SSAvER team also assumed that substance use disorders continue to generate costs for each year until age 64, adjusting for decreases in substance use over time based on typical rates of use by year of age.

Based on these assumptions, the team estimated the net benefit of avoiding a substance use disorder at $27,829 for an individual, $35,786 for taxpayers, and $201,383 for society as a whole (Table II.9). The large estimated net benefit to society primarily reflects a reduction in pain and suffering among crime victims; that is, a substance use disorder is associated with an increase in the likelihood of engaging in nondrug-related criminal activity, such as theft or assault. To avoid double-counting with other ingredients in the analysis, when the team omits costs and benefits related to crime, the team's estimated net benefit of avoiding a substance use disorder is more similar across the three perspectives: $27,829 for an individual, $16,758 for taxpayers, and $49,392 for society as a whole.

Table II.9. Net benefits associated with avoiding a substance use disorder

	Net benefits		
Component	Individuals who avoid substance use disorder	Taxpayers	Society
Drug treatment costs	560	4,422	6,228
Other medical costs	672	2,485	6,716
Productivity	12,358	4,577	16,935
Premature death	14,239	5,274	19,513
Crime	0	19,028	151,991
Total	**27,829**	**35,786**	**201,383**
Total removing net benefits of other outcomes	**27,829**	**16,758**	**49,392**

Note: All values are in 2018 dollars.

8. Youth involvement in the justice system

The estimated net benefits of avoiding a youth arrest include criminal justice costs for all arrests, criminal justice costs for arrests referred to court, and the costs to crime victims of crimes resulting in a conviction. Statistics reported in Rovner (2016) allowed the SSAvER team to estimate that 85 percent of arrested youth were referred to court and that 44 percent of arrested youth were convicted of a crime. For the share of arrests not referred to court, the team included

only costs associated with a police officer's time. For the share of arrests referred to court, the team included a more complete set of criminal justice costs based on Cohen's (1998) estimates of (1) incarceration and other criminal justice costs of youth criminal activity from ages 14 to 17 and (2) the number of arrests per youth involved in crime (that is, the estimates account for the fact that the average youth who was ever arrested was arrested more than once before age 18). For the share of arrests ending in a conviction, the team also accounted for the costs of the crime to victims (based on Cohen 1998).

From the perspective of an individual adolescent, research shows that youth arrests are associated with reductions in earnings in adulthood of about 15 percent (Grogger 1996; Hyla 2016) and that these reductions are largely attributable to differences in educational attainment among youth who have and have not been arrested (Hyla 2016). As discussed earlier in this section, the SSAvER team accounted for the net benefits associated with differences in educational attainment and adult productivity through other ingredients in the analysis. The trumping rules used for the analysis dictate the prioritization of these direct benefits over any indirect benefits accruing through avoidance of a youth arrest. If youth arrests led to additional differences in earnings not captured by these ingredients, this approach will likely underestimate the net benefits of avoiding youth arrest.

Given these assumptions, the team estimated the net benefit of a youth's avoidance of arrest at $7,621 for taxpayers and $19,204 for society as a whole (Table II.10). None of the included estimates requires adjustment for double-counting with other ingredients in the analysis. For individuals who avoid arrest, the team estimated no additional benefit beyond the benefits captured directly by other ingredients in the analysis.

Table II.10. Net benefits associated with avoiding youth arrest

	Net benefits		
Component	Individuals who avoid arrest	Taxpayers	Society
Victimization	0	7,621	7,621
Criminal justice system	0	0	11,583
Total	**0**	**7,621**	**19,204**

Note: All values are in 2018 dollars. None of the included benefits is also accounted for by other ingredients.

9. Adult criminal convictions

The SSAvER team estimated the net benefits of avoiding a single adult criminal conviction based on the share of convictions linked to 19 types of criminal offenses (from Motivans 2017) and the costs by offense type. For each offense, the analysis accounts for avoided costs associated with victimization and the criminal justice system. For 14 out of the 19 offense types, the team used crime victim and criminal justice costs per offense presented in McCollister et al. (2010). The team also assumed that other nonviolent offenses (including crimes against public order, weapons offenses, and immigration offenses) produced costs similar to fraud offenses and

that threats against the president produced costs similar to aggravated assault. For drug offenses, the team based its cost estimates on Aos et al. (2001).

Individuals who were convicted of a crime typically also have lower incomes than other individuals. For example, Craigie et al. (2020) estimated that incarceration is associated with a decrease in earnings of 14 to 52 percent, depending on the type of conviction. For individuals convicted of crimes at younger ages, these differences were likely attributable to differences in educational attainment (Hyla 2016). Especially for individuals first convicted at an older age (Western et al. 2001), there might be changes in earnings not related to education. As for the ingredient for youth involvement in the criminal justice system, the SSAvER team accounted for the net benefits associated with differences in educational attainment and adult productivity through other ingredients in the analysis. The trumping rules used for the analysis dictate the prioritization of these direct benefits over any indirect benefits accruing through avoidance of an adult criminal conviction. If incarceration led to additional differences in earnings not captured by these ingredients, this approach will likely underestimate the net benefits of avoiding an adult criminal conviction.

Based on these assumptions, the team estimated the net benefit of avoiding an adult criminal conviction at $1,761 for taxpayers and $18,720 for society as a whole (Table II.11). None of these estimates require adjustment for double-counting with other ingredients in the analysis. The team's estimation approach yields a net benefit of $0 to an individual because it assumes no additional benefit beyond the benefits captured directly by other ingredients in the analysis, and that all costs of victimization and costs to the criminal justice systems accrue to taxpayers and society as a whole rather than to the individuals who are convicted.

Table II.11. Net benefits associated with avoiding adult convictions

	Net benefits		
Component	Individuals who avoid adult convictions	Taxpayers	Society
Victimization	0	0	18,720
Criminal justice system	0	1,761	0
Total	**0**	**1,761**	**18,720**

Note: All values are in 2018 dollars. None of the included benefits is also accounted for by other ingredients.

10. Depression

The team based the component of the economic analysis for depression on work by Greenberg et al. (2003). This research estimated the annual costs of depression in two dimensions: increased expenditures on health care and lost productivity at work. Given the pattern of the effects of sexual initiation on mental health in past research (see Rotz et al. 2020), the SSAvER team assumed that individuals who experienced mental health issues as a consequence of sexual initiation did so for one year at age 18 (regardless of the actual age at which they initiated sexual activity). Transforming Greenberg et al.'s estimates for the SSAvER analysis, the team estimated

the net benefit of avoiding depression at $6,849 for an individual, $6,177 for taxpayers, and $14,735 for society as a whole (Table II.12). None of the estimates require adjustment for double-counting with other ingredients in the analysis.

Table II.12. Net benefits associated with avoiding depression

Component	Net benefits		
	Individuals who avoid depression	Taxpayers	Society
Medical costs	586	3,857	6,151
Productivity	6,263	2,320	8,583
Total	**6,849**	**6,177**	**14,735**

Note: All values are in 2018 dollars. None of the included benefits is also accounted for by other ingredients.

11. Anxiety

In work similar to that for depression, Greenberg et al. (1999) estimated the annual costs of anxiety disorders. The SSAvER team therefore used this estimate and a method similar to that for depression to estimate costs associated with anxiety disorders for the SSAvER economic analysis. Based on this approach, the team estimated the net benefit of avoiding an anxiety disorder at $674 for an individual, $1,972 for taxpayers, and $4,381 for society as whole (Table II.13). None of the estimates require adjustment for double-counting with other ingredients in the analysis.

Table II.13. Net benefits associated with avoiding an anxiety disorder

Component	Net benefits		
	Individuals who avoid an anxiety disorder	Taxpayers	Society
Medical costs	392	1,867	3,994
Productivity	282	105	387
Total	**674**	**1,972**	**4,381**

Note: All values are in 2018 dollars. None of the included benefits is also accounted for by other ingredients.

12. Educational attainment

The SSAvER team calculated the net benefits associated with increased educational attainment, accounting for changes in both earnings and expenditures on postsecondary education. Changes in earnings are based on average annual wage and salary income by educational attainment and age from the 2017 American Community Survey. Earnings differences by education might not reflect the causal effects of educational attainment on earnings, as individuals who obtain more education likely differ in a variety of ways from those who obtain less education. Therefore, the team applied multipliers provided by WSIPP (2018) to transform these differences into causal

effects of educational attainment on earnings. The team also used tabulations from WSIPP (2018) to estimate the costs of obtaining additional postsecondary education and used the 2017 American Community Survey to estimate the number of years that individuals were enrolled in postsecondary education based on their enrollment decisions and degree attainment.

The estimated benefits account for the earnings gains directly associated with an educational milestone as well as with those that accrue to an individual because reaching lower milestones means an individual will be more likely to achieve a higher milestone. For example, the net benefit of a high school diploma accounts for the fact that many of the individuals with a high school diploma will enroll in or complete postsecondary education programs. Alternative estimates account for double-counting by comparing (1) individuals with a high school diploma (and no more education) with those without a high school diploma, (2) individuals who entered but did not complete postsecondary education with those who obtained a high school diploma but did not enter postsecondary school, and (3) individuals who earned a four-year college degree with those who entered postsecondary school but did not earn a four-year degree.

Based on these assumptions, the team's estimates suggest substantial net benefits of education (Table II.14). For example, the team estimated the net benefit of obtaining at least a high school degree at $146,752 for an individual, $45,368 for taxpayers, and $186,946 for society as a whole. As expected, these estimates decline after accounting for the benefits accruing from future or earlier educational milestones accounted for in the analysis. For example, for individuals who obtained a high school degree but did not enroll in postsecondary education, the team estimates the net benefit of obtaining a high school degree at $64,783 for an individual, $23,996 for taxpayers, and $88,779 for society as a whole. The same pattern holds for the estimated net benefit of enrolling in postsecondary education and receipt of a four-year college degree: the net benefit declines after accounting for the benefits that accrue from earlier and future educational milestones.

Table II.14. Net benefits associated with education

Component	Net benefits		
	Individuals who receive additional education	Taxpayers	Society
High school graduation			
Expenditures on postsecondary education	-18,704	-15,918	-39,795
Productivity	165,455	61,286	226,742
Total	**146,752**	**45,368**	**186,946**
Total removing benefits accruing from future educational milestones	**64,783**	**23,996**	**88,779**
Enrollment in postsecondary education			
Expenditures on postsecondary education	-25,291	-21,524	-53,810
Productivity	197,576	73,184	270,760
Total	**172,285**	**51,660**	**216,950**
Total removing benefits accruing from future and earlier educational milestones	**30,879**	**6,904**	**35,174**
Receipt of a four-year college degree			
Expenditures on postsecondary education	-57,652	-27,765	-104,520
Productivity	177,474	65,738	243,212
Total	**119,822**	**37,973**	**138,692**
Total removing benefits accruing from earlier educational milestones	**88,065**	**28,516**	**98,805**

Note: All values are in 2018 dollars.

13. Public assistance

To estimate the net benefit associated with avoiding the use of public assistance, the SSAvER team used estimates of rates of public benefit receipt, average assistance received per year (given that any was received), and the average duration over which individuals receive public benefits. The team used CPS data to estimate the share of individuals receiving any public assistance benefits that received each of the following specific types of benefits: TANF, SNAP, Medicaid, housing assistance, home energy assistance, and CHIP. Then, the team estimated the average annual amounts of benefits based on CBPP (2018b) for cash assistance, CBPP (2018c) for food stamps, Kaiser Family Foundation (2014) for Medicaid, FamiliesUSA (2017) for CHIP, Office of Community Services (2012) for home energy assistance, and the National Low Income Housing Coalition (2017) for public housing. Finally, the team used estimates of the average duration of benefit receipt from Irving and Loveless (2015). The SSAvER team assumed that average duration of CHIP receipt was equal to average duration of Medicaid receipt and that average duration of energy assistance receipt was equal to average duration of housing assistance receipt. Based on these assumptions, the team estimated the net benefit of avoiding the receipt of public assistance at -$2,785 for an individual, $2,957 for taxpayers, and $172 for society as a whole over the course of an individual's lifetime (Table II.15). The negative net benefit to an

individual (-$2,785) reflects the individual's loss of public assistance receipt, which is offset by a benefit or savings to taxpayers of about the same amount ($2,957). The estimated net benefit to society of $172 reflects only the savings from lower program administration costs, not actual public assistance benefit amounts. This is because the benefit amounts reflect a transfer of resources from some individuals to others, with little net savings or cost to society as a whole. None of the estimates require adjustment for double-counting with other ingredients in the analysis.

Table II.15. Net benefits associated with avoiding public assistance

	Net benefits		
Component	Individuals who avoid public assistance	Taxpayers	Society
Public assistance payments	-2,785	2,957	172

Note: All values are in 2018 dollars. None of the included costs is accounted for by other ingredients.

14. Intimate partner violence

The SSAvER team estimated the net costs of intimate partner violence (IPV) based on cost calculations provided in Peterson et al. (2018). This previous study captured a range of costs associated with IPV, including medical expenses, lost productivity, and criminal justice costs. The SSAvER team adjusted these costs, assuming that victimization began at a mean age of 23 and applying the other assumptions discussed earlier in this chapter.

After netting out costs to avoid double-counting, the team estimated the net benefit of avoiding IPV at $23,010 for an individual, $14,129 for taxpayers, and $45,509 for society as a whole (Table II.16).

Table II.16. Net costs of IPV (net benefits of a reduction in IPV)

	Net benefits		
Component	IPV victims	Taxpayers	Society
Medical costs	3,005	11,119	30,052
Productivity	22,141	8,167	30,308
Criminal justice system	0	666	666
Property loss and damage	150	327	1,364
Total	**25,296**	**20,280**	**62,391**
Total removing net benefits of other outcomes	**23,010**	**14,129**	**45,509**

Note: All values are in 2018 dollars.

15. Divorce

Research shows that married families have higher income (Wilcox and Lerman 2014, Wilcox et al. 2015) and accrue more financial wealth (Zagorsky 2005, Olivetti and Rotz 2018) than single

families. Some research also suggests higher rates of marriage are associated with stronger economic growth, improved economic mobility, long-term savings, and lower rates of child poverty (Wilcox et al. 2015). For women, research suggests that divorce increases labor force participation and earnings (Voena 2015), although this individual advantage does not usually translate into increased net family income within the households of women and children after divorce (Raley and Sweeney 2020). For men, research suggests that male earnings could drop by 2 to 3 percent following a divorce due to the "marriage premium" (McDonald 2020). Differences in net family income by marital status are also shaped by U.S. tax policy. Research shows that tax policy favored single families in the 1990s and early 2000s and has favored married families since 2003 (Alm and Leguizamon 2015).

Following the same approach applied to other ingredients in the analysis, the team estimated the net benefits of avoiding divorce by using existing estimates available in the literature. Specifically, the team based its estimates of the net benefits of avoiding divorce on the work of Schramm (2006), who estimated individual and social costs of divorce in Utah. Schramm estimated the individual costs of divorce as those associated with legal and filing fees, divorce education classes, and additional housing costs due to divorce (as two individuals can generally live more cheaply together than apart; see Buhmann et al. 1998). The team adjusted these estimates to be more nationally representative based on national averages of (1) divorce filing fees from Nolo (2014) and (2) the costs of divorce parenting education classes from DivorceWriter (2019). The team assumed these costs occurred when respondents were age 28. In addition, the team adjusted estimates to account for higher rates of receipt of public assistance among divorced families compared with married families. Differences in rates of receipt were calculated based on the CPS, with the average amount received by recipients based on the sources described in Section B.13 of this chapter. In addition, the analysis accounted for the typical time individuals spend between divorce and remarriage according to Bramlett and Mosher (2002). As with other ingredients included in the analysis, the resulting estimates reflect available evidence in the literature and do not necessarily account for all possible savings and costs tied to avoiding a divorce.

Based on these assumptions, the team estimated the net benefit of avoiding a divorce at $10,910 for an individual, $4,093 for taxpayers, and $15,003 for society as a whole (Table II.17). When the team omits benefits associated with public assistance receipt to avoid double-counting with other ingredients in the analysis, the team's estimated net benefit of avoiding a divorce increases to $14,748 for an individual and declines to $0 for taxpayers and $14,748 for society as a whole.

Table II.17. Net benefits associated with avoiding a divorce

Component	Net benefits		
	Individuals who avoid a divorce	Taxpayers	Society
Personal costs			
Legal and filing fees	10,598	0	10,598
Divorce education class	27	0	27
Housing	4,122	0	4,122
Public assistance payments	-3,838	4,093	255
Total	**10,910**	**4,093**	**15,003**
Total removing net benefits of other outcomes	**14,748**	**0**	**14,748**

Note: All values are in 2018 dollars.

C. Calculating summary estimates of total net benefit

As a final step in the analysis, the SSAvER team combined estimates for the individual ingredients into overall summary estimates of the net benefit of delayed sexual activity. For each ingredient, measure of delay, and gender group, the team had up to four estimates of the relationship between the ingredient and the timing of first sexual activity—one for each analysis method (propensity score matching, comparison of siblings, and two IV techniques). To combine these multiple estimates into a single measure of association to apply in the economic analysis, the SSAvER team used an approach similar to that recommended by WSIPP (2018). In particular, the team calculated a weighted average of the estimates. Weights were proportional to each estimate's precision (which is equal to the inverse of the squared standard error of the estimate). For ingredients with three or four estimates, the team restricted the weights so that no more than 50 percent of the total weight was assigned to any one estimate. For ingredients with only two estimates, the team limited the weight assigned to any one estimate to two-thirds of the total weight. These restrictions are meant to avoid relying too much on any one method, given that each has its own strengths and weaknesses. In particular, it avoids the allocation of too much weight to estimates based on the propensity score method, which are the most precise estimates but have the most limited causal validity. Appendix C provides detailed information on the team's estimates, both separately for the four analysis methods and when combining the estimates across methods.

To account for the relative strengths and weaknesses of the various methods and level of uncertainty in the combined estimates, the team developed and applied two sets of rules for determining which estimates to include in the weighted average. This approach of applying different sets of rules is important in economic analyses to determine if the estimated net benefits vary depending on the particular methodological assumptions made (see National Academies of Sciences, Engineering, and Medicine 2016). If we find that different sets of rules lead to similar estimated net benefits, we can have more confidence that the findings are robust to the methodological assumptions. If we instead find that different sets of rules lead to different estimated net benefits, we can conclude that the findings depend in part on methodological

assumptions, and can interpret the resulting estimates as reflecting lower- and upper-bound estimates of net benefit under different plausible assumptions. The two sets of rules the team used are as follows:

- **More stringent estimation approach.** Under this approach, the team included an ingredient in the overall summary estimates of net benefit if (1) the estimated relationships from at least two of the four analytic methods (propensity score matching, comparison of siblings, and the two IV techniques) were statistically significant and of the same sign and (2) none of estimated associations was large (greater than 0.25 standard deviations) or statistically significant and of the opposite sign (Gottfredson et al. 2015). The team applied these decision rules uniformly across all ingredients and age cutoffs except in two cases: For avoiding a teen pregnancy, the team included this ingredient in the summary estimates for delaying sexual activity until age 20 or 22 regardless of the statistical significance of the estimates. The team made this exception because delaying sexual activity until age 20 or 22 must reduce the chances of teen pregnancy (to zero). Therefore, in these two cases, the team did not need to account for the statistical significance of the estimates in determining whether to include the ingredient in the summary estimates of net benefit.
- **Less stringent estimation approach.** Under this approach, the team included in the overall summary estimates of net benefit as many ingredients as possible regardless of the direction or statistical significance of the estimated relationships from the four analytic methods (Haddix et al. 2003).

To assess whether the economic benefit of delayed sexual activity varies for different definitions of the length of delay, the SSAvER team repeated the economic analysis and produced separate summary estimates of net benefit for five alternative age cutoffs: age 15 or later, age 18 or later, age 20 or later, age 22 or later, and age at first marriage (see results in Appendix C). To the extent that the estimated relationship between each ingredient and delayed sexual activity varies across the five definitions, each definition of delayed sexual activity results in a different estimate of economic savings.

Each of the five age cutoffs compares individuals who initiated sexual activity at different ages. To inform the interpretation of the different measures of delay further, Table II.18 includes the average age of first sex for individuals who did and did not delay sexual activity based on each measure of delay (excluding individuals who had not initiated sexual activity by the time of the Wave IV Add Health survey). Average ages at first sex differ by measure of delay. For example, in examining delay in sexual activity until age 18, the SSAvER team compared individuals who first had sex at an average age of 19.85 with those who first had sex at an average age at 15.20, a difference of 4.65 years. In contrast, the measure of delay until age 22 compares individuals who initiated sex at an average age of 23.87 with those who initiated sex at an average age of 16.29, a difference of 7.58 years.

Table II.18. Age at sexual initiation among individuals who ever had sex

Indicator of delayed sexual activity	Delayed	Did not delay	Difference
Delayed until age 15	17.59	13.32	4.27
Delayed until age 18	19.85	15.20	4.65
Delayed until age 20	21.96	15.90	6.06
Delayed until age 22	23.87	16.29	7.58
Delayed until marriage	21.63	15.34	6.29
Overall average age at sexual initiation: 16.75			

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation as well as the 5 percent of individuals who had not initiated sexual activity before the Wave IV Add Health survey.

Each of the five indicators of delayed sexual activity and analytic methods also draws on a sample of a different size for the Add Health data analysis, which in turn affects the precision of the estimated association between delayed sexual activity and each ingredient. Table II.19 summarizes the sample sizes for each analysis approach and delayed sexual activity indicator.

Table II.19. Analysis sample sizes, by analytic method

Indicator of delayed sexual activity	Sample size							
	Propensity score matching		Sibling model		IV1 (puberty)		IV2 (policy)	
	Delayed	Did not	Delayed	Did not	Delayed	Did not	Delayed	Did not
Delayed until age 15	3,620	1,107	1,628	341	5,255	1,107	n.a.	n.a.
Delayed until age 18	3,826	1,876	777	1,192	4,602	7,988	n.a.	n.a.
Delayed until age 20	1,764	1,017	394	1,575	n.a.	n.a.	1,032	4,811
Delayed until age 22	1,340	913	227	1,742	n.a.	n.a.	590	5,253
Delayed until marriage	179	140	32	1,834	n.a.	n.a.	n.a.	n.a.

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

Notes: The sample sizes for the IV1 approach, 15-year-old cutoff, and IV2 samples reflect only the female sample because the assessment of instrument relevance indicated that the instruments were not sufficiently strong among males to yield valid estimates.

IV = instrumental variable; n.a. = not applicable.

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III. MAIN FINDINGS

Using the methods described in the previous chapter, the SSAvER team generated several estimates of the net benefit of delayed sexual activity. These estimates varied based on (1) the age cutoff used to measure delay; (2) the focus on males, females, or all adolescents; and (3) the use of more or less stringent estimation approaches. These estimates reflect the specific ingredients included in the analysis and do not necessarily reflect all possible savings and costs of delayed sexual activity.

Based on the specific ingredients included in the analysis, the results show a wide range in the summary estimates of the lifetime per capita net benefit of delayed voluntary sexual activity. For benefits to society, the estimates range from just under $0 to over $60,000 (Table III.1) for each adolescent who voluntarily delays sexual initiation. The wide range in the estimates partly reflects differences by gender, with higher estimates for females than for males. For example, based on the SSAvER team's more stringent estimation approach, the net benefit to society totals $9,751 if an adolescent female delays voluntary sexual activity until age 18 or later and $914 if an adolescent male delays voluntary sexual activity until age 18 or later. A similar pattern holds for each age cutoff used to define delayed sexual activity. As discussed in greater detail later in this chapter, most of the gender difference in the estimates results from differential savings and costs associated with teen pregnancy.

Table III.1. Net benefit to society of delayed voluntary sexual activity

	Sample		
Age cutoff used to define delay	Females	Males	Full sample
More stringent estimation approach			
Age 15 or later	9,118	0	3,174
Age 18 or later	9,751	914	6,326
Age 20 or later	3,978	3,182	4,154
Age 22 or later	3,414	2,994	3,108
Age at first marriage	0	0	0
Less stringent estimation approach			
Age 15 or later	52,109	27,861	36,840
Age 18 or later	43,437	26,204	34,204
Age 20 or later	54,829	51,341	51,788
Age 22 or later	64,171	41,038	51,111
Age at first marriage	64,707	-150	30,631

Note: All values are in 2018 dollars. Estimates include only the net benefits included in the SSAvER economic analysis and discussed in Chapter II, Section B.

The wide range in the summary estimates of net benefit also reflects differences in the estimation approach used. As discussed in Chapter II, the team's estimates of the relationship between delayed sexual activity and the ingredients used for the analysis all have some degree of

uncertainty. The summary estimates of the net benefit to society are almost always lower when using a more stringent approach to account for this uncertainty than when using a less stringent approach (Table III.1). For example, using the SSAvER team's estimates for delaying voluntary sexual activity until age 18 or later, the net benefit to society totals $6,326 based on a more stringent estimation approach and $34,204 based on a less stringent approach.

In contrast to method and gender, the summary estimates of net benefit show no clear pattern based on the age cutoff used to define delayed sexual activity. For females, the summary estimates of net benefit to society decline with age when using a more stringent estimation approach but generally increase with age when using a less stringent estimation approach. For males, using age 20 as the cutoff for delayed sexual activity leads to the largest summary estimate of net benefit regardless of estimation approached (more or less stringent).

To provide additional context for the estimates, the SSAvER team examined how the summary estimates of net benefit break down by ingredient. For example, Table III.2 presents the summary estimates, broken down by ingredient, of the net benefit to society of delaying sexual activity until age 18 or later based on the SSAvER team's less stringent estimation approach. (See Appendix B for similar breakdowns by ingredient for all the age cutoffs used for the analysis.) The results of these analyses show that assumed reductions in teen pregnancy and unintended pregnancy in adulthood account for some—but not all—of the estimated net benefit. For females, the team's estimates for delaying sexual activity until age 18 or later suggest a net benefit to society of $3,403 from assumed reductions in teen pregnancy, with another $372 from assumed reductions in unintended pregnancy in adulthood. Together, these two benefits total $3,775, or roughly 9 percent of the total net benefit to society if an adolescent female delays sexual activity until age 18 or later (that is, $3,775 represents roughly 9 percent of the total net benefit of $43,437). In comparison, the largest component of these estimated net benefits comes from assumed reductions in substance use. For females, the SSAvER team's estimates suggest a net benefit to society of $368 from an assumed reduction in the likelihood of underage drinking, a net benefit of $20,092 from an assumed reduction in tobacco use (at any age), and a net benefit of $1,185 from an assumed reduction in the likelihood of having a substance use disorder.

Consistent with the findings for the individual ingredients, the SSAvER team found that the estimated net benefit to society declines by only a modest amount when excluding from the analysis individuals who became pregnant or got someone pregnant as a teen. For example, for delaying sexual activity until age 18 or later based on the SSAvER team's less stringent estimation approach, the summary estimate of net benefit to society declines by roughly 18 percent—from $34,204 to $28,067—when excluding from the analysis individuals who became pregnant or got someone pregnant as a teen. The team found a larger decline of 35 percent, however, when limiting the analysis to females. Relatedly, the team found that the gender difference in the summary estimate of net benefit declines when excluding from the analysis individuals who became pregnant or got someone pregnant as a teen. This pattern of findings suggests that teen pregnancy is important in explaining the gender difference in the estimates even if it is a relatively modest component of the net benefit overall. Appendix B Tables B.16 through B.18 provide more detailed findings from this analysis.

Table III.2. Net benefit to society of delaying sexual activity until age 18, by ingredient

Ingredient	Sample		
	Females	Males	Full Sample
Pregnancy and childbearing			
Teen pregnancy	3,403	1,600	2,514
Unintended pregnancy in adulthood	372	301	339
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	-473	-236
Diagnosed with another STI	12[a]	1	6
Substance use			
Underage drinking	368	722	545
Tobacco use (at any age)	20,092	12,318	16,265
Substance use disorder	1,185	1,926	1,531
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	269	999	653
Adult criminal convictions	693	1,572	1,161
Mental health			
Depression	634	-118	250
Anxiety diagnosis	114	105	110
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	3,018	977	1,509
Enrolled in postsecondary education	-668	-457	-809
Obtained four-year college degree	4,051	3,261	3,458
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	9	6	8
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	9,739[a]	2,549	6,326[a]
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	147	914[a]	575
Total	**43,437**	**26,204**	**34,204**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included in the team's more stringent estimation approach.

n/a = not available: the SSAvER team estimated associations for these ingredients but did not convert the associations to net benefits (see Chapter II for details). STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

According to most of the estimates, the net benefit of delayed voluntary sexual activity accrues primarily to the individual adolescents who choose to delay sex (Table III.3). For example, for the estimated net benefit of delaying sexual activity until age 18 or later, the SSAvER team's estimates based on the more stringent estimation approach imply a benefit of $3,198 to the individual adolescents who choose to delay sex. In comparison, the estimate for other taxpayers implies a smaller benefit of $1,964. The same pattern of relatively larger benefits from the perspective of individual adolescents holds across all of the estimates in Table III.3. The only exception to this pattern emerged when the team calculated summary estimates of net benefit separately by the gender of the adolescent. Based on the more stringent estimation approach (though not on the less stringent one), the team found that taxpayers accrue a relatively larger share of the estimated net benefit if an adolescent female delays sexual activity until age 20 or later (see Appendix B).

Table III.3. Net benefit of delayed voluntary sexual activity, by perspective

	Perspective		
Age cutoff used to define delay	**Individuals**	**Taxpayers**	**Society**
More stringent estimation approach			
Age 15 or later	1,507	1,360	3,174
Age 18 or later	3,198	1,964	6,326
Age 20 or later	2,200	1,512	4,154
Age 22 or later	1,745	1,016	3,108
Age at first marriage	0	0	0
Less stringent estimation approach			
Age 15 or later	23,021	11,133	36,840
Age 18 or later	19,997	10,304	34,204
Age 20 or later	33,905	15,361	51,788
Age 22 or later	34,040	14,847	51,111
Age at first marriage	17,737	8,803	30,631

Note: All values are in 2018 dollars. Estimates include only the net benefits included in the SSAvER economic analysis and discussed in Chapter II, Section B.

IV. SUMMARY AND CONCLUSIONS

This study provides estimates of the economic savings associated with delayed sexual activity among adolescents in the United States. In comparison to earlier studies on the savings and costs of teen pregnancy and unintended childbearing in the United States, this study is unique, first, by examining the savings and costs of delayed sexual activity as a precursor to teen pregnancy and unintended childbearing and, second, by considering other potential savings and costs associated with delayed sexual activity, such as savings from improved relationship stability, increased educational attainment, or reduced substance use.

Drawing on the methods and principles of economic analysis, the study provides summary estimates of the net benefit of delayed sexual activity from three perspectives: individual adolescents, taxpayers, and society as a whole. To produce these estimates, the SSAvER team used four methods, each with its own strengths and weaknesses, to examine the relationship between delayed sexual activity and 24 potential ingredients for the economic analysis. For 17 of the 24 ingredients, the team associated the ingredient with an estimate of the net benefit in dollar terms. The team then combined these estimates across ingredients to produce an overall summary estimate of the net benefit of delayed voluntary sexual activity. The team produced separate summary estimates based on gender (males, females, and all adolescents combined), different sets of rules used by the team to determine how much of each ingredient to include in the analysis (more or less stringent, accounting for the degree of uncertainty in the estimates), and different definitions of delay (delay until age 15, 18, 20, 22, or age of first marriage).

The results of the analysis show a wide range in the summary estimates of the net benefit of delayed voluntary sexual activity. That wide range partly reflects differences by gender, with higher estimates for females than for males. The range also reflects differences resulting from the rules used by the team to determine how much of each ingredient to include in the analysis, with the more stringent rules leading to lower estimated net benefits. The estimates show no clear pattern based on the age cutoff used to define delayed sexual activity. According to most of the estimates, the net benefit of delayed voluntary sexual activity accrues primarily to the individual adolescents who choose to delay sex. Other taxpayers accrue a smaller net benefit.

As in most economic analyses, the SSAvER team's analysis could not account for all potential savings and costs of delaying sexual activity. As discussed in Chapter I, the SSAvER team sought to incorporate a broad range of ingredients into the analysis, using Add Health data to examine the relationship between delayed sexual activity and each of 24 separate ingredients, 17 of which were included in the net benefit estimates. However, the set of ingredients likely does not capture all possible benefits of delayed sexual activity. Moreover, the study did not account for adolescents' personal preferences or the value adolescents derive from initiating sexual activity at the time of their choosing.

The savings and costs assigned to each ingredient of the economic analysis rely on several assumptions. As discussed in Chapter II, for each ingredient, the SSAvER team used existing studies to find estimates of the monetary savings and costs associated with the ingredient and then updated the estimates as needed for the purpose of this analysis. The estimates in the

literature and the adjustments made to these estimates involved assumptions that affected the bottom-line estimates of overall net benefits. Shifting these assumptions could lead to large differences in the summary estimates of net benefit.

This analysis focused on the net benefit of delayed voluntary sexual activity for the "typical" adolescent. To focus on the issue of voluntary sexual activity, the SSAvER team omitted from the analysis (1) individuals who reported experiencing sexual abuse or rape during or before the year they initiated sexual activity and (2) those who had sex before age 12. The resulting estimates yield the average net benefit for all other individuals in the sample. These averages might mask substantial variation in net benefits across adolescents depending on the context of first sexual activity. For example, a study by Meier (2007) suggests that the relationship between the timing of first sexual activity and females' mental health outcomes in adolescence can vary depending on factors such as (1) when a female becomes sexually active relative to her peers or (2) whether she experiences a breakup with a romantic partner in the same year she initiated sexual activity. Because of these influences, the specific savings or costs of delayed sexual activity for any one adolescent might differ from the averages presented in this report.

A key question for future research is how these estimates of net benefit compare with the overall costs and effects of the many prevention programs designed to delay the timing of first sexual activity among adolescents in the United States. For several decades, the federal government has supported programs that encourage adolescents to wait to have sex (Huber and Firmin 2014). From an economic perspective, whether the savings of these programs more than offset their costs depends on (1) the proportion of adolescents who voluntary delay sexual activity as a result of the programs, (2) the economic savings associated with these changes, and (3) the cost to taxpayers of implementing the programs. Focusing on the SSAvER team's estimates for delaying voluntary sexual activity until age 18 or later, the results of the present analysis suggest a net benefit to taxpayers of up to $7,551 if an adolescent male delays voluntary sexual activity and up to $13,372 if an adolescent female delays voluntary sexual activity. Future studies should incorporate this information when assessing the costs and impacts of prevention programs designed to delay the timing of first sexual activity among adolescents in the United States.

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Appendix A:

Details on Methods for Selecting Ingredients

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This appendix provides additional information on the methodology used to conduct the economic analysis for the Savings from Sexual Avoidance and Empowerment over Risks (SSAvER) project. In particular, it provides greater detail on the procedures the team used to estimate the relationship between delay in sexual initiation and each ingredient considered for the analysis. Section A provides details on how the SSAvER team measured each ingredient, and Sections B, C, and D cover the analysis approaches used by the team to estimate gender-specific associations between these ingredients and delay in sexual initiation. Section E then describes how the SSAvER team combined these gender-specific estimates.

A. Measures of ingredients

The SSAvER team analyzed 24 ingredients that previous research indicates could be linked to sexual activity, spanning seven domains: pregnancy and childbearing, physical health, substance use, delinquent behavior and criminal activity, mental health, path to economic self-sufficiency, and relationships (see Rotz et al. 2020). The team measured all outcomes using the National Longitudinal Study of Adolescent to Adult Health (Add Health), a longitudinal survey that follows a nationally representative sample of 20,475 adolescents who were enrolled in grades 7 to 12 during the 1994–1995 school year. Measures of ingredients were created using data from four survey waves, which were conducted during 1994–1995 (Wave I), 1995–1996 (Wave II), 2001–2002 (Wave III), and 2008 (Wave IV). This section describes how the team used the Add Health survey to measure the ingredients for the economic analysis, including the Add Health survey items used to create each measure (items are named in parentheses following the discussion of each data element).

1. Pregnancy and childbearing

The team analyzed three ingredients related to pregnancy and childbearing: teen pregnancy, unintended pregnancy in adulthood, and childbearing before marriage.

Teen pregnancy. The SSAvER team constructed this measure for male and female respondents based on the timing of their first experience with pregnancy. In Wave IV of the Add Health survey, respondents were asked to report information on each time they became pregnant or got someone pregnant. The team estimated the age the respondent was when the first pregnancy began based on how the pregnancy ended (H4PG1), the month and year the pregnancy ended (H4PG3M and H4PG3Y) or the due date for current pregnancies (H4PG2M and H4PG2Y), and the respondent's month and year of birth (H4OD1M and H4OD1Y, respectively). The team assumed pregnancies ending in birth lasted nine months, pregnancies ending in abortion lasted three months, pregnancies ending in miscarriage lasted two months, and pregnancies ending in stillbirth lasted six months. The team then created an indicator variable equal to one if an individual became pregnant or got someone pregnant for the first time when they were younger than 20 years old and equal to zero if their first pregnancy began at age 20 or older or if they had never been pregnant or gotten someone pregnant.

Unintended pregnancy in adulthood. The SSAvER team created this measure for both men and women by examining information on all pregnancies reported by respondents in Wave IV of the Add Health survey. First, for each pregnancy, the age at pregnancy was calculated in the manner

described for the teen pregnancy ingredient. Restricting the analysis to pregnancies beginning when an individual was age 20 or older (to avoid double-counting the costs associated with teen pregnancy), unintended pregnancies were identified as those that a respondent said were not planned based on the question, "Thinking back to the time just before this pregnancy . . . did you want to have a child then?" (H4PG8). The team constructed an indicator measure of unintended pregnancy equal to one if for any pregnancy starting at age 20 or older the response to this item was "no" and equal to zero if all pregnancies starting at age 20 or older were planned or the respondent had not been pregnant or gotten someone pregnant since reaching age 20.

Childbearing before marriage. As with the other measures in this domain, the SSAvER team constructed the measure of premarital childbearing for men and women using data from Add Health Wave IV. In particular, the team leveraged information on the romantic or sexual relationships linked to each reported pregnancy (H4TR13, H4PG9). The team created an indicator variable equal to one if a respondent reported having a pregnancy ending in birth (H4PG1) within a relationship other than marriage (including cases where the birth occurred before an individual married their child's other parent), and zero if an individual had no children or only had children within marriage. Because this measure is not included in the estimation of net benefits (see Chapter II of the main body of this report), the measure is not corrected for double-counting. That is, the same pregnancy could have resulted in an individual being categorized as having had an unintended pregnancy in adulthood or a teenage pregnancy (though not both) and as having had a child before marriage.

2. Physical health

The SSAvER team constructed two separate measures of ingredients related to physical health: an indicator variable for having been diagnosed with HIV and an indicator variable for having been diagnosed with an STI other than HIV. These outcomes were considered as separate ingredients due to the very different costs associated with HIV compared with other STIs.

HIV. To construct this measure, the SSAvER team used data on whether respondents reported having been diagnosed with HIV or AIDS in Wave I (H1CO16D), Wave II (H2CO19D), Wave III (H3SE21M, H3SE28), or Wave IV (H4SE36M, H4SE37M). The team constructed an indicator variable equal to one if an individual reported any HIV or AIDS diagnosis and equal to zero otherwise.

Other STIs. To construct this measure, the SSAvER team used Add Health data on whether an individual had ever been diagnosed with any of the following STIs: chlamydia, gonorrhea, trichomoniasis, syphilis, genital herpes, genital warts, human papilloma virus, or another STIs. The measure excludes reproductive infections not medically considered STIs, such as pelvic inflammatory disease and vaginosis. Like HIV, the information used to construct this measure came from multiple questions and survey waves (including Add Heath items H1CO16, H2CO19, H3SE21, H4SE36, and H4SE37).

The logic and construction of the indicator for having ever been diagnosed with an STI other than HIV was parallel to that for the HIV indicator described above. The team created an

indicator variable equal to one if an individual had ever been diagnosed with any of the indicated STIs and equal to zero otherwise.

3. Substance use

The cost analysis includes three measures in the domain of substance use, including indicators for having consumed alcohol underage, tobacco use, and potential substance abuse issues.

Underage drinking. This measure draws on items from the second and fourth Add Health survey waves that ask respondents about their alcohol consumption. The team created an indicator variable equal to one if a respondent reported having "had a drink of beer, wine, or liquor—not just a sip or taste of someone else's drink—more than 2 or 3 times" between survey Waves I and II (H2TO15), when all respondents were under age 21, or if the respondent reported at Wave IV having had his or her first alcoholic drink (meaning "a glass of wine, a can or bottle of beer, a wine cooler, a shot glass of liquor, or a mixed drink, not just sips or tastes from someone else's drink") before age 21 (H4TO34). The indicator was set to zero for respondents that had never consumed alcohol or had consumed it for the first time at age 21 or older, based on these survey items.

Tobacco use. This measure draws on survey items from each of the four Add Health survey waves to determine whether a respondent had ever smoked regularly. In Add Health Waves I, II, and IV, respondents were first asked whether they had ever tried smoking (H1TO1, H2TO1, and H4TO1). Those who had were then asked if they ever smoked regularly (meaning "at least 1 cigarette every day for 30 days"; H1TO3, H2TO3, and H4TO3). In Wave III, the series of questions about smoking included items assessing whether someone ever tried a cigarette, smoked a whole cigarette, and smoked at least 1 cigarette per day for 30 days (H3TO1, H3TO2, and H3TO4, respectively). The SSAvER team used these series of questions to create an indicator variable equal to one if an individual ever smoked regularly and equal to zero otherwise.

Substance use disorder. The team used information from Wave IV of the Add Health survey to determine whether survey respondents exhibited issues related to dependency on alcohol, marijuana, or other drugs. Alcohol dependency was determined based on whether an individual had experienced at least three of the following within a 12-month period:

1. Had to drink more than he or she wanted to in order to get the desired effects of alcohol
2. Spent a large amount of time drinking, planning to drink, or recovering from drinking
3. Drank more than he or she wanted to or drank over a longer period than he or she wanted
4. Wanted to cut down on his or her drinking
5. Tried to cut down on his or her drinking but was unable to do so
6. Experienced withdrawal symptoms when not drinking
7. Continued to drink after realizing drinking was causing emotional or health issues
8. Reduced participation in activities that interfered with drinking

(Add Health items H4TO50 to H4TO61). Dependency on marijuana and other drugs was determined in a parallel fashion (using Add Health items H4TO80–H4TO91 and H4TO109–H4TO119, respectively). The SSAvER team constructed an indicator variable equal to one if respondents' answers indicated they had three symptoms of dependency on alcohol, marijuana, or other drugs within a 12-month period, and equal to zero if the pattern of responses did not suggest the co-occurrence of at least three issues for any one type of substance.

4. Delinquent behavior and criminal activity

The study team analyzed two ingredients related to delinquent behavior and criminal activity. The first measure captures youth involvement in the criminal justice system, and the second captures adult criminal convictions.

Youth involvement in justice system. The SSAvER team used three series of questions to construct this variable. In Wave III, respondents were asked to report on their first arrest, including the age at which they were arrested (H3CJ4) and the crimes involved (HSCJ7). In Wave IV, individuals were asked to report on their first and most recent arrests, also including information on age (H4CJ3, H4CJ4) and crime (H4CJ7, H4CJ9). Based on that information, the SSAvER team created a measure equal to one if an individual reported an arrest occurring before age 18 that was associated with any criminal activity other than those related to underage alcohol, marijuana, or other drug consumption, and equal to zero otherwise. The team constructed this measure excluding substance-related involvement in the justice system to avoid double-counting costs associated with substance use or underage drinking, which are measured elsewhere.

Adult criminal convictions. This SSAvER team used information on whether respondents had ever been convicted of a crime other than a minor traffic violation (H4CJ10) and respondents' age at the time of their first and last convictions (H4CJ11, H4CJ12) to determine whether an individual had ever been convicted of a crime as an adult. The team constructed an indicator variable equal to one if an individual had ever been convicted of a crime after they turned 18 and equal to zero otherwise.

5. Mental health

The cost analysis included three ingredients related to mental health. The first used items from the Center for Epidemiologic Studies Depression Scale (CESD) to determine whether the respondent would be considered depressed at any Add Health wave based on this self-administered scale (Radloff 1977). The second measure indicated whether an individual had ever been diagnosed with an anxiety or related disorder. The third measure is a continuous measure of the intensity of a respondent's stress level.

Depression. The SSAvER team constructed a measure of having ever been depressed using items from all four waves of the Add Health survey. In each wave, the team calculated the mean of nine CESD items (for example, in Wave IV these items were H4MH18–H4MH23 and H4MH25–H4MH27) after reverse coding items as needed. Each item, and the scale as a whole, ranged from 0 to 3, with higher values indicating a greater likelihood of depression. Survey

respondents were assigned a score for each survey wave during which they responded to at least seven of the nine CESD items. The team then constructed an indicator equal to one if a respondent had an average value of one or greater during any survey wave and equal to zero if the respondent averaged a score of less than one for each survey wave for which he or she had a nonmissing average score. The team selected the cutoff value of one based on Radloff (1977).

Anxiety diagnosis. The SSAvER team constructed an indicator equal to one if an individual reported during Add Health Wave IV that he or she had ever been diagnosed with an anxiety or panic disorder (H4ID5J) or post-traumatic stress disorder (H4ID5I) and equal to zero otherwise.

Stress level. The study team developed a scale measure of the degree of anxiety a respondent reported at Add Health Wave IV. The measure was constructed as the mean of four items related to anxiety (H4PE6, H4PE14, H4PE22, and H4PE30) after reverse-coding the items as needed. Each item, and the scale as a whole, ranged from one to five, with higher values indicating greater stress levels. This ingredient was set to missing if individuals did not respond to at least three of the four items used to construct the scale.

6. Path to economic self-sufficiency

The SSAvER team constructed measures of five ingredients related to respondents' progress on the path to economic self-sufficiency, including three indicators of educational attainment, a measure of adult earnings, and an indicator of receipt of public assistance as an adult.

Graduated from high school. The SSAvER team used individuals' reported educational attainment at the time of the Wave IV Add Health survey to construct an indicator variable equal to one if a respondent reported having graduated from high school (including those with more than a high school education) and equal to zero otherwise.

Enrolled in postsecondary education. The SSAvER team used individuals' reported educational attainment at the time of the Wave IV Add Health survey to construct an indicator variable equal to one if a respondent reported having enrolled in postsecondary education (including those who completed a postsecondary program) and equal to zero otherwise.

Obtained a four-year college degree. The SSAvER team used individuals' reported educational attainment at the time of the Wave IV Add Health survey to construct an indicator variable equal to one if a respondent reported having earned a four-year college degree or other advanced degree and equal to zero otherwise.

Adult earnings. The SSAvER team constructed a measure of earnings in the year before the Wave IV survey based on self-reported annual income (H4EC2). If a survey respondent did not report his or her income in dollar terms but did respond to a follow-up survey item asking individuals to indicate their income range (H4EC3), the team used the midpoint of the selected income category. For example, if the respondent indicated income between $10,000 and $15,000, the team set the income measure to $12,500.

Adult receipt of public assistance. The SSAvER team constructed a measure of receipt of public assistance based on data from Add Health Waves III and IV. At Wave III, individuals were asked whether they currently received cash assistance benefits from programs such as Temporary Assistance for Needy Families (H3EC26) or food stamps (H3EC33). At Wave IV, individuals who had responded to the Wave III Add Health survey were asked whether they had received such benefits since Wave III, and those who had not responded to the Wave III survey were asked if they had received such benefits since Wave II (H4EC18). For individuals who were interviewed during Waves III and IV, the SSAvER team used these items to create an indicator variable equal to one if an individual received public assistance at Wave III or between Waves III and IV and equal to zero otherwise. For individuals interviewed at Wave IV but not Wave III, the team set the indicator variable equal to one if the individual received public assistance since Wave II and equal to zero otherwise.

7. Relationships

The economic analysis considered six ingredients related to relationships. These measures quantified an individual's relationship history, as well as providing measures of relationship quality. The ingredients included in the economic analysis include measures of relationship stability and violence within romantic relationships.

Number of serious relationships. During Wave IV, Add Health respondents were asked to report how many individuals they ever married (H4TR1), lived with (H4TR2), had a sexual encounter with that resulted in a pregnancy (H4TR3), or had a sexual or romantic relationship with for six or more months (H4TR5, H4TR13, TSDURATN). Individuals were instructed to count each relationship they had only once, so that, for example, an individual a respondent married would not also be counted when enumerating the individuals with whom the respondent had lived. The SSAvER team summed these numbers to create a measure of a respondent's total number of serious relationships.

Relationship satisfaction. At Wave IV, Add Health survey participants were asked to respond to seven items measuring the quality of their relationship with their current or most recent romantic partner (H4RD7A- H4RD7G). Individuals with multiple current partners were asked to respond with respect to the partner they were in a more serious relationship with or had been in a relationship with for longer. The SSAvER team associated each of the seven items with a score ranging from one to five, with higher scores indicating greater relationship satisfaction. The SSAvER team then used the average of these scores to create a scale measuring overall relationship satisfaction for all individuals who responded to at least six of the seven items. This measure was missing for any individuals who had never been in a romantic relationship.

Intimate partner violence (IPV). Both Wave III and Wave IV of the Add Health survey asked individuals a series of questions related to IPV. At Wave III, individuals were asked to report how many times each of up to three romantic partners had physically assaulted or threatened to physically assault them (H3RD110, H3RD110) or forced them to have sex (H3RD114). At Wave IV, similar questions were asked about survey respondents' current or most recent partners (H4RD18, H4RD19, and H4RD21). Individuals with multiple current partners were asked to

respond with respect to the partner they were in a more serious relationship with or had been in a relationship with for longer. The SSAvER team used these items to create an indicator variable equal to one if an individual reported that any partners had ever victimized them and equal to zero otherwise.

Ever cohabited (outside of marriage). The SSAvER team created an indicator variable equal to one if an individual reported living with any romantic partner outside of marriage (based on Add Health Wave IV items H4TR2 and H4TR16) and equal to zero otherwise.

Ever married. The SSAvER team created an indicator variable equal to one if an individual reported ever being married (based on Add Health Wave IV item H4TR1) and equal to zero otherwise.

Ever divorced. The SSAvER team created an indicator variable equal to one if an individual reported ever having had a marriage end in divorce before the Wave IV interview (H4TR29) and equal to zero otherwise (including individuals who were never married and individuals who were widowed).

B. Propensity score matching

Propensity score methods leverage all available information on individuals. To use this method to estimate associations between delay in sexual activity and the ingredients of interest, the SSAvER team matched each individual who delayed sexual activity to a similar individual who did not delay. The matching was conducted based on the propensity score, which measures the probability of delay in sexual activity based on observed characteristics.

The estimation procedure included the following five steps, each of which was completed separately by gender and for each measure of delay.

1. Many variables could potentially predict delay in sexual activity, and Add Health provides over 190 variables measured in the survey's first wave that could serve as potential predictors (see Table A.1). The SSAvER team used a partially data-driven procedure, similar to that in Imbens (2015), to identify the set of variables that best predict delayed sexual activity. First, the team selected a core set of predictors judged to be potentially important, from a theoretical standpoint, for predicting delay in sexual activity. These include the individual's age, race, and ethnicity and measures of socioeconomic status (household receipt of Supplemental Nutrition Assistance Program [SNAP] benefits), risk aversion (riding in a car without a seat belt), quality of parental relationships (feeling close to one's mother and father), and local social norms (county-level teen and unmarried birth rates and neighborhood prevalence of female-headed households). Then, additional variables were added to a logistic regression predicting delay in sexual initiation, from most to least predictive, until there were no more predictors that would have had a coefficient with a t-statistic of at least 1 if added to the regression. These variables included measures related to the core predictors (for example, other variables capturing risk aversion or socioeconomic status), as well as measures in other domains (for example, health). The exact number of predictors selected varied across samples defined by gender and measure of delayed sexual activity, but the number of

predictors was typically large. For example, in predicting delay in sexual activity until age 18, the procedure identified 119 predictors for the female sample and 138 predictors for the male sample (see Table A.2 for details).

Table A.1. Potential predictors to use in estimating propensity scores

Demographic characteristics	
Age	Main language spoken at home
Race/ethnicity	Urban or rural location
Immigrant status	Household composition
Parents and family background	
Family size	Parental monitoring of adolescent
Parents' marital status	Parents' labor force participation
Parents' religion	Parents' attitudes toward sex
Parents' religiosity	Discussed reproductive health topics with parents
Quality of relationship with parents	
Socioeconomic characteristics	
Parents' educational attainment	Family receipt of public assistance
Family financial hardship	Household income
Education and school experience	
Cognitive ability	Popularity at school
Age for grade	Involvement in school activities
Self-reported difficulty in school	Connectedness to school
Learning disabilities	College expectations
Neighborhood context	
Neighborhood economic disadvantage	Connectedness to neighborhood
Neighborhood social issues	
Religion	
Religious affiliation	
Reproductive health knowledge and attitudes*	
Attitudes toward pregnancy as a teen	Contraceptive self-efficacy
Attitudes toward birth control	Knowledge of reproductive health topics
Health	
Body mass index	Overall health
Other	
Sexual orientation	Risk-taking behavior
Physical attractiveness	Caring relationships with adults

Note: Factors were measured by the Add Health Wave I survey. Many factors are linked to multiple indicators or scales (for example, multiple indicator variables are used to capture race).

* Measures not available for all individuals under age 15 at the time of the Wave I Add Health survey.

Table A.2. Predictors selected for propensity score regression, analysis of delaying sexual activity until age 18

Characteristic	Predictors selected in female sample	Predictors selected in male sample
Demographic characteristics		
Age	8	5
Race/ethnicity	4	3
Main language spoken at home	2	1
Urban or rural location	1	1
Household composition	5	2
Immigrant status	0	1
Parents and family background		
Parents' marital status	2	2
Parents' religion	2	7
Parents' religiosity	4	2
Quality of relationship with parents	4	5
Parental monitoring of adolescent	3	5
Parents' labor force participation	3	2
Parents' attitudes toward sex	3	7
Discussions of reproductive health topics with parents	3	3
Family size	0	1
Socioeconomic characteristics		
Parents' educational attainment	5	3
Family financial hardship	2	1
Family receipt of public assistance	4	6
Household income	1	0
Education and school experience		
Cognitive ability	1	1
Age for grade	2	3
Self-reported difficulty in school	2	2
Popularity at school	1	2
Involvement in school activities	1	2
Connectedness to school	3	6
College expectations	1	1
Learning disabilities	1	1

Table A.2 *(continued)*

Characteristic	Predictors selected in female sample	Predictors selected in male sample
Neighborhood context		
Neighborhood economic disadvantage	2	7
Neighborhood social issues	2	2
Connectedness to neighborhood	2	5
Religion		
Religion	3	5
Reproductive health knowledge and attitudes*		
Attitudes toward pregnancy as a teen	10	13
Attitudes toward birth control	5	5
Contraceptive self-efficacy	4	4
Knowledge of reproductive health topics	14	14
Health		
Body mass index	1	1
Overall health	1	0
Other		
Physical attractiveness	1	2
Risk-taking behavior	4	3
Sexual orientation	1	0
Caring relationships with adults	1	0

* Measures not available for all individuals under age 15 at the time of the Wave I Add Health survey.

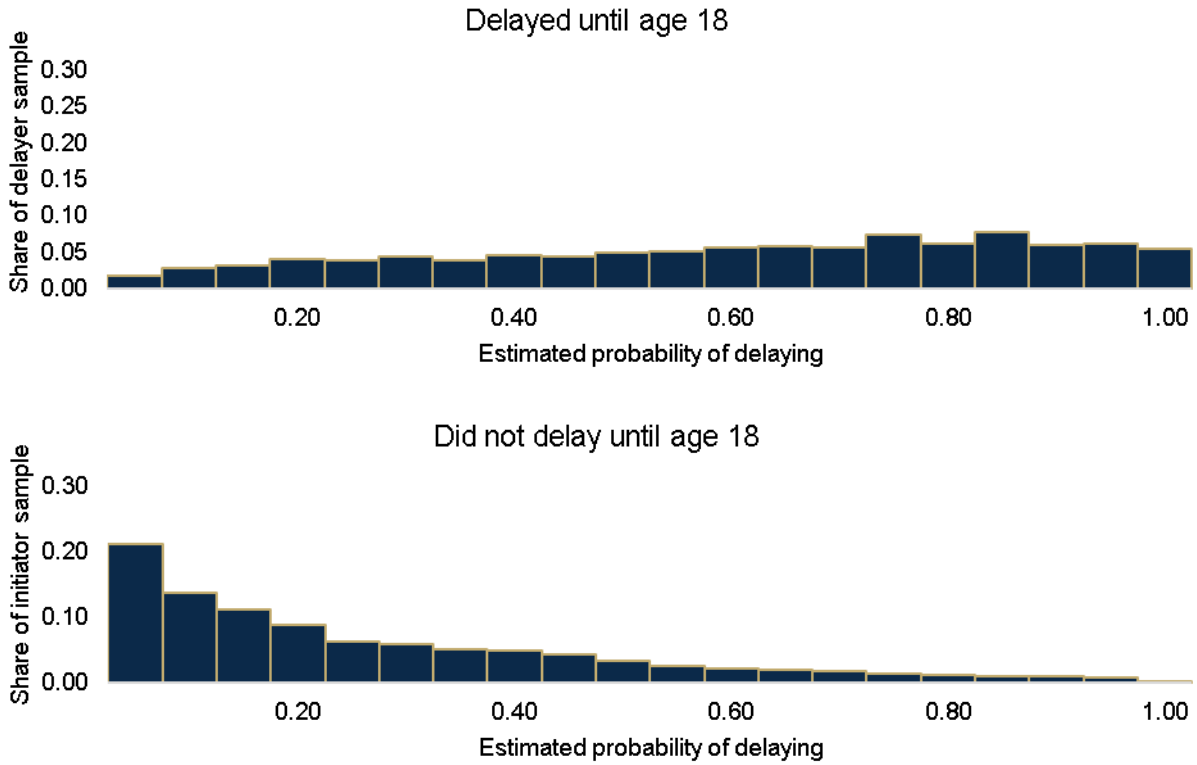
The SSAvER team used this method to select the predictors of delay in sexual activity because it balances a key tradeoff. When a predictor is added to the propensity-score regression, individuals matched based on the propensity score are more likely to have similar values for that predictor. But adding further predictors to the propensity-score regression could make it less likely for matched individuals to be similar based on the characteristics already included in the regression. Initially including a small set of characteristics, selected based on theory, and then adding the characteristics most predictive of delay, based on the data, balances these two competing forces.

2. The SSAvER team estimated logistic regression models predicting delay in sexual activity. The predictors generally explained a substantial amount of variation in the measures of delay. Pseudo-R2 statistics for the regressions predicting delay in sexual activity until age 18 were 0.31 for the male sample and 0.39 for the female sample. (The pseudo-R2 is a measure of the extent to which the predictor variables explain the outcome. It ranges from zero to one.) Values were similar or higher for other measures of delay.

3. The team used these models to estimate each individual's propensity score.

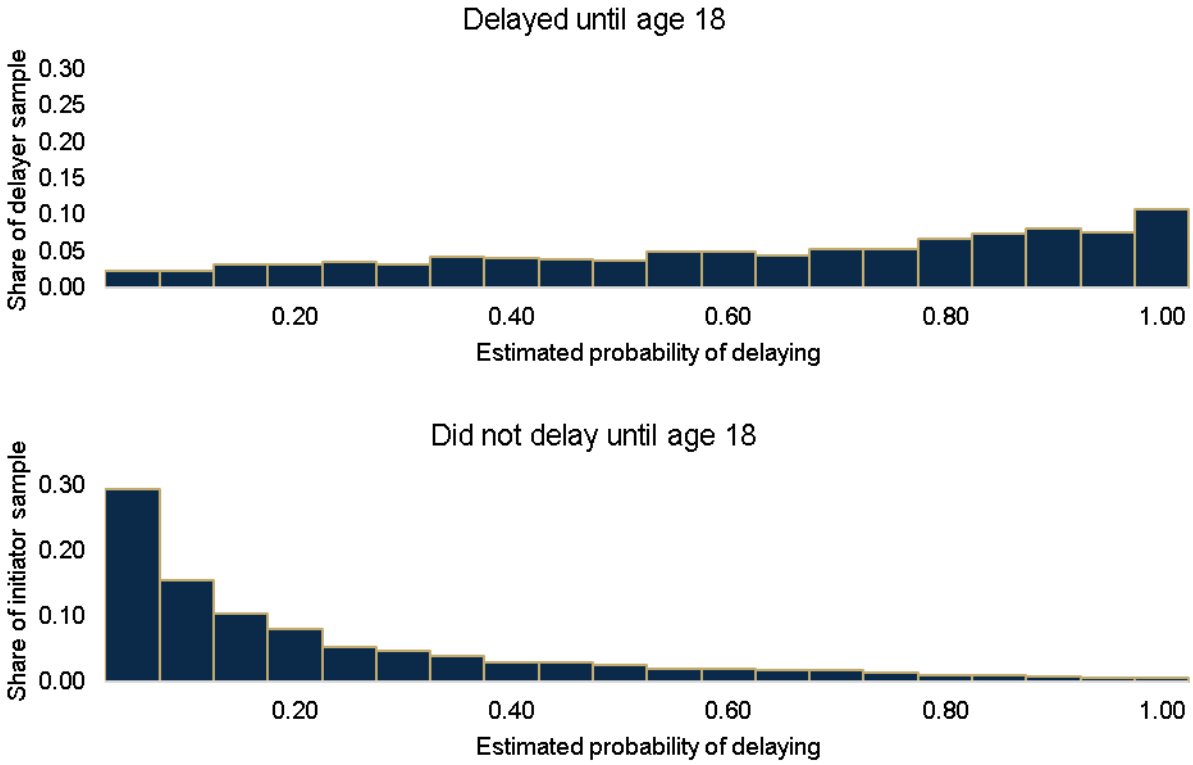
4. To produce valid estimates, the distributions of the propensity scores for individuals who delayed and did not delay sexual initiation should overlap (see Crump et al. 2009). Figures A.1 and A.2 show these distributions for the measure of delay until age 18, and demonstrate this assumption is met. To further ensure overlap, the team excluded from the analysis sample any individuals who were either so likely to have delayed sex, or so unlikely to have done so, that it would be difficult to find a similar individual who had made a different choice about delaying sexual activity. Generally, this was accomplished by excluding sample members with propensity scores less than 0.1 or greater than 0.9 (see Crump et al. 2009). However, for the analyses of delaying sexual activity until age 22 or until the age of marriage, a large majority of sample members were below or near the 0.1 threshold, regardless of whether they delayed or not (for example, see Figure A.3). Therefore, this trimming procedure would not have been helpful and was not applied for these measures of delay.

Figure A.1. Distribution of propensity scores for delay in sexual initiation until age 18, males



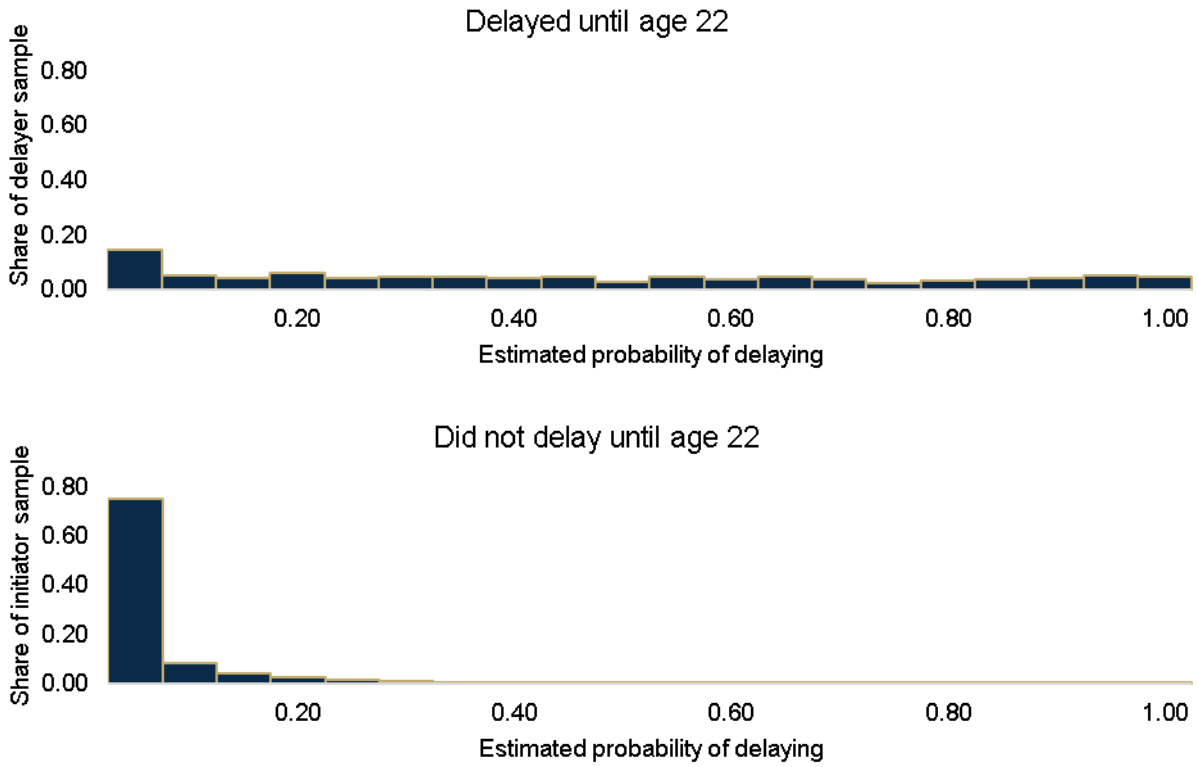
Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

Figure A.2. Distribution of propensity scores for delay in sexual initiation until age 18, females



Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

Figure A.3. Distribution of propensity scores for delay in sexual initiation until age 22, females



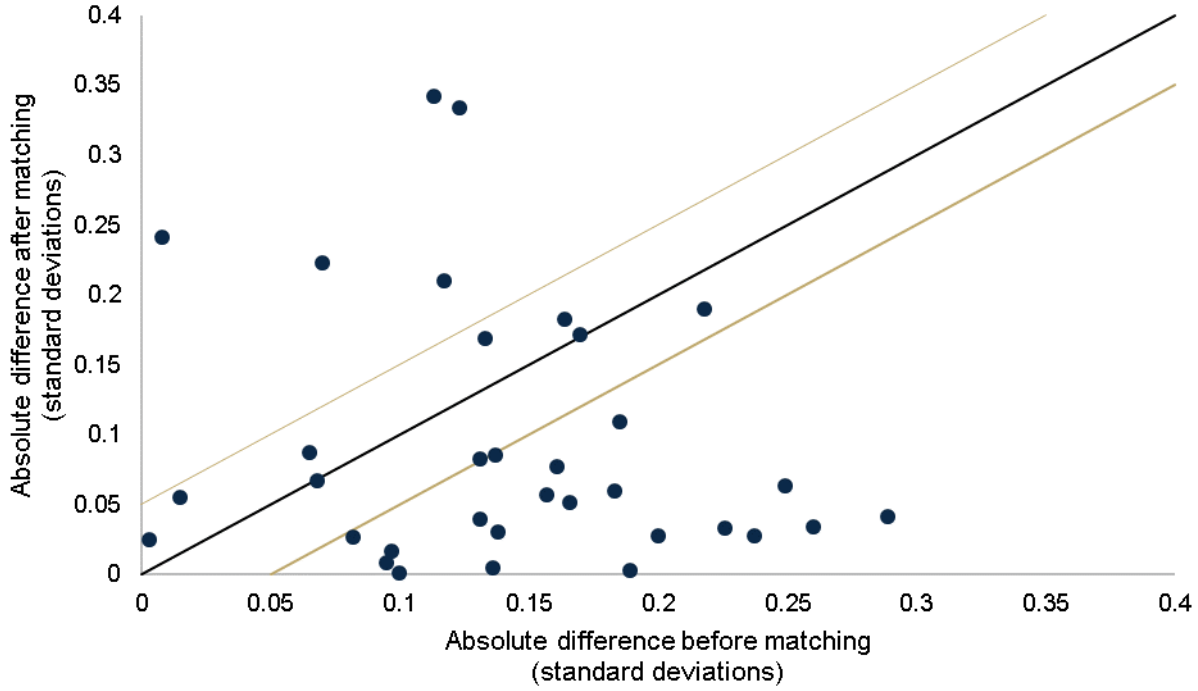
Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

5. The team matched each individual who had delayed sex to the individual who had not delayed with the closest propensity score. Individuals who did not delay sexual initiation could be matched to multiple individuals who chose to delay.

The matching procedure generally improved the similarity in the samples of individuals who did and did not delay sexual initiation compared in this analysis. This is shown in Figure A.4, which plots normalized differences in sample characteristics, before and after the matching procedure. Each point on the plot represents a different characteristic. The point's horizontal position shows the effect size of the difference in the characteristic (that is, the difference divided by the standard deviation of the characteristic) between individuals who did and did not delay sexual initiation, before propensity score matching; its vertical position indicates the same measure of difference after matching. Points below the dark diagonal line signal that matching improved the similarity of the two groups based on that characteristic, whereas those above the dark diagonal line signal matching increased differences. The figure also highlights the characteristics with effect sizes that do not change much after matching. These points are between the two light diagonal lines, which indicate the change in the effect size of the characteristic due to matching was less than 0.05 standard deviations. Propensity score matching improved the sample balance for 22 out of the 34 characteristics, and for 19 of those characteristics the improvement was

greater than 0.05 standard deviations. However, for five characteristics, matching increased differences by more than 0.05 standard deviations.

Figure A.4. Balance in the sample before and after matching



Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

Table A.3 further shows how propensity-score matching can decrease differences in key characteristics, using delay in sexual initiation until age 18 or later as an example. After the propensity-score matching, a small number of differences remained. In particular, the individuals who delayed sex were slightly younger, more likely to be white but less likely to be black or another race, and less likely to be Hispanic. They also lived in counties with relatively fewer births to unmarried women.

To account for differences such as these (and following Funk et al. 2011), the SSAvER team used regression analysis to estimate the relationship between delay in sexual initiation and each ingredient. Specifically, within the propensity-score matched sample, the team estimated linear regression models of the form

$$y_i = \alpha + \gamma X_i + \delta D_i + \epsilon_i,$$

where, for individual i, y_i is the value of the ingredient, D_i is an indicator for delayed sexual activity (equal to one if an individual delayed sex and zero otherwise), X_i is a set of control variables, and ϵ_i is an error term. The characteristics accounted for in X_i include the core set of predictors judged to be important, from a theoretical standpoint, for predicting delay in sexual activity (measures of age, race, ethnicity, household socioeconomic status, risk aversion, quality

of parental relationships, and local social norms), as well as the first 10 factors selected by the data-driven procedure used to select covariates for the propensity score regression (5 factors for delay until age 22 or marriage, due to smaller sample sizes for these analyses). In addition, analyses of ingredients related to education included additional controls for cognitive ability and parent's educational attainment; analyses of earnings and public benefit receipt included additional controls for socioeconomic status during adolescence; analyses of relationship satisfaction, number of relationships, and intimate partner violence included additional controls for an adolescent's relationships with their parents; analyses of cohabitation included an additional control for whether the adolescent lived with both of their parents at the time of the first wave of the Add Health survey; and analyses of marriage and divorce included additional controls for whether an adolescent's parents were married or formerly married. The coefficient δ represents the relationship between the ingredient and delayed sexual initiation within the propensity-score matched sample, holding these characteristics constant. In additional, exploratory analyses not reported here, the SSAvER team confirmed that the conclusions of the economic analysis were not sensitive to the precise components of X_i.

Table A.3. Sample characteristics: Analysis of delayed sex until age 18

Characteristic (% unless noted)	Delayed sex until age 18	Did not delay sex until age 18	Difference	Difference (effect size)[a]	p-value
Age (years)	15.1	15.5	-0.4	-0.223	0.004
Race					
Black	9.3	15.6	-6.3	-0.190	0.001
White	71.5	55.0	16.5	0.342	0.001
Other race	14.4	22.6	-8.2	-0.210	0.130
Multiple races	4.8	6.8	-2.0	-0.087	0.076
Hispanic	13.6	23.0	-9.3	-0.241	0.009
Foreign born	8.7	14.1	-5.4	-0.172	0.046
Reported same-sex attraction	4.3	4.8	-0.5	-0.027	0.440
Cognitive ability	102.9	100.4	2.5	0.169	0.017
Living with parent					
Lives with mother figure	96.7	96.6	0.1	0.005	0.873
Lives with father figure	80.6	79.2	1.4	0.034	0.441
Lives with both	78.1	76.3	1.8	0.042	0.335
Parent marital status					
Parent is married	80.4	78.0	2.4	0.064	0.139
Parent is single	2.8	4.3	-1.4	-0.083	0.030
Parent is separated, widowed, or divorced	16.8	17.7	-1.0	-0.028	0.501
Relationship with parents					
Teen feels very close to mother	67.7	67.7	-0.0	-0.001	0.986
Teen feels very close to father	47.4	45.7	1.7	0.033	0.428
Teen feels mom cares	87.6	86.5	1.1	0.031	0.389
Teen feels dad cares	69.2	67.9	1.3	0.028	0.539

Table A.3 *(continued)*

Characteristic (% unless noted)	Delayed sex until age 18	Did not delay sex until age 18	Difference	Difference (effect size)[a]	p-value
Mother's educational attainment					
Less than high school	12.2	12.0	0.3	0.009	0.845
High school	35.2	37.0	-1.8	-0.040	0.388
Some college	17.1	15.2	1.9	0.055	0.113
College degree	26.5	26.4	0.1	0.003	0.947
More than college	8.9	9.4	-0.5	-0.017	0.720
Father's educational attainment					
Less than high school	11.3	13.6	-2.4	-0.086	0.109
High school	30.6	27.7	2.9	0.077	0.179
Some college	15.9	16.7	-0.8	-0.025	0.645
College degree	27.6	25.4	2.2	0.057	0.196
More than college	14.6	16.5	-1.9	-0.060	0.220
Economic status					
Parent reports not enough money to pay bills	15.2	17.5	-2.3	-0.067	0.215
Household received SNAP last month	8.7	10.1	-1.4	-0.052	0.214
Community context					
Share of female-headed households in census block group	0.1	0.1	-0.0	-0.109	0.079
County-level teen birth rate[b]	56.9	60.8	-4.0	-0.183	0.102
County-level nonmarital fertility rate[c]	926.4	1,050.5	-124.2	-0.334	0.069
Sample Size	**1,876**	**3,826**			

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

[a] The effect size is calculated as the delayers' mean or proportion minus the initiators' mean or proportion, divided by the sample-wide standard deviation.

[b] Births per 1,000 women ages 15 to 19.

[c] Expected births outside of marriage per 1,000 women ages 15 to 44.

SNAP = Supplemental Nutrition Assistance Program.

To account for missing data on the X_i variables, the team used a dummy variable adjustment similar to that described by Puma et al. (2009). In this approach, missing values for a given baseline covariate are first set to an arbitrary constant value (in this case, the mean among observations with the same delay indicator value) and the regression model includes a series of dummy variables for each element of X_i for which at least 10 percent of observations have missing data, with the dummy variables equal to one if the element of X_i is missing and zero otherwise. Observations with missing data on an ingredient were omitted from the analysis of that ingredient.

Finally, the linear regression models account for the Add Health survey design and analysis approach. The data are weighted to account for the Add Health sampling method and the way in which the SSAvER team constructed the matched comparison group. Regression standard errors were also adjusted to account for the Add Health sampling design.

C. Comparison of siblings

The analysis of siblings used differences in delay in sexual activity across siblings from the same household to estimate the associations between delayed sexual initiation and the ingredients for the economic analysis. Specifically, the SSAvER team estimated models of the form

$$y_i = \alpha + \gamma X_i + \theta_h + \delta D_i + \epsilon_{ih}.$$

Similar to the explanation of terms in Section B, for individual i from household h, y_i is the value of the ingredient, D_i is an indicator for delayed sexual activity (equal to one if an individual delayed sex and zero otherwise), X_i is a set of control variables, and ϵ_{ih} is an error term. This regression also includes a control θ_h, which is a household fixed effect. The household fixed effects account for all factors that are the same for siblings from the same household. In this way, the regression estimates the association δ holding constant all factors that are the same for two siblings. The regression also controls for a set of characteristics, X_i, that could vary for siblings within the same household, including adolescent's age, birth order (eldest, middle, youngest, or twin), race and ethnicity, sexual orientation, quality of relationship with parents, participation in school activities, cognitive ability and expected educational attainment, quality of peer relationships, body mass index, knowledge of and attitudes on reproductive health topics, risk tolerance, and measures of appearance and personality (as assessed by the Add Health interviewer). The analysis accounted for missing data and the Add Health survey design in a manner parallel to that described in Section B of this Appendix.

Consistent with the SSAvER team's approach of estimating regressions by gender, the analysis sample for each indicator of delayed sexual activity included all Add Health respondents with a same-gender sibling who also responded to the Add Health survey. However, estimating δ relies on variation in the decision to delay sexual activity within sibling groups. That is, the estimate's precision is governed by three sample sizes: the number of individuals, the number of households, and the number of households in which at least one sibling delayed sexual activity and at least one sibling did not delay sexual activity. Table A.4 therefore presents both the full sample size used to estimate the sibling models and the sample size for the subgroup of individuals with a sibling that made a different decision about delaying sexual initiation than they had.

Table A.4. Analysis sample sizes, by analytic method

	Sample size			
	Full analysis sample		Sample with differing delay indicator values	
Indicator of delayed sex	Delayed	Did not	Delayed	Did not
Delayed until age 15	1,628	341	174	172
Delayed until age 18	777	1,192	269	258
Delayed until age 20	394	1,575	158	157
Delayed until age 22	227	1,742	121	122
Delayed until marriage	32	1,834	22	27

Source: Add Health sibling survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

D. Instrumental variables analysis

The SSAvER team used two sets of instrumental variables to estimate differences in outcomes between adolescents who delayed sexual initiation and those who did not. This section describes the specification of the two-stage least squares model used to estimate these differences, and presents evidence on the relevance of each set of instruments to the decision to delay sexual initiation.

The SSAvER team used the following two-stage least squares (2SLS) model to estimate differences between individuals who delayed sexual activity and those who did not do so:

$$D_i = \zeta + \varphi X_i + \pi Z_i + \eta_i$$

$$y_i = \alpha + \gamma X_i + \delta \widehat{D}_i + \epsilon_i.$$

As in Section B, for individual i, D_i is an indicator for delayed sexual activity (equal to one if an individual delayed sex and zero otherwise), X_i is a set of control variables, y_i is the value of the ingredient, and ϵ_i is an error term. Similar to the other regression approaches discussed in this appendix, for this approach, X_i included measures of age, race and ethnicity, sexual orientation, quality of relationships with parents, participation in school activities, cognitive ability and expected educational attainment, quality of peer relationships, body mass index, knowledge of and attitudes on reproductive health topics, risk tolerance, and measures of appearance and personality (as assessed by the Add Health interviewer). This framework also introduces a second error term, η_i, and a set of instrumental variables, Z_i. The analysis accounted for missing data and the Add Health survey design in a manner parallel to that described in Section B of this Appendix.

The two regression equations correspond to the two stages of the 2SLS model. The first equation of this framework uses the control variables and instruments to predict whether an individual will delay sexual activity. The second equation estimates the relationship between an outcome of interest, y_i, and the *predicted* value of D_i represented as $\widehat{D}_i$, estimated based on the first equation.

Following the methods in a series of papers by Sabia and Rees (2008, 2011, 2012), the SSAvER team used two different sets of instruments measured in the first wave of Add Health. The first set, referred to as the "puberty instruments," are measures of physical development that predict the probability of sexual initiation at a given cutoff age. For female respondents, these measures include body shape, breast development, onset of menstruation, and overall physical development relative to peers. For male respondents, these measures include the amount of facial and underarm hair, voice pitch, and overall physical development relative to peers. The second set, referred to as "policy instruments," are measures of the school and community context that might affect the choice to become sexually active. These include the number of family planning clinics per capita in the respondent's county, whether the respondent's school has a contraceptive-inclusive HIV education program, whether the respondent's school provided family planning services or referrals, and whether the respondent's school required pregnant students to transfer to a separate school. For both approaches, the SSAvER team only included individuals without any missing values of the instruments in the analysis sample.

For each set of instruments, the SSAvER team considered multiple specifications for the first stage model, and chose the specification that yielded the greatest explanatory power as measured by an F-test that jointly assessed whether the coefficient on each instrument in Z_i is zero. For each index variable in the set of instruments that took on a small number of values, the team explored alternatively including the index as a single regression variable or including a series of indicator variables to capture variation in the index. For each continuous variable in the set of instruments, the team explored whether the value of the variable squared should be included in the regression as well as the value of the variable itself.

For the policy instruments, the final model specification included binary measures of whether an individual's school offered contraceptive-inclusive HIV education, provided family planning services or referrals, and mandated that pregnant students leave the school, as well as the number of family planning clinics per 10,000 women of child-bearing age in the county, and the square of that number.

For the puberty instruments, specifications varied by gender. For females, the final set of instruments included categorical measures breast development, body shape (level of "curviness"), and overall development, as well as a binary measure of having had one's first menstrual period and a continuous measure of the age at first menstruation (this variable was zero if a female had not yet begun to menstruate). For males, the final specification included categorical measures of the development of underarm hair, development of facial hair, deepening of voice, and overall physical development. The team also explored whether to include the average values of these instruments for an adolescent's opposite-sex schoolmates as additional or alternative instruments; however, these had minimal predictive power and were thus excluded.

To produce valid estimates, the instrumental variables must be strongly predictive of delayed sexual initiation. In some cases, the evidence suggests this is true; however, the degree of this predictiveness varies by measure of delay and by gender. The SSAvER team conducted an F-test of the joint significance of each instrument set separately for each measure of delay (that is, delay until ages 15, 18, 20 22, and until marriage) and for each gender (see Table A.5).

Researchers commonly consider instruments to be sufficiently strong if they have an *F*-statistic above 10 (Staiger and Stock 1997), although there is evidence that even stronger instruments can be beneficial (see Stock and Yogo 2002). Based on the results of the *F*-tests, the team proceeded with the second-stage analysis for 5 of the 20 combinations of IV approach, delay indicator, and gender. Four of the 5 selected analyses had an *F*-statistic above 10, while one had an *F*-statistic near this threshold ($F = 8.9$).

Table A.5. *F*-statistics of instrumental variables, by delay indicator and gender

Instrument set and gender	Indicator of delayed sex				
	Delayed sex until age 15	Delayed sex until age 18	Delayed sex until age 20	Delayed sex until age 20	Delayed sex until marriage
Policy instruments					
Females	22.0†	17.3†	6.1	5.1	1.8
Males	2.7	10.9†	4.3	2.2	2.7
Puberty instruments					
Females	3.0	5.6	8.9†	10.0†	1.1
Males	1.9	2.8	2.3	1.9	1.0

Source: Add Health sibling survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

† The team judged that the *F*-statistic was sufficiently high to estimate the second stage of the regression using 2SLS.

E. Combining gender-specific effect estimates

To account for potentially important differences, for each of the analytic approaches described in Sections B through D of this Appendix, the SSAvER team estimated the associations between delayed sexual initiation and each of the ingredients separately for males and females. As a result, the SSAvER team produced two estimates of the association between each measure of delay and ingredient, one for males and one for females.

The team also calculated a sample-wide estimate by combining the impacts from the gender-specific subgroups, putting equal weight on the estimate for each gender group. To test the statistical significance of the pooled estimates, the team calculated a combined *t*-statistic,

$$t = \frac{0.5\hat{\delta}_m + 0.5\hat{\delta}_f}{\sqrt{0.25(\widehat{SE}_m)^2 + 0.25(\widehat{SE}_f)^2}},$$

where $\hat{\delta}_m$ is the estimated association between delayed sexual activity and the ingredient among males, $\hat{\delta}_f$ is the estimated association among females, and $\widehat{SE}_m$ and $\widehat{SE}_f$ are the estimated standard errors of those estimates for males and females, respectively.

Appendix B:

Net Benefit Measures by Ingredient

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Table B.1. Net benefits of delaying sexual activity until age 15

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	1,507	1,360	3,174
Unintended pregnancy in adulthood	43	213	427
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-95	-350	-945
Diagnosed with another STI	1	3	8
Substance use			
Underage drinking	155	57	243
Tobacco use (at any age)	11,842	5,312	18,657
Substance use disorder	863	519	1,531
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	373	941
Adult criminal convictions	0	109	1,161
Mental health			
Depression	205	185	442
Anxiety diagnosis	11	32	70
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,943	720	2,663
Enrolled in postsecondary education	0	0	0
Obtained four-year college degree	5,460	1,768	6,126
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-103	109	6
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence[a]	1,174	721	2,321
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	15	0	15
Total	**23,021**	**11,133**	**36,840**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.2. Net benefits of delaying sexual activity until age 15, males

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	1,036	936	2,184
Unintended pregnancy in adulthood	32	159	317
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-47	-175	-473
Diagnosed with another STI	0	0	0
Substance use			
Underage drinking	357	131	558
Tobacco use (at any age)	8,275	3,712	13,036
Substance use disorder	1,113	670	1,976
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	701	1,767
Adult criminal convictions	0	102	1,086
Mental health			
Depression	-68	-62	-147
Anxiety diagnosis	-1	-4	-9
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	907	336	1,243
Enrolled in postsecondary education	-1,328	-297	-1,512
Obtained four-year college degree	6,693	2,167	7,509
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	56	-59	-3
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	92	57	182
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	147	0	147
Total	**17,263**	**8,374**	**27,861**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. No benefits were included when using the more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

Table B.3. Net benefits of delaying sexual activity until age 15, females

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	1,952	1,763	4,114
Unintended pregnancy in adulthood	54	271	542
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	95	350	945
Diagnosed with another STI	2	6	17
Substance use			
Underage drinking	155	57	243
Tobacco use (at any age)	11,842	5,312	18,657
Substance use disorder	863	519	1,531
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	61	154
Adult criminal convictions	0	86	917
Mental health			
Depression	479	432	1,031
Anxiety diagnosis	23	67	149
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	3,822	1,416	5,238
Enrolled in postsecondary education	432	97	492
Obtained four-year college degree	3,699	1,198	4,150
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-89	95	6
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence[a]	4,602	2,826	9,102
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	-88	0	-88
Total	**30,987**	**15,948**	**52,109**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.4. Net benefits of delaying sexual activity until age 18

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	1,193	1,077	2,514
Unintended pregnancy in adulthood	34	170	339
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-24	-87	-236
Diagnosed with another STI	1	2	6
Substance use			
Underage drinking	349	128	545
Tobacco use (at any age)	10,324	4,631	16,265
Substance use disorder	863	519	1531
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	259	653
Adult criminal convictions	0	109	1,161
Mental health			
Depression	116	105	250
Anxiety diagnosis	17	49	110
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,101	408	1,509
Enrolled in postsecondary education	-710	-159	-809
Obtained four-year college degree	3,082	998	3,458
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-123	130	8
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence[a]	3,198	1,964	6,326
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	575	0	575
Total	**19,997**	**10,304**	**34,204**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.5. Net benefits of delaying sexual activity until age 18, males

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	759	686	1,600
Unintended pregnancy in adulthood	30	150	301
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-47	-175	-473
Diagnosed with another STI	0	1	1
Substance use			
Underage drinking	462	170	722
Tobacco use (at any age)	7,819	3,507	12,318
Substance use disorder	1,085	654	1,926
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	396	999
Adult criminal convictions	0	148	1,572
Mental health			
Depression	-55	-49	-118
Anxiety diagnosis	16	47	105
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	713	264	977
Enrolled in postsecondary education	-401	-90	-457
Obtained four-year college degree	2,906	941	3,261
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-103	109	6
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	1,289	791	2,549
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced[a]	914	0	914
Total	**15,387**	**7,551**	**26,204**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.6. Net benefits of delaying sexual activity until age 18, females

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	1,615	1,458	3,403
Unintended pregnancy in adulthood	37	186	372
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	0	0
Diagnosed with another STI[a]	1	4	12
Substance use			
Underage drinking	235	87	368
Tobacco use (at any age)	12,753	5,721	20,092
Substance use disorder	668	402	1,185
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	107	269
Adult criminal convictions	0	65	693
Mental health			
Depression	295	266	634
Anxiety diagnosis	18	51	114
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	2,203	816	3,018
Enrolled in postsecondary education	-587	-131	-668
Obtained four-year college degree	3,611	1,169	4,051
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-139	148	9
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence[a]	4,924	3,024	9,739
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	147	0	147
Total	**25,781**	**13,372**	**43,437**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.7. Net benefits of delaying sexual activity until age 20

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	1,314	1,186	2,768
Unintended pregnancy in adulthood	58	290	580
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	0	0
Diagnosed with another STI	0	1	4
Substance use			
Underage drinking[a]	886	326	1,386
Tobacco use (at any age)	14,196	6,368	22,364
Substance use disorder	1,169	704	2,074
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	229	576
Adult criminal convictions	0	77	824
Mental health			
Depression	178	161	383
Anxiety diagnosis	4	12	26
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	389	144	533
Enrolled in postsecondary education	648	145	739
Obtained four-year college degree	11,537	3,736	12,943
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-150	160	9
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,968	1,823	5,871
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	708	0	708
Total	**33,905**	**15,361**	**5,1788**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.8. Net benefits of delaying sexual activity until age 20, males

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	759	686	1,600
Unintended pregnancy in adulthood	53	263	525
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-47	-175	-473
Diagnosed with another STI	0	0	1
Substance use			
Underage drinking[a]	1,012	372	1,583
Tobacco use (at any age)	16,625	7,458	26,191
Substance use disorder	1,002	603	1,778
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	381	960
Adult criminal convictions	0	97	1,030
Mental health			
Depression	-199	-179	-427
Anxiety diagnosis	-10	-30	-66
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,166	432	1,598
Enrolled in postsecondary education	185	41	211
Obtained four-year college degree	9,423	3,051	10,572
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-125	133	8
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,899	1,780	5,734
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	516	0	516
Total	**33,260**	**14,914**	**51,341**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.9. Net benefits of delaying sexual activity until age 20, females

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	1,880	1,697	3,961
Unintended pregnancy in adulthood	64	317	635
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	0	0
Diagnosed with another STI	1	2	6
Substance use			
Underage drinking[a]	567	209	887
Tobacco use (at any age)	12,829	5,755	20,211
Substance use disorder	946	570	1,679
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	-23	-58
Adult criminal convictions	0	37	393
Mental health			
Depression	507	457	1,090
Anxiety diagnosis	28	83	184
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	-194	-72	-266
Enrolled in postsecondary education	1,359	304	1,548
Obtained four-year college degree	15,676	5,076	17,587
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance[a]	-270	287	17
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,830	1,738	5,598
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	1,357	0	1,357
Total	**37,579**	**16,437**	**54,829**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.10. Net benefits of delaying sexual activity until age 22

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	699	631	1,473
Unintended pregnancy in adulthood	73	361	722
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	71	262	709
Diagnosed with another STI	0	1	3
Substance use			
Underage drinking[a]	1,046	385	1,635
Tobacco use (at any age)	14,044	6,300	22,125
Substance use disorder	974	587	1,729
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	130	326
Adult criminal convictions	0	55	580
Mental health			
Depression	-48	-43	-103
Anxiety diagnosis	4	12	26
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,231	456	1,687
Enrolled in postsecondary education	124	28	141
Obtained four-year college degree	12,153	3,935	13,635
Adult earnings	0	0	0
Adult receipt of public assistance	-50	53	3
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,761	1,696	5,461
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	959	0	959
Total	**34,040**	**14,847**	**51,111**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.11. Net benefits of delaying sexual activity until age 22, males

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	639	577	1346
Unintended pregnancy in adulthood	73	364	728
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-142	-525	-1,418
Diagnosed with another STI	0	1	2
Substance use			
Underage drinking[a]	1,054	388	1,648
Tobacco use (at any age)	11,463	5,142	18,059
Substance use disorder	557	335	988
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	381	960
Adult criminal convictions	0	88	936
Mental health			
Depression	-219	-198	-472
Anxiety diagnosis	2	6	13
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,684	624	2,308
Enrolled in postsecondary education	309	69	352
Obtained four-year college degree	9,511	3,080	10,671
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-58	62	4
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,186	1,342	4,323
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	590	0	590
Total	**27,649**	**11,736**	**41,038**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.12. Net benefits of delaying sexual activity until age 22, females

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy[a]	759	686	1,600
Unintended pregnancy in adulthood	72	358	717
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	142	525	1,418
Diagnosed with another STI	0	2	4
Substance use			
Underage drinking	865	318	1,353
Tobacco use (at any age)	17,991	8,071	28,344
Substance use disorder	918	553	1,630
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	-290	-730
Adult criminal convictions	0	7	75
Mental health			
Depression	158	142	339
Anxiety diagnosis	23	67	149
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,231	456	1,687
Enrolled in postsecondary education	834	186	950
Obtained four-year college degree	16,644	5,390	18,674
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-86	92	5
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	3,106	1,907	6,144
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced[a]	1,814	0	1,814
Total	**44,472**	**18,469**	**64,171**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.13. Net benefits of delaying sexual activity until marriage

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	-133	-120	-279
Unintended pregnancy in adulthood	20	98	197
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	0	0
Diagnosed with another STI	0	1	2
Substance use			
Underage drinking	920	338	1,438
Tobacco use (at any age)	13,285	5,959	20,929
Substance use disorder	1,058	637	1,877
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	15	38
Adult criminal convictions	0	58	618
Mental health			
Depression	0	0	0
Anxiety diagnosis	20	57	127
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	-1,101	-408	-1,509
Enrolled in postsecondary education	1,081	242	1,231
Obtained four-year college degree	-881	-285	-988
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-58	62	4
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	3,498	2,148	6,917
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	29	0	29
Total	**17,737**	**8,803**	**30,631**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. No benefits were included when using the more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

Table B.14. Net benefits of delaying sexual activity until marriage, males

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	-832	-751	-1,752
Unintended pregnancy in adulthood	-50	-246	-492
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	0	0	0
Diagnosed with another STI	0	1	3
Substance use			
Underage drinking	365	134	571
Tobacco use (at any age)	8,350	3,746	13,155
Substance use disorder	-83	-50	-148
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	-91	-230
Adult criminal convictions	0	162	1,722
Mental health			
Depression	-55	-49	-118
Anxiety diagnosis	-17	-49	-110
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	-988	-221	-1,126
Enrolled in postsecondary education	-2,114	-684	-2,371
Obtained four-year college degree	0	0	0
Adult earnings	36	-38	-2
Adult receipt of public assistance	-988	-221	-1,126
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	-391	-240	-774
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	44	0	44
Total	**-1,952**	**-682**	**-150**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. No benefits were included when using the more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

Table B.15. Net benefits of delaying sexual activity until marriage, females

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	578	522	1,219
Unintended pregnancy in adulthood	89	440	881
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	307	1,137	3,072
Diagnosed with another STI	0	0	0
Substance use			
Underage drinking	1,479	544	2,312
Tobacco use (at any age)	18,219	8,173	28,703
Substance use disorder	2,226	1,341	3,951
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	114	288
Adult criminal convictions	0	-44	-468
Mental health			
Depression	55	49	118
Anxiety diagnosis	55	162	359
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	4,017	1,488	5,504
Enrolled in postsecondary education	3,150	704	3,588
Obtained four-year college degree	528	171	593
Adult earnings	0	0	0
Adult receipt of public assistance	-156	166	10
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	7,363	4,521	14,563
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	15	0	15
Total	**37,925**	**19,488**	**64,707**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. No benefits were included when using the more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

Table B.16. Net benefits of delaying sexual activity until age 18, excluding individuals who became or got someone pregnant as a teen

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	0	0	0
Unintended pregnancy in adulthood	26	129	257
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-95	-350	-945
Diagnosed with another STI	1	3	7
Substance use			
Underage drinking	424	156	663
Tobacco use (at any age)	10,248	4,597	16,145
Substance use disorder	1,447	871	2,568
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	198	499
Adult criminal convictions	0	107	1,142
Mental health			
Depression	48	43	103
Anxiety diagnosis	8	24	53
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	648	240	888
Enrolled in postsecondary education	-1,050	-235	-1,196
Obtained four-year college degree	2,114	684	2,371
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	11	-12	-1
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,347	1,441	4,642
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	870	0	870
Total	**17,048**	**7,898**	**28,067**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. No benefits were included when using the more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

Table B.17. Net benefits of delaying sexual activity until age 18, males, excluding those who got someone pregnant as a teen

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	0	0	0
Unintended pregnancy in adulthood	20	101	202
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	47	175	473
Diagnosed with another STI	0	1	2
Substance use			
Underage drinking	471	173	736
Tobacco use (at any age)	8,882	3,984	13,992
Substance use disorder	1,503	905	2,667
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	335	845
Adult criminal convictions	0	158	1,685
Mental health			
Depression	199	179	427
Anxiety diagnosis	5	16	35
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	1,296	480	1,776
Enrolled in postsecondary education	-432	-97	-492
Obtained four-year college degree	1,585	513	1,778
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	-53	56	3
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	1,565	961	3,095
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced[a]	1,018	0	1,018
Total	**16,105**	**7,941**	**28,241**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Table B.18. Net benefits of delaying sexual activity until age 18, females, excluding those who became pregnant as a teen

Ingredient	Perspective		
	Individual adolescents	Taxpayers	Society
Pregnancy and childbearing			
Teen pregnancy	0	0	0
Unintended pregnancy in adulthood	31	156	312
Childbearing before marriage	n/a	n/a	n/a
Physical health			
Diagnosed with HIV	-260	-962	-2,599
Diagnosed with another STI[a]	1	5	13
Substance use			
Underage drinking	382	141	598
Tobacco use (at any age)	11,615	5,210	18,298
Substance use disorder	1,419	855	2,519
Delinquent behavior and criminal activity			
Youth involvement in justice system (other than for substance use)	0	76	192
Adult criminal convictions	0	58	618
Mental health			
Depression	-103	-93	-221
Anxiety diagnosis	11	34	74
Stress level	n/a	n/a	n/a
Path to economic self-sufficiency			
Graduated from high school	0	0	0
Enrolled in postsecondary education	-741	-166	-844
Obtained four-year college degree	3,875	1,255	4,347
Adult earnings	n/a	n/a	n/a
Adult receipt of public assistance	33	-35	-2
Relationships			
Number of serious relationships	n/a	n/a	n/a
Relationship satisfaction	n/a	n/a	n/a
Intimate partner violence	2,301	1,413	4,551
Ever cohabited (outside of marriage)	n/a	n/a	n/a
Ever married	n/a	n/a	n/a
Ever divorced	398	0	398
Total	**18,964**	**7,946**	**28,253**

Note: All values are in 2018 dollars and are based on the team's less stringent estimation approach. Benefits marked with a superscript remain included under the team's more stringent estimation approach.

n/a = not available; STI = sexually transmitted infection.

[a] Benefit remains included when using more stringent estimation approach.

Appendix C:

Estimates of the Relationship Between Delayed Sexual Activity and Individual Ingredients

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This appendix shows the SSAvER team's estimates of the relationship between delayed sexual activity and each ingredient in the economic analysis using the four different analytic methods described in Chapter II. As described in Chapter II, the team estimated these relationships separately by gender (males and females) and for five alternative age cutoffs (age 15 or later, age 18 or later, age 20 or later, age 22 or later, and age at first marriage). Tables C.1 to C.5 show the SSAvER team's estimates of the relationship between delayed sexual activity and each ingredient for the five alternative age cutoffs (males and females combined). Tables C.6 through C.15 show comparable estimates separately for males and females.

Table C.1. Impacts of delaying sexual activity until age 15

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.091***	-0.192**	n/a	n/a	-0.125
		(0.000)	(0.042)			
	Unintended pregnancy in adulthood	-0.076***	-0.083	n/a	n/a	-0.078
		(0.001)	(0.454)			
	Childbearing before marriage	-0.087***	-0.129	n/a	n/a	-0.101
		(0.001)	(0.293)			
STIs	Diagnosed with HIV	0.001	0.011	n/a	n/a	0.004
		(0.802)	(0.690)			
	Diagnosed with another STI	-0.061***	-0.070	n/a	n/a	-0.064
		(0.000)	(0.320)			
Substance use	Underage drinking	-0.043**	-0.026	n/a	n/a	-0.037
		(0.022)	(0.773)			
	Tobacco use (at any age)	-0.151***	-0.166*	n/a	n/a	-0.156
		(0.000)	(0.069)			
	Substance use disorder	-0.094***	0.094	n/a	n/a	-0.031
		(0.000)	(0.204)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.040***	-0.068	n/a	n/a	-0.049
		(0.004)	(0.101)			
	Adult criminal convictions	-0.055***	-0.077	n/a	n/a	-0.062
		(0.001)	(0.299)			
Mental health	Depression	-0.019	-0.051	n/a	n/a	-0.030
		(0.421)	(0.588)			
	Anxiety diagnosis	0.002	-0.053	n/a	n/a	-0.016
		(0.895)	(0.406)			
	Stress level	0.017	-0.099	n/a	n/a	-0.022
		(0.610)	(0.513)			
Path to economic self-sufficiency	Graduated from high school	0.020	0.050	n/a	n/a	0.030
		(0.170)	(0.356)			
	Enrolled in postsecondary education	0.008	-0.017	n/a	n/a	-0.000
		(0.716)	(0.829)			
	Obtained four-year college degree	0.081***	0.023	n/a	n/a	0.062
		(0.000)	(0.767)			
	Adult earnings	3,004**	3,977	n/a	n/a	3,329
		(0.022)	(0.398)			
	Adult receipt of public assistance	-0.012	-0.088	n/a	n/a	-0.037
		(0.581)	(0.256)			
Relationship quality and stability	Number of serious relationships	-1.061**	-0.121	n/a	n/a	-0.522
		(0.024)	(0.763)			
	Relationship satisfaction	0.049	0.020	n/a	n/a	0.039
		(0.200)	(0.923)			
	Intimate partner violence	-0.078***	0.004	n/a	n/a	-0.051
		(0.002)	(0.972)			
	Ever cohabited (outside of marriage)	-0.075***	0.036	n/a	n/a	-0.038
		(0.000)	(0.689)			
	Ever married	0.031	-0.072	n/a	n/a	-0.003
		(0.196)	(0.475)			
	Ever divorced	-0.005	0.007	n/a	n/a	-0.001
		(0.760)	(0.924)			

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact p-values listed in parentheses.

IV = instrumental variable; STI = sexually transmitted infection; n/a = not available.

Table C.2. Impacts of delaying sexual activity until age 18

Domain	Ingredient	Impact estimate				Average
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.106***	-0.084	n/a	n/a	-0.099
		(0.000)	(0.206)			
	Unintended pregnancy in adulthood	-0.076***	-0.033	n/a	n/a	-0.062
		(0.000)	(0.706)			
	Childbearing before marriage	-0.089***	-0.088	n/a	n/a	-0.089
		(0.000)	(0.238)			
STIs	Diagnosed with HIV	0.002	0.002	-0.007	n/a	0.001
		(0.535)	(0.845)	(0.763)		
	Diagnosed with another STI	-0.034***	-0.041	-0.089*	n/a	-0.048
		(0.000)	(0.380)	(0.086)		
Substance use	Underage drinking	-0.105***	-0.038	n/a	n/a	-0.083
		(0.000)	(0.620)			
	Tobacco use (at any age)	-0.190***	-0.027	n/a	n/a	-0.136
		(0.000)	(0.776)			
	Substance use disorder	-0.044***	-0.006	n/a	n/a	-0.031
		(0.009)	(0.928)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.041***	-0.017	-0.061	n/a	-0.034
		(0.000)	(0.601)	(0.308)		
	Adult criminal convictions	-0.072***	-0.028	-0.093	n/a	-0.062
		(0.000)	(0.599)	(0.178)		
Mental health	Depression	-0.027	0.002	n/a	n/a	-0.017
		(0.199)	(0.973)			
	Anxiety diagnosis	-0.024*	-0.028	n/a	n/a	-0.025
		(0.092)	(0.570)			
	Stress level	-0.013	-0.093	n/a	n/a	-0.040
		(0.660)	(0.442)			
Path to economic self-sufficiency	Graduated from high school	0.016*	0.031	-0.055	n/a	0.017
		(0.089)	(0.297)	(0.447)		
	Enrolled in postsecondary education	0.001	0.022	-0.250***	n/a	-0.023
		(0.962)	(0.672)	(0.006)		
	Obtained four-year college degree	0.059***	0.058	-0.062	n/a	0.035
		(0.002)	(0.363)	(0.442)		
	Adult earnings	183	-722	-6,360	n/a	-743
		(0.898)	(0.872)	(0.524)		
	Adult receipt of public assistance	-0.068***	-0.078	0.152	n/a	-0.044
		(0.000)	(0.165)	(0.118)		
Relationships	Number of serious relationships	-0.585***	-0.755	-0.725	n/a	-0.661
		(0.000)	(0.268)	(0.205)		
	Relationship satisfaction	0.000	0.013	0.492***	n/a	0.111
		(0.996)	(0.932)	(0.006)		
	Intimate partner violence	-0.102***	-0.006	-0.365***	n/a	-0.139
		(0.000)	(0.954)	(0.001)		
	Ever cohabited (outside of marriage)	-0.124***	-0.107	-0.077	n/a	-0.110
		(0.000)	(0.139)	(0.410)		
	Ever married	-0.053**	-0.064	-0.276***	n/a	-0.103
		(0.016)	(0.454)	(0.007)		
	Ever divorced	-0.040***	0.009	-0.096*	n/a	-0.039
		(0.001)	(0.848)	(0.083)		

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact p-values listed in parentheses.

IV = instrumental variable; STI = sexually transmitted infection; n/a = not available.

Table C.3. Impacts of delaying sexual activity until age 20

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.126*** (0.000)	-0.075 (0.217)	n/a	n/a	-0.109
	Unintended pregnancy in adulthood	-0.107*** (0.000)	-0.105 (0.278)	n/a	n/a	-0.106
	Childbearing before marriage	-0.109*** (0.000)	-0.080 (0.306)	n/a	n/a	-0.099
STIs	Diagnosed with HIV	-0.002 (0.765)	0.004 (0.755)	n/a	n/a	-0.000
	Diagnosed with another STI	-0.045*** (0.000)	-0.000 (0.994)	n/a	n/a	-0.030
Substance use	Underage drinking	-0.173*** (0.000)	-0.286*** (0.004)	n/a	n/a	-0.211
	Tobacco use (at any age)	-0.235*** (0.000)	-0.091 (0.387)	n/a	n/a	-0.187
	Substance use disorder	-0.043*** (0.009)	-0.041 (0.583)	n/a	n/a	-0.042
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.030*** (0.000)	-0.029 (0.512)	n/a	n/a	-0.030
	Adult criminal convictions	-0.048*** (0.000)	-0.037 (0.525)	n/a	n/a	-0.044
Mental health	Depression	-0.046 (0.104)	0.015 (0.850)	n/a	n/a	-0.026
	Anxiety diagnosis	0.007 (0.714)	-0.031 (0.598)	n/a	n/a	-0.006
	Stress level	-0.032 (0.519)	0.008 (0.954)	n/a	n/a	-0.019
Path to economic self-sufficiency	Graduated from high school	0.003 (0.747)	0.013 (0.652)	n/a	n/a	0.006
	Enrolled in postsecondary education	0.020 (0.281)	0.024 (0.684)	n/a	n/a	0.021
	Obtained four-year college degree	0.118*** (0.000)	0.156* (0.059)	n/a	n/a	0.131
	Adult earnings	-645 (0.760)	-1,395 (0.797)	n/a	n/a	-895
	Adult receipt of public assistance	-0.047** (0.034)	-0.069 (0.336)	n/a	n/a	-0.054
Relationship quality and stability	Number of serious relationships	-0.401** (0.040)	-0.318 (0.356)	n/a	n/a	-0.373
	Relationship satisfaction	0.042 (0.333)	0.131 (0.465)	n/a	n/a	0.072
	Intimate partner violence	-0.159*** (0.000)	-0.069 (0.537)	n/a	n/a	-0.129
	Ever cohabited (outside of marriage)	-0.231*** (0.000)	-0.295*** (0.007)	n/a	n/a	-0.252
	Ever married	-0.122*** (0.000)	-0.151 (0.102)	n/a	n/a	-0.132
	Ever divorced	-0.038*** (0.004)	-0.067 (0.263)	n/a	n/a	-0.048

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact p-values listed in parentheses.

IV = instrumental variable; STI = sexually transmitted infection; n/a = not available.

Table C.4. Impacts of delaying sexual activity until age 22

Domain	Ingredient	Impact estimate: Propensity score matching	Impact estimate: Sibling model	Impact estimate: IV1 (puberty)	Impact estimate: IV2 (policy)	Estimate for costing
Pregnancy and childbearing	Teen pregnancy	-0.086*** (0.000)	-0.003 (0.966)	n/a	n/a	-0.058
	Unintended pregnancy in adulthood	-0.140*** (0.000)	-0.115 (0.241)	n/a	n/a	-0.132
	Childbearing before marriage	-0.158*** (0.000)	-0.005 (0.939)	n/a	n/a	-0.107
STIs	Diagnosed with HIV	-0.007 (0.391)	0.002 (0.782)	n/a	n/a	-0.003
	Diagnosed with another STI	-0.033*** (0.004)	-0.003 (0.944)	n/a	n/a	-0.023
Substance use	Underage drinking	-0.224*** (0.000)	-0.299*** (0.007)	n/a	n/a	-0.249
	Tobacco use (at any age)	-0.206*** (0.000)	-0.142 (0.215)	n/a	n/a	-0.185
	Substance use disorder	-0.053*** (0.009)	0.000 (0.999)	n/a	n/a	-0.035
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.025*** (0.001)	0.000 (0.999)	n/a	n/a	-0.017
	Adult criminal convictions	-0.049*** (0.001)	0.005 (0.940)	n/a	n/a	-0.031
Mental health	Depression	-0.002 (0.960)	0.026 (0.772)	n/a	n/a	0.007
	Anxiety diagnosis	0.002 (0.938)	-0.022 (0.754)	n/a	n/a	-0.006
	Stress level	-0.028 (0.534)	-0.034 (0.805)	n/a	n/a	-0.030
Path to economic self-sufficiency	Graduated from high school	0.019* (0.065)	0.020 (0.511)	n/a	n/a	0.019
	Enrolled in postsecondary education	-0.036** (0.047)	0.084 (0.122)	n/a	n/a	0.004
	Obtained four-year college degree	0.131*** (0.000)	0.152* (0.098)	n/a	n/a	0.138
	Adult earnings	-4,970** (0.016)	-543 (0.920)	n/a	n/a	-3,494
	Adult receipt of public assistance	-0.013 (0.546)	-0.029 (0.681)	n/a	n/a	-0.018
Relationship quality and stability	Number of serious relationships	-0.544** (0.035)	-0.048 (0.916)	n/a	n/a	-0.379
	Relationship satisfaction	-0.042 (0.407)	0.184 (0.412)	n/a	n/a	0.033
	Intimate partner violence	-0.144*** (0.000)	-0.073 (0.496)	n/a	n/a	-0.120
	Ever cohabited (outside of marriage)	-0.244*** (0.000)	-0.206* (0.099)	n/a	n/a	-0.231
	Ever married	-0.253*** (0.000)	-0.151 (0.157)	n/a	n/a	-0.219
	Ever divorced	-0.080*** (0.000)	-0.036 (0.615)	n/a	n/a	-0.065

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact p-values listed in parentheses.

IV = instrumental variable; STI = sexually transmitted infection; n/a = not available.

Table C.5. Impacts of delaying sexual activity until marriage

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.122 (0.209)	0.101 (0.829)	n/a	n/a	-0.048
	Unintended pregnancy in adulthood	-0.161 (0.150)	-0.161 (0.602)	n/a	n/a	-0.161
	Childbearing before marriage	-0.192* (0.072)	-0.173 (0.656)	n/a	n/a	-0.186
STIs	Diagnosed with HIV	-0.025 (0.323)	0.011 (0.874)	n/a	n/a	-0.013
	Diagnosed with another STI	-0.064 (0.108)	0.118 (0.559)	n/a	n/a	-0.003
Substance use	Underage drinking	-0.246** (0.013)	-0.563* (0.082)	n/a	n/a	-0.352
	Tobacco use (at any age)	-0.122 (0.202)	-0.475 (0.407)	n/a	n/a	-0.240
	Substance use disorder	0.018 (0.561)	-0.275 (0.402)	n/a	n/a	-0.080
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.015 (0.604)	-0.016 (0.913)	n/a	n/a	-0.015
	Adult criminal convictions	-0.003 (0.309)	0.082 (0.502)	n/a	n/a	0.025
Mental health	Depression	0.002 (0.985)	-0.029 (0.935)	n/a	n/a	-0.008
	Anxiety diagnosis	0.043 (0.525)	-0.333 (0.271)	n/a	n/a	-0.082
	Stress level	-0.018 (0.897)	-0.087 (0.831)	n/a	n/a	-0.041
Path to economic self-sufficiency	Graduated from high school	0.049 (0.401)	0.089 (0.651)	n/a	n/a	0.062
	Enrolled in postsecondary education	0.062 (0.490)	0.181 (0.442)	n/a	n/a	0.102
	Obtained four-year college degree	0.080 (0.387)	-0.143 (0.511)	n/a	n/a	0.006
	Adult earnings	1,030 (0.870)	3,575 (0.862)	n/a	n/a	1,879
	Adult receipt of public assistance	-0.039 (0.640)	-0.089 (0.847)	n/a	n/a	-0.056
Relationship quality and stability	Number of serious relationships	-0.109 (0.817)	0.149 (0.912)	n/a	n/a	-0.023
	Relationship satisfaction	0.115 (0.437)	0.014 (0.982)	n/a	n/a	0.081
	Intimate partner violence	-0.332*** (0.000)	-0.295 (0.541)	n/a	n/a	-0.320
	Ever cohabited (outside of marriage)	0.060 (0.523)	-0.054 (0.805)	n/a	n/a	0.022
	Ever married	0.268*** (0.001)	0.043 (0.919)	n/a	n/a	0.193
	Ever divorced	0.052 (0.507)	-0.106 (0.720)	n/a	n/a	-0.001

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact p-values listed in parentheses.

IV = instrumental variable; STI = sexually transmitted infection; n/a = not available.

Table C.6. Impacts of delaying sexual activity until age 15, males

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.060**	-0.139*	n/a	n/a	-0.086
		(0.014)	(0.100)			
	Unintended pregnancy in adulthood	-0.041	-0.093	n/a	n/a	-0.058
		(0.169)	(0.557)			
	Childbearing before marriage	-0.049	-0.010	n/a	n/a	-0.036
		(0.187)	(0.942)			
STIs	Diagnosed with HIV	0.005	-0.003	n/a	n/a	0.002
		(0.449)	(0.883)			
	Diagnosed with another STI	-0.037**	0.066	n/a	n/a	-0.003
		(0.031)	(0.455)			
Substance use	Underage drinking	-0.093***	-0.068	n/a	n/a	-0.085
		(0.000)	(0.615)			
	Tobacco use (at any age)	-0.134***	-0.058	n/a	n/a	-0.109
		(0.000)	(0.557)			
	Substance use disorder	-0.129***	0.139	n/a	n/a	-0.040
		(0.000)	(0.166)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.079***	-0.119	n/a	n/a	-0.092
		(0.002)	(0.106)			
	Adult criminal convictions	-0.082***	-0.010	n/a	n/a	-0.058
		(0.003)	(0.930)			
Mental health	Depression	0.044	-0.057	n/a	n/a	0.010
		(0.194)	(0.682)			
	Anxiety diagnosis	0.024	-0.043	n/a	n/a	0.002
		(0.112)	(0.594)			
	Stress level	0.046	-0.034	n/a	n/a	0.019
		(0.306)	(0.847)			
Path to economic self-sufficiency	Graduated from high school	-0.001	0.043	n/a	n/a	0.014
		(0.959)	(0.560)			
	Enrolled in postsecondary education	-0.010	-0.109	n/a	n/a	-0.043
		(0.755)	(0.279)			
	Obtained four-year college degree	0.115***	-0.003	n/a	n/a	0.076
		(0.000)	(0.977)			
	Adult earnings	1,835	3,034	n/a	n/a	2,235
		(0.387)	(0.684)			
	Adult receipt of public assistance	0.014	0.032	n/a	n/a	0.020
		(0.607)	(0.750)			
Relationship quality and stability	Number of serious relationships	-1.599*	-0.151	n/a	n/a	-0.634
		(0.086)	(0.808)			
	Relationship satisfaction	0.040	0.076	n/a	n/a	0.052
		(0.415)	(0.732)			
	Intimate partner violence	-0.030	0.047	n/a	n/a	-0.004
		(0.403)	(0.747)			
	Ever cohabited (outside of marriage)	-0.089***	0.030	n/a	n/a	-0.049
		(0.000)	(0.798)			
	Ever married	0.077**	-0.165	n/a	n/a	-0.004
		(0.035)	(0.183)			
	Ever divorced	-0.002	-0.026	n/a	n/a	-0.010
		(0.889)	(0.812)			

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.7. Impacts of delaying sexual activity until age 15, females

Domain	Ingredient	Impact estimate: Propensity score matching	Impact estimate: Sibling model	Impact estimate: IV1 (puberty)	Impact estimate: IV2 (policy)	Estimate for costing
Pregnancy and childbearing	Teen pregnancy	-0.121***	-0.245	n/a	n/a	-0.162
		(0.000)	(0.146)			
	Unintended pregnancy in adulthood	-0.112***	-0.074	n/a	n/a	-0.099
		(0.002)	(0.638)			
	Childbearing before marriage	-0.125***	-0.247	n/a	n/a	-0.166
		(0.001)	(0.215)			
STIs	Diagnosed with HIV	-0.003	0.025	-0.011	n/a	-0.004
		(0.622)	(0.621)	(0.606)		
	Diagnosed with another STI	-0.085***	-0.207*	-0.168**	n/a	-0.133
		(0.003)	(0.061)	(0.024)		
Substance use	Underage drinking	0.008	0.016	n/a	n/a	0.011
		(0.773)	(0.894)			
	Tobacco use (at any age)	-0.168***	-0.274*	n/a	n/a	-0.203
		(0.000)	(0.073)			
	Substance use disorder	-0.059**	0.048	n/a	n/a	-0.023
		(0.049)	(0.655)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.002	-0.016	-0.011	n/a	-0.008
		(0.890)	(0.666)	(0.765)		
	Adult criminal convictions	-0.029	-0.144	-0.041	n/a	-0.049
		(0.104)	(0.119)	(0.463)		
Mental health	Depression	-0.083**	-0.045	n/a	n/a	-0.070
		(0.017)	(0.723)			
	Anxiety diagnosis	-0.020	-0.063	n/a	n/a	-0.034
		(0.434)	(0.523)			
	Stress level	-0.012	-0.164	n/a	n/a	-0.063
		(0.814)	(0.504)			
Path to economic self-sufficiency	Graduated from high school	0.042*	0.056	0.105	n/a	0.059
		(0.083)	(0.470)	(0.242)		
	Enrolled in postsecondary education	0.026	0.076	-0.072	n/a	0.014
		(0.367)	(0.514)	(0.541)		
	Obtained four-year college degree	0.046*	0.048	0.028	n/a	0.042
		(0.057)	(0.685)	(0.797)		
	Adult earnings	4,174***	4,920	-10,482	n/a	3,413
		(0.007)	(0.392)	(0.447)		
	Adult receipt of public assistance	-0.037	-0.207*	0.173	n/a	-0.032
		(0.271)	(0.075)	(0.154)		
Relationship quality and stability	Number of serious relationships	-0.522***	-0.091	-1.253**	n/a	-0.534
		(0.000)	(0.858)	(0.048)		
	Relationship satisfaction	0.057	-0.036	0.387*	n/a	0.166
		(0.322)	(0.916)	(0.059)		
	Intimate partner violence	-0.126***	-0.038	-0.370***	n/a	-0.200
		(0.000)	(0.852)	(0.004)		
	Ever cohabited (outside of marriage)	-0.061***	0.043	-0.020	n/a	-0.029
		(0.005)	(0.758)	(0.852)		
	Ever married	-0.015	0.021	-0.058	n/a	-0.020
		(0.612)	(0.893)	(0.670)		
	Ever divorced	-0.007	0.039	0.007	n/a	0.006
		(0.784)	(0.664)	(0.925)		

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.8. Impacts of delaying sexual activity until age 18, males

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.070***	-0.049	n/a	n/a	-0.063
		(0.000)	(0.386)			
	Unintended pregnancy in adulthood	-0.076***	-0.013	n/a	n/a	-0.055
		(0.000)	(0.910)			
	Childbearing before marriage	-0.079***	-0.061	n/a	n/a	-0.073
		(0.000)	(0.542)			
STIs	Diagnosed with HIV	0.003	0.005	-0.022	n/a	0.002
		(0.362)	(0.799)	(0.580)		
	Diagnosed with another STI	-0.016*	-0.016	0.018	n/a	-0.011
		(0.069)	(0.732)	(0.807)		
Substance use	Underage drinking	-0.122***	-0.085	n/a	n/a	-0.110
		(0.000)	(0.341)			
	Tobacco use (at any age)	-0.156***	0.002	n/a	n/a	-0.103
		(0.000)	(0.986)			
	Substance use disorder	-0.053*	-0.011	n/a	n/a	-0.039
		(0.072)	(0.914)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.063***	-0.026	-0.110	n/a	-0.052
		(0.000)	(0.628)	(0.334)		
	Adult criminal convictions	-0.098***	-0.028	-0.158	n/a	-0.084
		(0.000)	(0.750)	(0.216)		
Mental health	Depression	0.005	0.013	n/a	n/a	0.008
		(0.861)	(0.884)			
	Anxiety diagnosis	-0.010	-0.052	n/a	n/a	-0.024
		(0.488)	(0.344)			
	Stress level	-0.007	-0.105	n/a	n/a	-0.040
		(0.861)	(0.509)			
Path to economic self-sufficiency	Graduated from high school	0.005	0.032	-0.193*	n/a	0.011
		(0.658)	(0.312)	(0.093)		
	Enrolled in postsecondary education	-0.020	0.063	-0.370***	n/a	-0.013
		(0.323)	(0.295)	(0.007)		
	Obtained four-year college degree	0.059**	0.074	-0.123	n/a	0.033
		(0.011)	(0.376)	(0.288)		
	Adult earnings	-2,005	-1,684	-555	n/a	-1,751
		(0.209)	(0.815)	(0.972)		
	Adult receipt of public assistance	-0.049**	-0.052	0.178	n/a	-0.037
		(0.047)	(0.352)	(0.240)		
Relationship quality and stability	Number of serious relationships	-0.759***	-1.348	-0.271	n/a	-0.715
		(0.002)	(0.310)	(0.790)		
	Relationship satisfaction	-0.020	0.116	0.637**	n/a	0.121
		(0.604)	(0.524)	(0.029)		
	Intimate partner violence	-0.064**	0.055	-0.318*	n/a	-0.056
		(0.042)	(0.598)	(0.062)		
	Ever cohabited (outside of marriage)	-0.130***	-0.085	-0.093	n/a	-0.109
		(0.000)	(0.388)	(0.540)		
	Ever married	-0.059*	-0.085	-0.440***	n/a	-0.130
		(0.091)	(0.446)	(0.006)		
	Ever divorced	-0.035***	-0.030	-0.199**	n/a	-0.062
		(0.007)	(0.627)	(0.017)		

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.9. Impacts of delaying sexual activity until age 18, females

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.142*** (0.000)	-0.118 (0.322)	n/a	n/a	-0.134
	Unintended pregnancy in adulthood	-0.076*** (0.005)	-0.053 (0.691)	n/a	n/a	-0.068
	Childbearing before marriage	-0.099*** (0.001)	-0.116 (0.299)	n/a	n/a	-0.105
STIs	Diagnosed with HIV	-0.000 (0.908)	-0.001 (0.937)	0.008 (0.751)	n/a	-0.000
	Diagnosed with another STI	-0.052*** (0.001)	-0.065 (0.415)	-0.195*** (0.006)	n/a	-0.095
Substance use	Underage drinking	-0.088*** (0.001)	0.009 (0.946)	n/a	n/a	-0.056
	Tobacco use (at any age)	-0.224*** (0.000)	-0.057 (0.703)	n/a	n/a	-0.168
	Substance use disorder	-0.036** (0.028)	-0.001 (0.993)	n/a	n/a	-0.024
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.018 (0.157)	-0.008 (0.828)	-0.013 (0.735)	n/a	-0.014
	Adult criminal convictions	-0.045*** (0.009)	-0.028 (0.636)	-0.029 (0.581)	n/a	-0.037
Mental health	Depression	-0.060** (0.047)	-0.008 (0.941)	n/a	n/a	-0.043
	Anxiety diagnosis	-0.037 (0.120)	-0.004 (0.958)	n/a	n/a	-0.026
	Stress level	-0.019 (0.665)	-0.081 (0.657)	n/a	n/a	-0.040
Path to economic self-sufficiency	Graduated from high school	0.026* (0.077)	0.030 (0.551)	0.083 (0.340)	n/a	0.034
	Enrolled in postsecondary education	0.021 (0.335)	-0.019 (0.825)	-0.130 (0.256)	n/a	-0.019
	Obtained four-year college degree	0.058** (0.043)	0.042 (0.664)	-0.000 (0.999)	n/a	0.041
	Adult earnings	2,371 (0.320)	241 (0.964)	-12,165 (0.299)	n/a	240
	Adult receipt of public assistance	-0.087*** (0.003)	-0.104 (0.285)	0.126 (0.292)	n/a	-0.050
Relationship quality and stability	Number of serious relationships	-0.411*** (0.000)	-0.162 (0.597)	-1.179** (0.021)	n/a	-0.420
	Relationship satisfaction	0.021 (0.701)	-0.089 (0.728)	0.347* (0.087)	n/a	0.100
	Intimate partner violence	-0.140*** (0.000)	-0.067 (0.706)	-0.413*** (0.002)	n/a	-0.214
	Ever cohabited (outside of marriage)	-0.119*** (0.001)	-0.129 (0.222)	-0.061 (0.572)	n/a	-0.107
	Ever married	-0.047* (0.076)	-0.043 (0.741)	-0.113 (0.357)	n/a	-0.063
	Ever divorced	-0.046** (0.019)	0.049 (0.529)	0.006 (0.929)	n/a	-0.010

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.10. Impacts of delaying sexual activity until age 20, males

Domain	Ingredient	Impact estimate: Propensity score matching	Impact estimate: Sibling model	Impact estimate: IV1 (puberty)	Impact estimate: IV2 (policy)	Estimate for costing
Pregnancy and childbearing	Teen pregnancy	-0.084*** (0.000)	-0.021 (0.765)	n/a	n/a	-0.063
	Unintended pregnancy in adulthood	-0.084*** (0.006)	-0.120 (0.278)	n/a	n/a	-0.096
	Childbearing before marriage	-0.092*** (0.000)	-0.023 (0.836)	n/a	n/a	-0.069
STIs	Diagnosed with HIV	0.002 (0.572)	0.002 (0.912)	n/a	n/a	0.002
	Diagnosed with another STI	-0.015 (0.270)	0.001 (0.989)	n/a	n/a	-0.010
Substance use	Underage drinking	-0.199*** (0.000)	-0.326*** (0.008)	n/a	n/a	-0.241
	Tobacco use (at any age)	-0.276*** (0.000)	-0.105 (0.500)	n/a	n/a	-0.219
	Substance use disorder	-0.047* (0.086)	-0.013 (0.917)	n/a	n/a	-0.036
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.045*** (0.000)	-0.061 (0.418)	n/a	n/a	-0.050
	Adult criminal convictions	-0.068*** (0.002)	-0.029 (0.765)	n/a	n/a	-0.055
Mental health	Depression	0.004 (0.892)	0.080 (0.367)	n/a	n/a	0.029
	Anxiety diagnosis	0.020 (0.354)	0.005 (0.953)	n/a	n/a	0.015
	Stress level	0.025 (0.704)	-0.005 (0.982)	n/a	n/a	0.015
Path to economic self-sufficiency	Graduated from high school	0.015 (0.291)	0.025 (0.638)	n/a	n/a	0.018
	Enrolled in postsecondary education	0.003 (0.914)	0.011 (0.909)	n/a	n/a	0.006
	Obtained four-year college degree	0.092** (0.023)	0.136 (0.180)	n/a	n/a	0.107
	Adult earnings	-4,194 (0.222)	-6,089 (0.473)	n/a	n/a	-4,826
	Adult receipt of public assistance	-0.023 (0.437)	-0.088 (0.251)	n/a	n/a	-0.045
Relationship quality and stability	Number of serious relationships	-0.476 (0.178)	-0.046 (0.938)	n/a	n/a	-0.333
	Relationship satisfaction	0.084 (0.145)	0.148 (0.549)	n/a	n/a	0.105
	Intimate partner violence	-0.171*** (0.000)	-0.036 (0.831)	n/a	n/a	-0.126
	Ever cohabited (outside of marriage)	-0.201*** (0.000)	-0.239 (0.147)	n/a	n/a	-0.214
	Ever married	-0.050 (0.210)	-0.223* (0.097)	n/a	n/a	-0.108
	Ever divorced	-0.039** (0.030)	-0.026 (0.767)	n/a	n/a	-0.035

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.11. Impacts of delaying sexual activity until age 20, females

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.169***	-0.130	n/a	n/a	-0.156
		(0.000)	(0.195)			
	Unintended pregnancy in adulthood	-0.130***	-0.089	n/a	n/a	-0.116
		(0.000)	(0.571)			
	Childbearing before marriage	-0.125***	-0.137	n/a	n/a	-0.129
		(0.000)	(0.213)			
STIs	Diagnosed with HIV	-0.005	0.005	n/a	n/a	-0.000
		(0.580)	(0.612)			
	Diagnosed with another STI	-0.075***	-0.002	n/a	n/a	-0.051
		(0.000)	(0.987)			
Substance use	Underage drinking	-0.147***	-0.246	n/a	0.893**	-0.135
		(0.000)	(0.109)		(0.042)	
	Tobacco use (at any age)	-0.194***	-0.077	n/a	-0.833*	-0.169
		(0.000)	(0.586)		(0.066)	
	Substance use disorder	-0.039**	-0.068	n/a	0.314	-0.034
		(0.029)	(0.404)		(0.196)	
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.014	0.002	n/a	0.134	0.003
		(0.212)	(0.964)		(0.285)	
	Adult criminal convictions	-0.028**	-0.044	n/a	0.234	-0.021
		(0.037)	(0.474)		(0.192)	
Mental health	Depression	-0.096**	-0.050	n/a	-0.063	-0.074
		(0.037)	(0.699)		(0.842)	
	Anxiety diagnosis	-0.007	-0.066	n/a	-0.181	-0.042
		(0.817)	(0.427)		(0.498)	
	Stress level	-0.090	0.021	n/a	-0.597	-0.071
		(0.235)	(0.902)		(0.187)	
Path to economic self-sufficiency	Graduated from high school	-0.009	0.002	n/a	0.037	-0.003
		(0.315)	(0.934)		(0.839)	
	Enrolled in postsecondary education	0.037	0.037	n/a	0.308	0.044
		(0.156)	(0.583)		(0.301)	
	Obtained four-year college degree	0.144***	0.176	n/a	0.608	0.178
		(0.002)	(0.175)		(0.151)	
	Adult earnings	2,904	3,299	n/a	61,679**	4,701
		(0.243)	(0.626)		(0.028)	
	Adult receipt of public assistance	-0.071**	-0.050	n/a	-1.170**	-0.097
		(0.031)	(0.678)		(0.011)	
Relationship quality and stability	Number of serious relationships	-0.325**	-0.589*	n/a	1.438	-0.412
		(0.045)	(0.096)		(0.376)	
	Relationship satisfaction	-0.001	0.113	n/a	-0.376	0.006
		(0.988)	(0.661)		(0.458)	
	Intimate partner violence	-0.147***	-0.102	n/a	-0.080	-0.123
		(0.000)	(0.485)		(0.801)	
	Ever cohabited (outside of marriage)	-0.261***	-0.351**	n/a	-0.164	-0.297
		(0.000)	(0.013)		(0.702)	
	Ever married	-0.195***	-0.080	n/a	-1.227**	-0.163
		(0.000)	(0.530)		(0.037)	
	Ever divorced	-0.037*	-0.109	n/a	-0.948**	-0.092
		(0.056)	(0.190)		(0.012)	

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.12. Impacts of delaying sexual activity until age 22, males

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.072*** (0.000)	-0.015 (0.821)	n/a	n/a	-0.053
	Unintended pregnancy in adulthood	-0.107*** (0.000)	-0.185 (0.104)	n/a	n/a	-0.133
	Childbearing before marriage	-0.121*** (0.000)	-0.016 (0.871)	n/a	n/a	-0.086
STIs	Diagnosed with HIV	0.007 (0.200)	0.003 (0.856)	n/a	n/a	0.006
	Diagnosed with another STI	-0.014 (0.290)	-0.013 (0.815)	n/a	n/a	-0.014
Substance use	Underage drinking	-0.240*** (0.000)	-0.272** (0.044)	n/a	n/a	-0.251
	Tobacco use (at any age)	-0.183*** (0.001)	-0.088 (0.606)	n/a	n/a	-0.151
	Substance use disorder	-0.053 (0.130)	0.046 (0.737)	n/a	n/a	-0.020
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.048*** (0.001)	-0.053 (0.396)	n/a	n/a	-0.050
	Adult criminal convictions	-0.089*** (0.001)	0.029 (0.776)	n/a	n/a	-0.050
Mental health	Depression	0.008 (0.845)	0.079 (0.432)	n/a	n/a	0.032
	Anxiety diagnosis	-0.018 (0.524)	0.028 (0.761)	n/a	n/a	-0.003
	Stress level	-0.026 (0.714)	0.030 (0.881)	n/a	n/a	-0.007
Path to economic self-sufficiency	Graduated from high school	0.039** (0.031)	0.001 (0.988)	n/a	n/a	0.026
	Enrolled in postsecondary education	-0.020 (0.438)	0.071 (0.383)	n/a	n/a	0.010
	Obtained four-year college degree	0.099** (0.024)	0.127 (0.308)	n/a	n/a	0.108
	Adult earnings	-6,643* (0.055)	-6,355 (0.418)	n/a	n/a	-6,547
	Adult receipt of public assistance	0.017 (0.570)	-0.096 (0.295)	n/a	n/a	-0.021
Relationship quality and stability	Number of serious relationships	-0.420 (0.370)	0.273 (0.726)	n/a	n/a	-0.189
	Relationship satisfaction	-0.068 (0.285)	0.395 (0.193)	n/a	n/a	0.086
	Intimate partner violence	-0.100** (0.014)	-0.084 (0.573)	n/a	n/a	-0.095
	Ever cohabited (outside of marriage)	-0.169*** (0.001)	-0.180 (0.320)	n/a	n/a	-0.173
	Ever married	-0.170*** (0.000)	-0.226 (0.145)	n/a	n/a	-0.189
	Ever divorced	-0.057*** (0.003)	-0.005 (0.929)	n/a	n/a	-0.040

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.13. Impacts of delaying sexual activity until age 22, females

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.099***	0.009	n/a	n/a	-0.063
		(0.000)	(0.935)			
	Unintended pregnancy in adulthood	-0.174***	-0.045	n/a	n/a	-0.131
		(0.000)	(0.778)			
	Childbearing before marriage	-0.194***	0.005	n/a	n/a	-0.128
		(0.000)	(0.965)			
STIs	Diagnosed with HIV	-0.021	0.002	n/a	n/a	-0.006
		(0.177)	(0.821)			
	Diagnosed with another STI	-0.053***	0.008	n/a	n/a	-0.033
		(0.005)	(0.882)			
Substance use	Underage drinking	-0.207***	-0.327*	n/a	1.018*	-0.206
		(0.000)	(0.060)		(0.061)	
	Tobacco use (at any age)	-0.229***	-0.197	n/a	-1.286*	-0.237
		(0.000)	(0.201)		(0.073)	
	Substance use disorder	-0.052***	-0.046	n/a	0.391	-0.033
		(0.006)	(0.601)		(0.214)	
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.003	0.053	n/a	0.212	0.038
		(0.561)	(0.464)		(0.199)	
	Adult criminal convictions	-0.009	-0.020	n/a	0.267	-0.004
		(0.421)	(0.758)		(0.249)	
Mental health	Depression	-0.011	-0.026	n/a	-0.101	-0.023
		(0.823)	(0.863)		(0.813)	
	Anxiety diagnosis	0.022	-0.072	n/a	-0.329	-0.034
		(0.598)	(0.491)		(0.387)	
	Stress level	-0.031	-0.098	n/a	-0.714	-0.088
		(0.591)	(0.595)		(0.260)	
Path to economic self-sufficiency	Graduated from high school	-0.002	0.039	n/a	0.053	0.019
		(0.872)	(0.347)		(0.826)	
	Enrolled in postsecondary education	-0.053**	0.098	n/a	0.373	0.027
		(0.042)	(0.176)		(0.346)	
	Obtained four-year college degree	0.163***	0.177	n/a	0.844	0.189
		(0.000)	(0.189)		(0.122)	
	Adult earnings	-3,296	5,269	n/a	86,054***	3,067
		(0.138)	(0.483)		(0.007)	
	Adult receipt of public assistance	-0.044	0.038	n/a	-1.660***	-0.031
		(0.175)	(0.727)		(0.005)	
Relationship quality and stability	Number of serious relationships	-0.668***	-0.369	n/a	2.875	-0.449
		(0.001)	(0.432)		(0.192)	
	Relationship satisfaction	-0.016	-0.028	n/a	-0.782	-0.086
		(0.838)	(0.933)		(0.284)	
	Intimate partner violence	-0.189***	-0.063	n/a	-0.233	-0.135
		(0.000)	(0.686)		(0.611)	
	Ever cohabited (outside of marriage)	-0.319***	-0.232	n/a	-0.185	-0.274
		(0.000)	(0.175)		(0.768)	
	Ever married	-0.337***	-0.076	n/a	-1.946**	-0.238
		(0.000)	(0.603)		(0.013)	
	Ever divorced	-0.102***	-0.067	n/a	-1.382***	-0.123
		(0.000)	(0.609)		(0.008)	

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.14. Impacts of delaying sexual activity until marriage, males

Domain	Ingredient	Impact estimate				
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	Estimate for costing
Pregnancy and childbearing	Teen pregnancy	0.029	0.149	n/a	n/a	0.069
		(0.522)	(0.391)			
	Unintended pregnancy in adulthood	0.041	0.187	n/a	n/a	0.090
		(0.648)	(0.478)			
	Childbearing before marriage	-0.198*	-0.001	n/a	n/a	-0.132
		(0.061)	(0.996)			
STIs	Diagnosed with HIV	0.000	0.035	n/a	n/a	n/a
		(.)	(0.446)			
	Diagnosed with another STI	-0.015	-0.035	n/a	n/a	-0.022
		(0.683)	(0.771)			
Substance use	Underage drinking	-0.082	-0.098	n/a	n/a	-0.087
		(0.465)	(0.635)			
	Tobacco use (at any age)	-0.093	-0.143	n/a	n/a	-0.110
		(0.396)	(0.741)			
	Substance use disorder	-0.076	0.161	n/a	n/a	0.003
		(0.332)	(0.559)			
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.021	0.077	n/a	n/a	0.012
		(0.498)	(0.548)			
	Adult criminal convictions	-0.045	-0.185	n/a	n/a	-0.092
		(0.439)	(0.259)			
Mental health	Depression	0.053	-0.083	n/a	n/a	0.008
		(0.634)	(0.862)			
	Anxiety diagnosis	0.064	-0.053	n/a	n/a	0.025
		(0.272)	(0.833)			
	Stress level	-0.431**	-0.265	n/a	n/a	-0.376
		(0.048)	(0.532)			
Path to economic self-sufficiency	Graduated from high school	-0.104	-0.079	n/a	n/a	-0.096
		(0.116)	(0.542)			
	Enrolled in postsecondary education	-0.188**	0.279	n/a	n/a	-0.032
		(0.024)	(0.141)			
	Obtained four-year college degree	-0.021	-0.031	n/a	n/a	-0.024
		(0.821)	(0.908)			
	Adult earnings	-10,091	1,898	n/a	n/a	-5,817
		(0.216)	(0.862)			
	Adult receipt of public assistance	0.011	0.018	n/a	n/a	0.013
		(0.911)	(0.962)			
Relationship quality and stability	Number of serious relationships	4.860	-0.723	n/a	n/a	1.138
		(0.296)	(0.616)			
	Relationship satisfaction	-0.176	-0.414	n/a	n/a	-0.255
		(0.290)	(0.516)			
	Intimate partner violence	-0.107	0.265	n/a	n/a	0.017
		(0.280)	(0.471)			
	Ever cohabited (outside of marriage)	-0.175*	-0.168	n/a	n/a	-0.173
		(0.078)	(0.602)			
	Ever married	0.317***	0.157	n/a	n/a	0.264
		(0.001)	(0.676)			
	Ever divorced	0.007	-0.024	n/a	n/a	-0.003
		(0.904)	(0.884)			

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

Table C.15. Impacts of delaying sexual activity until marriage, females

Domain	Ingredient	Impact estimate				Estimate for costing
		Propensity score matching	Sibling model	IV1 (puberty)	IV2 (policy)	
Pregnancy and childbearing	Teen pregnancy	-0.122 (0.209)	0.101 (0.829)	n/a	n/a	-0.048
	Unintended pregnancy in adulthood	-0.161 (0.150)	-0.161 (0.602)	n/a	n/a	-0.161
	Childbearing before marriage	-0.192* (0.072)	-0.173 (0.656)	n/a	n/a	-0.186
STIs	Diagnosed with HIV	-0.025 (0.323)	0.011 (0.874)	n/a	n/a	-0.013
	Diagnosed with another STI	-0.064 (0.108)	0.118 (0.559)	n/a	n/a	-0.003
Substance use	Underage drinking	-0.246** (0.013)	-0.563* (0.082)	n/a	n/a	-0.352
	Tobacco use (at any age)	-0.122 (0.202)	-0.475 (0.407)	n/a	n/a	-0.240
	Substance use disorder	0.018 (0.561)	-0.275 (0.402)	n/a	n/a	-0.080
Delinquent behavior and criminal activity	Youth involvement in justice system	-0.015 (0.604)	-0.016 (0.913)	n/a	n/a	-0.015
	Adult criminal convictions	-0.003 (0.309)	0.082 (0.502)	n/a	n/a	0.025
Mental health	Depression	0.002 (0.985)	-0.029 (0.935)	n/a	n/a	-0.008
	Anxiety diagnosis	0.043 (0.525)	-0.333 (0.271)	n/a	n/a	-0.082
	Stress level	-0.018 (0.897)	-0.087 (0.831)	n/a	n/a	-0.041
Path to economic self-sufficiency	Graduated from high school	0.049 (0.401)	0.089 (0.651)	n/a	n/a	0.062
	Enrolled in postsecondary education	0.062 (0.490)	0.181 (0.442)	n/a	n/a	0.102
	Obtained four-year college degree	0.080 (0.387)	-0.143 (0.511)	n/a	n/a	0.006
	Adult earnings	1,030 (0.870)	3,575 (0.862)	n/a	n/a	1,879
	Adult receipt of public assistance	-0.039 (0.640)	-0.089 (0.847)	n/a	n/a	-0.056
Relationship quality and stability	Number of serious relationships	-0.109 (0.817)	0.149 (0.912)	n/a	n/a	-0.023
	Relationship satisfaction	0.115 (0.437)	0.014 (0.982)	n/a	n/a	0.081
	Intimate partner violence	-0.332*** (0.000)	-0.295 (0.541)	n/a	n/a	-0.320
	Ever cohabited (outside of marriage)	0.060 (0.523)	-0.054 (0.805)	n/a	n/a	0.022
	Ever married	0.268*** (0.001)	0.043 (0.919)	n/a	n/a	0.193
	Ever divorced	0.052 (0.507)	-0.106 (0.720)	n/a	n/a	-0.001

Source: Add Health survey sample, excluding individuals who reported sexual initiation before age 12 or sexual assault at or before the age of sexual initiation.

*/**/***Significantly different from zero at the .10/.05/.01 level, two-tailed test. Exact *p*-values listed in parentheses.

IV = instrumental variable; n/a = not available; STI = sexually transmitted infection.

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