Distribution Agreement

In presenting this thesis or dissertation as a partial fulfillment of the requirements for an advanced degree from Emory University, I hereby grant to Emory University and its agents the non-exclusive license to archive, make accessible, and display my thesis or dissertation in whole or in part in all forms of media, now or hereafter known, including display on the world wide web. I understand that I may select some access restrictions as part of the online submission of this thesis or dissertation. I retain all ownership rights to the copyright of the thesis or dissertation. I also retain the right to use in future works (such as articles or books) all or part of this thesis or dissertation.

Signature:

_____ _____

Maris Perlman Date

The Effect of Comprehensive Sex Education on Contraceptive Use Behaviors

By

Maris Perlman
MSPH

Health Policy and Management

_____

Laura M. Gaydos
Committee Chair

_____

Laura M. Gaydos
MSPH Director

_____

Sarah Blake
Committee Member

_____

Curtis Florence
Committee Member

The Effect of Comprehensive Sex Education on Contraceptive Use Behaviors

By

Maris Perlman

BA
Stanford University
2009

Thesis Committee Chair: Laura M. Gaydos, PhD

An abstract of
A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Science in Public Health
in Health Policy and Health Services Research
2011

ABSTRACT

The Effect of Comprehensive Sex Education on Contraceptive Use Behaviors
By Maris Perlman

The recent increase in teen pregnancy rates has brought prevention programs to the forefront of public policy in the United States. With a historical new emphasis on evidence-based models of pregnancy prevention programs, a better understanding the effects of comprehensive sex education programs is needed. This study uses a novel outcome variable of contraceptive effectiveness to evaluate the relationship between comprehensive programs and contraceptive behaviors among 1,980 sexually active respondents of the National Survey of Family Growth. Our results demonstrate that individuals who receive instruction on both abstinence and birth control methods not only use contraceptives at a higher rate than those not receiving comprehensive sex education, but also use more effective methods of contraceptives. Yet, this relationship is not as straightforward for segments of the population already at risk for poor contraceptive use. These results indicate that comprehensive sex education is successful at improving contraceptive behaviors in ways that have not previously been explicitly considered. However, more research is needed to determine how prevention programs may better serve these at-risk populations.

The Effect of Comprehensive Sex Education on Contraceptive Use Behaviors

By

Maris Perlman

BA
Stanford University
2009

Thesis Committee Chair: Laura M. Gaydos, PhD

A thesis submitted to the Faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirements for the degree of
Master of Science in Public Health
in Health Policy and Health Services Research
2011

ACKNOWLEDGMENT

I would like to thank Dr. Laura Gaydos, Sarah Blake and Dr. Curtis Florence for guidance throughout this entire process. This thesis would not have been possible without their knowledge, assistance and support. I would also like to thank my peers Heather Coffin, Peiyin Hung, Prabjhyot Saini, Drew Warlick, Hefei Wen for their constant contributions and feedback. Lastly, I would like to thank my parents who have supported me throughout my educational journey.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

CSE	Comprehensive Sex Education
MSA	Metropolitan Statistical Area
NSFG	National Survey of Family Growth
SES	Socio-economic status
STD	Sexually Transmitted Disease

INTRODUCTION

The United States (U.S.) has experienced immense improvement in teen pregnancy rates since the early 1990s, but in recent years those improvements have stalled and even reversed (Kost, Henshaw et al. 2010). Teen sexual health outcomes are important on both social and economic levels. Teen pregnancies are associated with negative consequences for both teen parents and children, including lowered educational attainment and earnings for the teen parents (Hotz, McElroy et al. 1997; Hofferth, Reid et al. 2001; Perper, Peterson et al. 2010), and higher rates of abuse/neglect, incarceration, and teen pregnancy for the children (Hoffman 2006). Teenage pregnancy is also extremely costly to the public. It was estimated that in 2004, teen pregnancy cost taxpayers $9.1 billion through public health care, child welfare, incarceration, and lost tax revenue costs. In 2004, the declines from the 1990 teen pregnancy rates saved taxpayers $6.7 billion (Hoffman 2006). Additionally, sexually transmitted diseases (STDs) increase health care costs and can affect future fertility and physical health (Jossens, Schachter et al. 1994; Eng and Butler WT 1997).

Effective sex education has the potential to reduce costs to taxpayers by billions of dollars as well as increase the social and economic well-being of our future generations. Understanding the complete effects of such programs is crucial to designing more successful sex education programs.

Adolescent sexual behavior can have a multitude of consequences that have lasting effects on the lives of teenagers. For the purposes of this study we will focus on

contraceptive use, however other important behavioral outcomes include age at initiation of sexual activity, number of sexual partners, STDs and pregnancy.

To date, the extensive existing literature on sex education mainly focuses on the efficacy of various program structures and components, with the majority of research supporting comprehensive sex education (CSE) programs as more effective than abstinence-only programs, due to their ability to increase overall contraceptive use (Manlove, Papillio et al. 2004; Bennett and Assefii 2005). CSE programs provide information on both abstinence and contraceptive methods, as opposed to abstinence-only programs that stress abstinence as the sole option for teenagers.

While many studies have investigated the effect of comprehensive programs on overall contraceptive use, there is very limited research into the effect on contraceptive choices (Marsiglio 1986; Scott-Jones and Turner 1988). Hence, this study will explicitly examine the relationship between such comprehensive programs with overall contraceptive use and contraceptive effectiveness. This study will also pay specific attention to these associations for previously identified at-risk populations. Lastly, this study will investigate the relationship between timing of first exposure to CSE and the resultant contraceptive behaviors. We hypothesize that the study will find an increased overall use of contraceptives and increased use of more effective methods among individuals receiving CSE—indicating that CSE has the ability to positively affect a multitude of contraceptive behaviors. We also hypothesize that there will be differing relationships among the outcomes of interest for the at-risk groups when compared to the general population, suggesting that these specific populations warrant more individualized attention from policymakers. Lastly, we expect to find that individuals

receiving an earlier first exposure to CSE have more positive patterns of both contraceptive behaviors, indicating that timing should be considered when developing sex education programs.

LITERATURE REVIEW

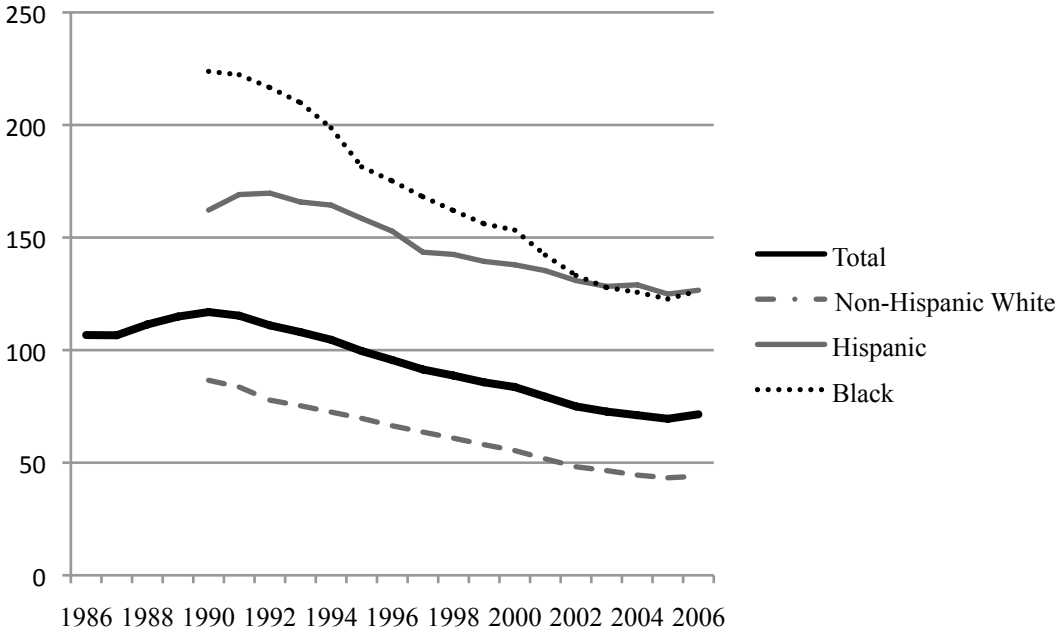
Sexual Health Outcome Trends Among Teens in the U.S.

For the past twenty years, the U.S. has experienced drastic improvements in teen STD and pregnancy rates, but these improvements have stalled and reversed in recent years (Kost, Henshaw et al. 2010). In the discussion of trends that follows, average national rates and statistics will be presented. However, sexual behaviors and outcomes differ markedly between races, with non-Hispanic white teens experiencing better outcomes than Hispanic and Black teens, and slightly between genders, with males more likely to report use of contraceptives (Eng and Butler WT 1997; Suellentrop 2006; Kost, Henshaw et al. 2010).

Teenage pregnancy in the U.S. has been on a long-term decline since the 1950s, with a few notable increases in the late 1980s and from 2005 to 2007. From 1991 to 2005 the pregnancy rate among teens decreased forty percent, from 116.5 pregnancies per 1,000 teenage girls to 70.6 pregnancies per 1,000. The pregnancy rate declined more rapidly for younger teenagers, aged fifteen to seventeen, than for older teenagers, aged eighteen to nineteen (Ventura, Mathews et al. 2001; Ventura, Abma et al. 2009). From 2005 to 2007, the birth rate among teenagers increased 4% (Hamilton, Martin et al. 2010). However, preliminary data of 2008 and 2009 births indicates that teen pregnancy is again on the decline. Currently the pregnancy rate for teen girls aged fifteen to nineteen in the U.S. is estimated at 71.5 pregnancies per 1,000 women. However, this rate is much

higher for Black and Hispanic teens and for girls with mothers that were themselves teen mothers (Kost, Henshaw et al. 2010). Figure 1 illustrates the trends in teen pregnancy over the past few decades. In spite of the improvements, the U.S. still has the highest teen pregnancy rate among comparable industrialized countries, with approximately three out of ten girls becoming pregnant at least once before the age of twenty (The National Campaign to Prevent Teen Pregnancy 2006).

FIGURE 1. U.S. TEEN PREGNANCY RATES (PER 1,000) 1986-2006, BY RACE/ETHNICITY.



Teenagers have the highest rates of STDs of any age group. Adolescents are at a greater risk for STDs due to a higher likelihood of engaging in sex with multiple partners and failing to use contraception consistently (Quinn and Cates 1992). An estimated 18.9 million STDs occurred in the US in 2000, of these cases, approximately 48% occurred among individuals aged 25 and younger (Weinstock, Berman et al. 2004).

Behavioral Determinants of Outcomes

The improvements in teen pregnancy outcomes, and the more recent setbacks, have been widely attributed to sexual activity levels and contraceptive use among teenagers. There is a high level of agreement in the literature attributing the majority of the change to contraceptive use, and a smaller proportion to sexual activity levels (Darroch, Singh et al. 2001; Santelli, Orr et al. 2009). A recent study attributed 77% of the decline in pregnancy risk among teens aged fifteen to seventeen during the 1995 to 2002 period to increased contraceptive use (Santelli, Lindberg et al. 2007).

Approximately 46% of high school students have had sex and one-third are sexually active, meaning they have had sex within the three months before surveyed. The proportion of sexually active teenagers decreased 11% (from 38% to 34%) between 1991 and 2007 (Lemoine 2010). On average, teenage boys initiate sexual intercourse at age 16.9, slightly earlier than girls who initiate sex, on average, at age 17.4 (Suellentrop 2006).

The more influential factor of contraceptive use follows a slightly different trend than sexual activity. Contraceptive use at last sex decreased from 1988 to 1995 and then increased for all teens between 1995 and 2002 before leveling off. Currently, approximately, 83% of teenage girls and 91% of boys report using some form of contraception at last sex (Suellentrop 2006). At first sex, contraceptive use rates are lower, with 74% of girls and 82% of boys reporting using contraception (Suellentrop 2006). Furthermore, consistency of contraceptive use is also associated with unintended pregnancies. Girls aged fifteen to nineteen are more likely to report sporadic contraceptive use than any other age group (Glei 1999).

Sex Education Curriculum

Sex education programs aim to improve sexual health outcomes among teens. Programs can be separated into two main approaches to curriculum—abstinence-only and comprehensive. Many studies have assessed the effectiveness of abstinence-only versus CSE. Abstinence-only programs, in accordance with the Health Resource and Services Administration's Maternal and Child Health Services Block Grant program (Title V Section 510), teach abstinence until marriage as the only option for teenagers. Such programs do not acknowledge that many teenagers will become sexually active and avoid all discussion of abortion. Contraceptive methods are not discussed, other than to emphasize their failure rates. Proponents of abstinence-only education argue that discussing contraception with teens can send mixed messages about sexual activity expectations. On the other hand, comprehensive programs promote abstinence yet acknowledge that many teenagers will become sexually active. Thus, the programs provide information about abstinence and contraceptive methods and include discussions about abortion, STDs, and HIV. Proponents of CSE argue that it is important not only to promote abstinence, but also to provide teens with the information and skills to protect themselves from poor sexual health outcomes if they choose to engage in sexual activity.

The large majority of literature assessing the efficacy of sex education programs supports comprehensive programs as the more effective program design. Conversely, systematic reviews of programs have found no significant evidence proving abstinence-only education to be effective at delaying sexual initiation. A review of recent studies assessing sex education programs, led Santelli et al. to conclude that abstinence-only

programs are not only ineffective but unethical due to their withholding of medically-accurate information about contraception (Santelli, Ott et al. 2006).

In one of the first systematic reviews of prevention programs, Manlove et al. assessed the effects of twenty-two programs aimed at delaying sexual initiation. The authors found that one of the two abstinence-only education programs had a positive impact on sexual initiation, increasing the age of initiation, but did not demonstrate any other significant effects. Of the nine CSE programs, six demonstrated a positive impact on sexual initiation and six also reported positive effects on contraceptive use. Additionally, of the seven HIV/AIDS and STD education programs, five demonstrated positive effects on sexual initiation and three reported increases in contraceptive use. While the evaluation of only two abstinence-only programs make conclusions from this review difficult, the results do largely support comprehensive education as the more effective program design (Manlove, Papillio et al. 2004).

In a more recent systematic review of sixteen randomly controlled trials evaluating U.S. secondary school abstinence-only and comprehensive programs, Bennett & Assefi found that among the three abstinence-only programs, two reported no change in the onset of sexual activity, while one reported a positive effect. Among the thirteen comprehensive programs, two reported increases in the age of initiation and one reported a decrease, four reported a decrease in frequency of sex, five reported increases in knowledge about contraception, and six demonstrated increases in contraceptive use (Bennett and Assefi 2005).

To assess the effectiveness of federally funded programs, Congress authorized the evaluation of Title V, Section 510 abstinence-only education programs. In the

experimentally-designed analysis of four programs, researchers found that youth in the abstinence education programs were no more likely than subjects in the control groups to have abstained from sex, have fewer partners, or initiate sex at a later age. These youth also had similar use and knowledge of contraceptives. However, youth in the abstinence education programs were less knowledgeable about STD consequences (Trenholm, Devaney et al. 2007). These reviews of abstinence-only and comprehensive programs indicate that CSE programs have the ability to affect teen sexual health behaviors and outcomes, where as abstinence-only programs do not.

Common Components of Effective Sex-Education Programs

While comprehensive programs have the ability to be effective, some are not. Several studies have examined programs to define characteristics that are common among effective programs. In the most extensive and recent study, Kirby et al. reviewed eighty-three worldwide studies of sex education programs and found that, of studies that measured the following specific outcomes, 42% found a delay in sexual initiation of at least six months, 29% found a reduction in frequency of sex, 35% found a decrease in numbers of sexual partners, 40% found an increase in contraceptive use, 23% found a reduction in teen pregnancy rates, and 20% found a reduction in STD rates. The same study identified seventeen program characteristics deemed important in creating effective programs. These characteristics involve the development, structure, and implementation of the curriculum. Effective programs had a narrow focus on specific behavioral goals, such as delaying sexual initiation or using contraceptives. These programs also were based upon theoretical approaches that have been successful in influencing other risk

behaviors, mainly social learning theories that emphasized knowledge, motivation, outcome expectancy, and self-efficacy. The effective programs also focused on medically accurate information about risks and ways of protecting oneself, and provided clear messages. The programs also addressed individual and group values as well as social influences. Finally, all the effective programs included activities designed to develop communication and negotiation skills. Length and skill practice were both found to not be important (Kirby, Laris et al. 2007).

Absence of Contraceptive Effectiveness as an Outcome Measure

Very few of the studies of sex education consider contraceptive effectiveness as an outcome measure to assess the effectiveness of the programs. Yet, pregnancy and STD rates are driven not only by contraceptive use patterns, but also the effectiveness of these contraceptive methods. Effectiveness of contraceptive methods varies widely; Table 1 provides the failure rates with typical use for the major methods of contraceptives.

TABLE 1: CONTRACEPTIVE METHOD EFFECTIVENESS, BY TYPICAL USE FAILURE RATES.

Method	**Typical Use Failure Rate**
Implant	0.05%
Male Sterilization	0.15%
Intrauterine Device (IUD)	0.2%-0.8%
Female Sterilization	0.5%
Injections (Depo-Provera)	3%
Oral Contraceptive Pill	8%
Contraceptive Patch	8%
Contraceptive Ring	8%
Emergency Contraception	12%
Male Condom	15%
Diaphragm	16%
Female Condom	21%
Sponge	16%-32%
Natural Family Planning Methods	25%
Withdrawal	27%
Spermicides	29%
No Method	85%

Hormonal methods have a 8% or less chance of pregnancy with typical use, while condoms and other barrier methods have around a 15%-21% failure rate (Trussel 2007). Thus, the methods used by teens are of great importance, as is whether or not sex education affects these choices. Two notable studies of sex education from the 1980s use contraceptive effectiveness as an outcome variable. The first study found that older sexually active girls who had received sex education were more likely to use a more effective contraceptive method than those who had never received sex education. In this study, contraceptive effectiveness was defined as a binary variable where effective contraceptive methods were defined as the pill, condom, diaphragm, intrauterine device (IUD), and female and male sterilization, and ineffective methods were defined as natural family planning, calendar methods, withdrawal, spermicides, and any other unlisted methods (Marsiglio 1986). The second study examined the effects of sex education on contraceptive use among Black females found that sex education was positively associated with the effectiveness of the current contraceptive method being used (Scott-Jones and Turner 1988). However, more recent reviews of CSE focus exclusively on overall contraceptive use rather than effectiveness of the methods used.

Absence of Timing of Exposure as a Consideration in Evaluations of Effectiveness

None of the reviews of sex education programs explicitly consider timing of exposure to CSE as a factor that may influence a program's ability to affect outcomes. This is mainly due to the fact that the major data sets used to examine teen sexual behavior begin observation with subjects aged fifteen and have limitations when examining younger adolescents. Yet, this is an issue that is often at the forefront of public

discussion. Many state mandates refer to the delivery of "age-appropriate" information, but none define when it is age appropriate to learn about contraceptives and receive CSE. It is estimated that one in five teens has had sex before the age of 15 indicating that timing of sex education programs should be considered when implementing programs (Albert, Brown et al. 2003).

In an evaluation of middle school sex education programs, Manlove et al. found that comprehensive programs can be effective at delaying first sex and improving contraceptive use among this younger teen cohort (Manlove, Franzetta et al. 2004). Yet a study of sex education programs in the fifth and sixth grades, reported that the majority of teachers indicated the necessary topics were not being covered at these grades (Landry, Singh et al. 2000). As such, it seems prudent that timing of exposure to CSE be considered in the planning of sexuality education programs and, additionally, more research is needed into its effect. In addition to the timing of the exposure, frequency of exposure to sex education programs is also a topic that is rarely addressed in literature.

History of Sex Education Policy and Offerings

An estimated 89% of U.S. public school students receive some form of sex education between 7th and 12th grade (Kaiser Family Foundation 2002). What the program looks like is determined by various federal funding grants, state mandates, and local decisions. Changes in these grants and mandates over the past thirty years led to extreme changes in the offerings of sex education programs.

In the late 1980s, the emergence of HIV/AIDS led to many states enacting legislation requiring education about the prevention of HIV/AIDS and some to enact

legislation concerning a broader definition of sex education. Most of these state-level laws were very broad in their prescriptions for the curriculum of such programs leaving most content decisions up to local school districts. Table 2 shows the breakdown of states that have mandates and contraception coverage requirements.

As of December 2010, twenty-two states and the District of Columbia mandate schools to provide both sex education and instruction on HIV/STDs; of these states seventeen explicitly require a discussion of contraceptive methods. Thirteen states require instruction about HIV/STDs, but have no requirements concerning sex education; of these states only six require a discussion of contraceptive methods. Fifteen states have no legislative mandates requiring sex education or HIV education; however, three of these states require a discussion of contraceptive methods if sex or HIV education is provided (Guttamacher Institute 2010).

Regardless of the presence or absence of mandates, states vary in their enforcement of legislation and their prescriptions for curriculum, thereby leaving much to the decision of local school districts. According to a nationally representative survey, only 69% of public school districts have a district-wide policy concerning sex education. The structure of such policies varied extensively by geographic region, with school districts in the South much more likely to have an abstinence-only policy when compared to school districts in the Northeast (Landry, Kaeser et al. 1999; Kaiser Family Foundation 2002).

TABLE 2: STATE SEX AND STD/HIV EDUCATION POLICY.

State	Sex Education		STD/HIV Education	
	Mandate	**If Taught, Contraception Content Required**	**Mandate**	**If Taught, Contraception Content Required**
Alabama		Yes	X	Yes
Alaska				
Arizona				
Arkansas				
California		Yes	X	Yes
Colorado		Yes		
Connecticut			X	
Delaware	X	Yes	X	Yes
Washington D.C.	X	Yes	X	
Florida	X		X	
Georgia	X		X	
Hawaii	X	Yes	X	Yes
Idaho				
Illinois				Yes
Indiana				
Iowa	X		X	
Kansas	X		X	
Kentucky	X		X	
Louisiana				
Maine	X	Yes	X	Yes
Maryland	X	Yes	X	Yes
Massachusetts				
Michigan			X	
Minnesota	X		X	
Mississippi				
Missouri			X	
Montana	X		X	
Nebraska				
Nevada	X		X	
New Hampshire			X	
New Jersey	X		X	
New Mexico	X	Yes	X	Yes
New York			X	Yes
North Carolina	X	Yes	X	Yes
North Dakota				
Ohio			X	
Oklahoma			X	Yes
Oregon	X	Yes	X	Yes
Pennsylvania			X	
Rhode Island	X	Yes	X	Yes
South Carolina	X	Yes	X	Yes
South Dakota				
Tennessee	X		X	
Texas				
Utah	X		X	
Vermont	X	Yes	X	Yes
Virginia		Yes		Yes
Washington		Yes	X	Yes
West Virginia	X	Yes	X	Yes
Wisconsin		Yes	X	Yes
Wyoming				
TOTAL	**22+DC**	**17+DC**	**35+DC**	**19**

The federal government affects the structure of sex education programs through funding. Over the past thirty years, the federal government has mainly supported abstinence-only sex education programs. This support began with the passage of the Adolescent Family Life Act in 1981, which aimed to prevent teen pregnancy by promoting abstinence and self-discipline and provided an annual $6-$8 million to fund abstinence-only programs. The most significant change occurred in 1996 with the passage of the Personal Responsibility and Work Opportunity Reconciliation Act, which amended Title V, Section 510 of the Social Security Act, providing $250 million in federally matched funds over a five-year period to states to support abstinence-only programs. The matching structure of this grant led to the appropriation of approximately $437.5 million in federal and state funds to abstinence-only sex education programs. This Act also established the eight-point definition of abstinence-only education that prohibited any discussion of contraception other than to emphasize failure rates. In 2000, Congress approved the "Special Projects of Regional and National Significance Community-Based Abstinence Education" maternal and child health block grants, which provided an additional $40 million in support over a two year period (Kaiser Family Foundation 2002).

This combination of federal funding and state mandates led to drastic changes in the structure of sex education programs. From 1995 to 2002, the percentage of teenagers receiving abstinence-only education increased from 8-9% to over 20%. Furthermore, the percentage of teenage girls receiving education about contraceptives before initiating sexual activity decreased from 72% to 62%. Additionally, in 2002, one in four teens did

not even receive education about abstinence before first sex (Lindberg 2006). This meant fewer teens were formally learning about contraceptive methods and how to prevent STDs and pregnancy if they chose to engage in sex, and many teens were not receiving any type of formal sex education before initiating sexual activity.

Risk and Protective Factors For Sexual Health Behaviors

Studies have identified various risk and protective factors related to sexual health behaviors and outcomes among teens. In a meta-analysis of more than 250 studies, Kirby identified the common statistically significant antecedents of initiation of sex, contraceptive use, and pregnancy among teens. The analysis found that more than 100 risk and protective factors were associated with the outcomes. These antecedents relate to the teens, partners, peers, families, schools, and communities. Kirby identified three trends concerning the antecedents. First, a large number of the risk factors involved some form of disadvantage—such as coming from a low socio-economic status (SES), single parent household and experiencing emotional distress. Second, many of the factors related to the influence of the physical and social environment—such as peer and community norms. Lastly, many of the protective factors were related to attachment to people or groups that display positive expectations and model desired behaviors—such as attachment to school or religion (Kirby 2002).

Other studies have attempted to identify the most important effects on outcomes, yet with so many associated factors, these analyses cannot possibly consider all the possible influences. A study by Santelli et al., looked at the influences of psychological, social, and demographic factors to identify the strongest influences on early initiation of

sexual intercourse among middle school, inner-city youth. The most influential factors were identified as personal and perceived peer norms about sex, academic performance, alcohol/drug use, gender, and race. The authors note that the limitations of the study stem from the difficulty in measuring sexual behaviors and psychosocial factors for middle school youth due to cognitive difficulties, social desirability biases, and student concerns about confidentiality (Santelli, Kaiser et al. 2004).

The research on this topic is extensive, and there are many factors that contribute to teens' risky sexual behaviors and poor sexual health outcomes. The studies on this topic consider slightly different variables, but for the most part, the findings are consistent, with no obvious contradictions. Research indicates that main risk factors include living in a single-parent or low SES household (Lammers, Ireland et al. 2000; Santelli, Lindberg et al. 2000), racial minority status (Smith 1997; Santelli, Lindberg et al. 2000), depressive tendencies (Tubman, Windle et al. 1996; Chen, Stiffman et al. 1997), and drug and alcohol use (Kowaleski-Jones and Mott 1998). Protective factors include high academic achievement orientation (Resnick, Bearman et al. 1997; Halpern, Joyner et al. 2000) and religiosity (Resnick, Bearman et al. 1997). Furthermore, peers also play a very influential role in sexual behavior, as they largely determine teen attitudes about sex (Meschke, Zweig et al. 2000). The wide variety of risk and protective factors indicates that there are likely multiple determinants for the observed trends in teen sexual behavior and resultant outcomes.

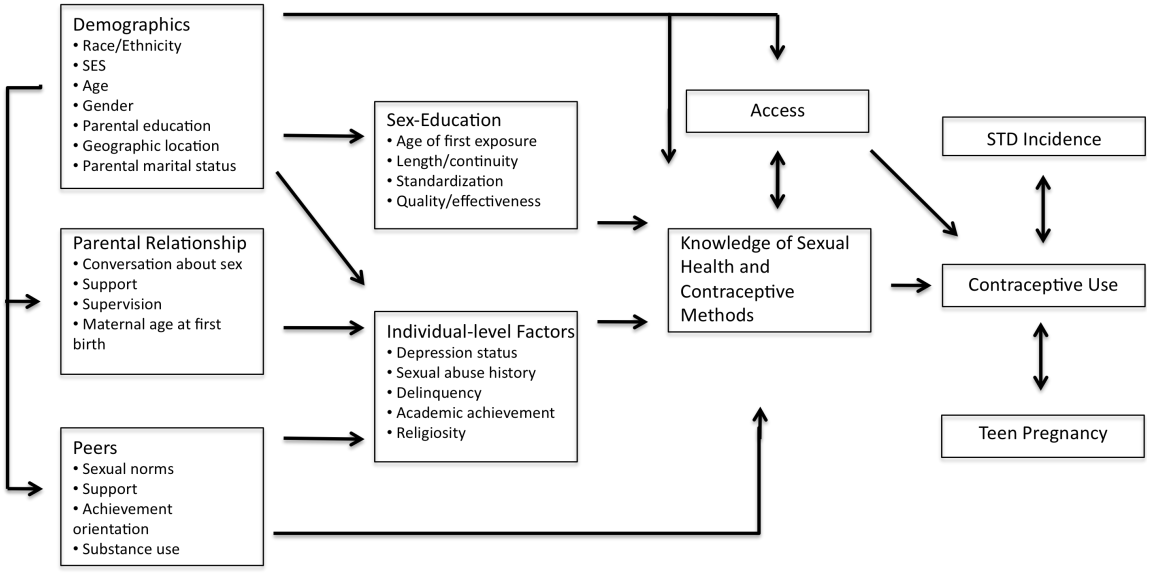
Determinants of Behavioral Trends

Many researchers have attributed these behavioral and outcome trends to sex education programs. A recent review of research posited that the decrease in contraceptive use after 2003 and the rise in birth rates after 2005 can largely be explained by the shift in sex education towards abstinence-only education, and that public policy would be more effective if it focused on promoting contraceptive use among teens (Santelli, Orr et al. 2009).

Trends in contraceptive use and sexual activity levels have also been attributed to reasons other than sex education policy and offerings. In studies of teenage pregnancy rates in the U.S. and other developed countries, various economic, social, and demographic variables have been identified as significantly related to birthrates. One study examined the trends in U.S. teen birthrates from 1980 to 1995, to determine the effect of the social environment in which teens live. The authors found that changes in family environments (i.e. disruption), discussions with parents about sex, and formal sex education programs were all associated with the trends (Manlove, Terry et al. 2000). A recent study identified the increasing Hispanic population in the U.S. as a driver of teen birthrates, as well as sex education and family planning service policies as significant determinants (Yang and Gaydos 2010). Other studies have identified larger economic and social determinants that drive trends world-wide—such as attitudes toward sex, minimum marriage ages, access to contraceptives, and increased importance on education as significantly related to birthrates among developed countries (Jones, Forrest et al. 1985; Singh and Darroch 2000). Therefore, various factors, other than sex education, may be partially responsible for the trends in teen sexual behavior. Figure 2 illustrates the

complicated relationships between some of the more prominent antecedents of contraceptive use and teen sexual health outcomes, as well as the proposed relationships concerning sex education.

FIGURE 2. ANTECEDENTS TO CONTRACEPTIVE USE.



Future Direction of Sex Education

Often, the federal and local policies do not line up with parental preference. Federal and state policy has widely financed and promoted abstinence-only education for the past decade, yet the majority of parents indicate that they prefer comprehensive education with a discussion of contraceptive methods. This overwhelming support spans geographic regions and demographic subgroups (Ito, Gizlice et al. 2006; Constantine, Jerman et al. 2007). Accordingly, in President Obama's fiscal year 2010 budget, Obama eliminated the $145 million in federal grants that previously funded abstinence-only education and in its place allocated $178 million to fund evidence-based and promising models of teen pregnancy prevention programs. This focus on evidence-based programs was the first ever among federal funding policies, thereby indicating a new national

approach to teen sex education that more appropriately meets the needs and preferences of U.S. teenagers and parents. Unfortunately before the budget measure could go into effect, the new health reform bill included a provision to restore $250 million over a five-year period to fund abstinence-only education, a measure added to appease the bill's opposition. The bill also included $375 million over five years to fund evidence-based models, so it still represented a new support of comprehensive programs. In researching promising models of prevention programs, the effects on use of more effective contraceptive methods and the timing of exposure to sex education programs should be considered as areas of necessary attention.

METHODOLOGY

This study examines the association between exposure to CSE and behavioral outcomes. The behavioral outcomes of interest are contraceptive choices and use patterns. The study hypotheses are:

Hypothesis One: Subjects receiving CSE will have higher rates of contraceptive use at both first and last sex.

Sub-Hypothesis A: Subjects receiving CSE in Middle School will have higher rates of contraceptive use at both first and last sex than subjects solely receiving CSE in High School.

Sub-Hypothesis B: At-risk subjects receiving CSE will have greater increases in rates of contraceptive use at both first and last sex than the general population.

Hypothesis Two: Subjects receiving CSE will have a greater likelihood of using contraceptive methods categorized as high effectiveness (failure rate ≤ 10%) at both first and last sex.

Sub-Hypothesis C: Subjects receiving CSE in Middle School will have a greater likelihood of using contraceptive methods categorized as high effectiveness at both first and last sex than subjects solely receiving CSE in High School.

Sub-Hypothesis D: At-risk subjects receiving CSE will have greater increases in the likelihood of using contraceptive methods categorized as high effectiveness at both first and last sex than the general population.

Dataset

The data source for this analysis was the National Survey of Family Growth (NSFG), a publically available dataset from the National Center for Health Statistics, Centers for Disease Control and Prevention. The NSFG is designed to represent the

national non-institutionalized population aged fifteen to forty-four. Each distinct data collection period is referred to as a cycle. The first six cycles were conducted in 1973, 1976, 1982, 1988, 1995, and 2002 via personal interviews conducted within the homes of the subjects. The first five cycles (1973-1995) solely interviewed women, while in 2002, men were also included in the sample. Beginning in 2006, cycle 7 adopted a continuous survey design. Interviews were conducted throughout the year for four years (June 2006-June 2010). A nationally representative sample of men and women were selected from geographically designated Primary Sampling Units (PSUs). The on-going sampling occurred during this time with slight changes in the questionnaires and PSUs on an annual basis.

The cycle 7 dataset purposefully over samples Blacks and Hispanics aged 15-24, and females, but as the data is intended to be representative of the national population, population weights are available to adjust for sample design. For recoded variables, observations with missing data (which were few) were imputed using logical imputation. Most recode values were determined using regression imputation software using all other variables in the data set as explanatory variables.

All data within the public-use dataset has been de-identified for privacy concerns of the respondents. All geographic or other identifying information has been eliminated from public use files. The only geographic variable within the dataset is a three-value geographic recode variable describing the individual's proximity to a metropolitan statistical area (MSA).

Sample

The sample for this analysis was taken from the 2006-2008 publically available portion of the cycle 7 NSFG dataset. This dataset includes interviews of 13,495 individuals (7,356 men and 6,139 women). In the general sample there were 2,860 respondents aged nineteen to twenty-four. All subjects aged fifteen to twenty-for were administered a supplementary section concerning contraceptive use. Thus, this study used age twenty-four as a cut off point. The sample began at age nineteen, because this is the age at which the majority of respondents would have completed secondary school, and the research questions concerned the effects of school programs after their completion. As the study questions concern sexual behaviors, subjects were excluded if they had never had sex with an opposite-sex partner (n=442). Of the sexually active sample (n=2,418), female subjects were excluded if they reported being married before the age of 19 (n=59), as formal sex education programs would not be expected to affect sexual behaviors among these individuals. Male subjects married before the age of 19 could not be identified through the data, but based on the number of married females we can reasonably expect this number to be low. Subjects were also excluded if they reported a first sexual intercourse experience before the age of twelve (n=34), because their first sexual experience occurred before the period of interest. Subjects were also excluded from the sample if they had incomplete information about sex education exposure (n=226), reported exposure to CSE before middle school (n=143), or did not specify a starting grade (n=13), as such timings were not consistent with specified study timing groups. Subjects were also excluded if exposed to sex education programs that only taught birth control without a discussion of abstinence (n=224), as such programs were

not consistent with the study definition of comprehensive programs. In total, the final sample size was 1,980.

To analyze the relationship between CSE and at-risk groups, specific at-risk groups were identified from the literature. For these additional analyses we focused on three at-risk populations commonly identified in previous research—populations of Black subjects (n=408), Hispanic subjects (n=443), and subjects with teen mothers—mothers who had their first child before the age of 20 (n=652). The race/ethnicity groups were mutually exclusive.

Dependent Variables

Contraceptive Use at First Sex

We defined contraceptive use as any contraceptive method—including natural contraceptive methods such as withdrawal. Use of contraception was determined from direct answers within the dataset concerning the specific methods used at first sex and recoded within the dataset as a single variable. We coded the dichotomous outcome variable as a binary variable.

Contraceptive Effectiveness at First Sex

We coded contraceptive effectiveness as a categorical variable with four groups based on typical failure rates. For respondents reporting multiple contraceptive methods, effectiveness was defined as the highest effectiveness level of the birth control methods reported. Group one consists of no contraceptive methods utilized. Group two consists of low-effectiveness contraceptive methods: rhythm method, safe period method,

withdrawal, sponge, foam, and suppository. Group three consists of moderate-effectiveness contraceptive methods: condom, diaphragm, cervical cap, emergency contraception, and female condom. Emergency contraception was grouped with moderately effective methods because its use indicates inconsistent use of primary contraceptives. The efficacy of emergency contraception is also difficult to measure and there is some debate about its effectiveness (Trussel 2011). Group four consists of high-effectiveness contraceptive methods: pill, Depo-Provera, IUD, implant, hormonal patch, contraceptive ring, and sterilization.

TABLE 3: CONTRACEPTIVE METHOD EFFECTIVENESS GROUPINGS.

Group	Method	Typical Use Failure Rate
Group 1: None	No Method	85%
Group 2: Low	Spermicides	29%
	Withdrawal	27%
	Natural Family Planning & Calendar Methods	25%
	Sponge	16-32%
Group 3: Moderate	Female Condom	21%
	Diaphragm	16%
	Male Condom	15%
	Emergency Contraception	12%
Group 4: High	Oral Contraceptive Pill	8%
	Contraceptive Patch	8%
	Contraceptive Ring	8%
	Injections (Depo-Provera)	3%
	Female Sterilization	0.5%
	IUD	0.2%-0.8%
	Male Sterilization	0.15%
	Implant	0.05%

Contraceptive Use at Last Sex

We defined use of contraception at last sex as use of any reported contraceptive method for the last sexual intercourse within the year prior to the interview that did not constitute the subject's first sexual experience. The variable was recoded within the dataset from multiple answers. We coded the outcome variable as a binary variable.

Contraceptive Effectiveness at Last Sex

We defined contraceptive effectiveness at last sex as the highest effectiveness level of the birth control methods reported for the last sexual intercourse encounter reported within the year prior to the interview that did not constitute the subject's first sexual experience. We coded the variable as a four-tier categorical variable.

Primary Independent Variables

Comprehensive Sex Education

We measured exposure to formal CSE based on two separate interview questions. The first question asked whether the respondent had received any formal instruction on how to say no to sex (abstinence). The second question asked whether the respondent received any formal instruction about methods of birth control. Individuals who reported receiving instruction on both topics were classified as having received CSE. Respondents reporting learning about only abstinence or neither topic were classified as not having received CSE. We excluded any respondents indicating learning only about birth control without a discussion of abstinence, as their education was not consistent with the study definition of comprehensive programs or non-comprehensive programs.

TABLE 4: SEX EDUCATION CLASSIFICATION DISTRIBUTION IN THE SEXUALLY-ACTIVE STUDY SAMPLE.

	Frequency (n)	**Percent (%)**
Comprehensive Sex Education	1,404	70.91%
No Comprehensive Sex Education	576	29.09%
Total	1,980	100%

Timing of First Exposure to CSE

We then classified timing of first exposure to CSE through follow-up questions asking about what grade the respondent was in when he/she first learned about these sex education topics. The timing grade variable was determined by the grade in which respondents indicated instruction on birth control methods first occurred. We excluded any respondents indicating instruction on birth control methods before 6th grade, as this timing was not consistent with the study definitions of middle school and high school timing (n=143). Respondents indicating first exposure to birth control instruction in Middle School (grades 6-8) were classified as Middle School timing. Individuals who reported receiving instruction on contraception for the first time in High School (grades 9-12) were classified as High School timing. All individuals who were classified as not having received CSE were classified as the third timing group—no CSE.

TABLE 5: SEX EDUCATION TIMING CLASSIFICATION DISTRIBUTION IN THE STUDY SAMPLE.

	Frequency (n)	**Percent (%)**
No CSE	576	29.09%
Middle School Timing	768	38.79%
High School Timing	636	32.12%
Total	1,980	100%

Secondary Independent Variables

To identify the effect of CSE exposure timing on sexual health behaviors and outcomes, it is necessary to account for other factors that have previously been shown to be associated with sexual health behaviors and outcomes. Variables thought to affect these outcomes that were included in this study are: age, gender, race, academic achievement orientation, parental marital status, urbanicity, religious affiliation, income,

parental communication about sex, and maternal age at first birth. See table 6 for a description of the included secondary independent variables.

TABLE 6: SECONDARY INDEPENDENT VARIABLES INCLUDED IN THE ANALYSIS.

Variable Name	Type	Description
Age	Continuous	Full integer values, restricted to the range from 19 to 24.
Gender	Binary	Responses of male and female.
Education	Binary	Coded from responses about attainment of a high school degree or GED. Responses of attainment of a high school degree or GED and lack of attainment. This variable is a proxy for academic achievement orientation.
Intact Family	Binary	Parental marital status from birth to age 18 was used to determine status of family intactness. Responses of intact marriage and non-intact marriage.
Race/Ethnicity	Categorical	This variable included four categories: non-Hispanic White; non-Hispanic Black; Hispanic; and non-Hispanic other.
Maternal Education	Categorical	This variable included four categories representing maternal educational attainment: less than high school degree; high school degree; some college; and college degree or higher.
Urbanicity	Categorical	This variable reports the classification of residence at the time of interview. Three categories include: Metropolitan Statistical Area (MSA)-central city; MSA-non-city; and Non-MSA. This variable is a proxy for geographic location during teenage years.
Religious Affiliation	Binary	Self-report of religious affiliation was used to classify individuals as religious or not religious, regardless of denomination. This variable is a proxy for religiosity.
Income	Categorical	This variable included four categories of self-reported household income: <$25,000; $25,000-49,999; $50,000-74,999; and >$75,000. This variable was used as a proxy variable for SES during teenage years.
Parental Communication	Binary	This variable was created to represent communication with parents about sex, STDs, and contraception. The variable was broken into two categories, whether any topics were discussed or whether no topics were discussed.
Maternal Age at First Birth	Categorical	This variable represents maternal age at first birth. There were five categories: birth before age 18; age 18-19; age 20-24; age 25-29; and age 30 or above.

Analysis

To assess the effect of CSE and timing of first exposure to CSE on the probability of contraceptive use at first and last sex, we used the following probit model equation:

$$\Pr(Y=1|X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_i X_i + \varepsilon$$

Where:

β_1: CSE

β_2: Age

β_3: Gender
β_4: Education
β_5: Intact_Family
β_6: Black_Race
β_7: Hispanic_Race
β_8: Other_Race
β_9: Maternal_Ed_Less_HS
β_{10}: Maternal_Ed_HS
β_{11}: Maternal_Ed_College
β_{12}: Maternal_Age_First_Birth_U19
β_{13}: Matenal_Age_First_Birth_O30
β_{14}: MSA_Residence
β_{15}: Non-MSA_Residence
β_{16}: Religiosity
β_{17}: Income_25-50
β_{18}: Income_50-75
β_{19}: Income_O75

These models were also applied to the at-risk populations to capture the relationship between these variables among at-risk groups. Using a sample restricted to subjects receiving CSE (n=1,404), a similar regression model, replacing the independent variable of CSE with a CSE-timing variable, was applied to determine the relationship between CSE timing of exposure classification and the dependent variables. The first series of models examined the relationship between contraceptive use at first sex and the independent variables. While the second series of models examined the relationship between contraceptive use at last sex and the independent variables.

To assess the effect of CSE and timing of first exposure to CSE on contraceptive effectiveness choice at first sex, we used an ordered probit model. The distribution of contraceptive effectiveness was broken into four levels: 1) No contraceptive used, 2)

Low-effectiveness method, 3) Moderate-effectiveness method, 4) High-effectiveness method. We used the following ordered probit model equation:

$$\Pr(\text{Effectiveness Level}|X) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \ldots \beta_i X_I + \varepsilon$$

Where:

β_1: CSE
β_2: Age
β_3: Gender
β_4: Education
β_5: Intact_Family
β_6: Black_Race
β_7: Hispanic_Race
β_8: Other_Race
β_9: Maternal_Ed_Less_HS
β_{10}: Maternal_Ed_HS
β_{11}: Maternal_Ed_College
β_{12}: Maternal_Age_First_Birth_U19
β_{13}: Matenal_Age_First_Birth_O30
β_{14}: MSA_Residence
β_{15}: Non-MSA_Residence
β_{16}: Religiosity
β_{17}: Income_25-50
β_{18}: Income_50-75
β_{19}: Income_O75

Using an ordered probit model takes into account the multinomial construct of this categorical variable and was thereby expressed in terms of an underlying latent variable (y*) that included threshold values and cut off points within the four categories. Again, these models were also applied to the at-risk populations and the CSE-only population. The first series of models examined the relationship between contraceptive effectiveness at first sex and the independent variables. The second series of models examined the relationship between contraceptive effectiveness at last sex and the independent variables.

We calculate the marginal effects from the models and they are included in the results section. All models used the complex survey design function. The models used with the general sexually-active population were tested for multicollinearity, heteroskedasticity, and omitted variables. The variance inflation factor (VIF) method resulted in mean VIFs of 1.28, thereby indicating that multicollinearity is not a problem. The White test indicates that heteroskedasticity does exist in the model. Due to this heteroskedasticity, we used robust standard errors to more accurately estimate the standard errors. The results of the Ramsey RESET test were mixed between the four overarching models. For the model using contraceptive use at first sex, the test indicated that there are omitted variables, with a p-value of 0.0009. For the model using contraceptive use at last sex as the dependent variable the test indicated that there may be omitted variables, with a p-value of 0.0976. For the models using contraceptive effectiveness there was no indication of missing variables. Having omitted variables would result in biased coefficients that absorb some of the effects of the missing variables. Some of these omitted variables may not be measureable, for example attitudes about risk or peer influence, while others may be. However, given that the importance of these variables is mixed, including them could lead to over-fitting of the model.

All data formatting and preparation was performed using SAS software, version 9.2 of the SAS System for Windows. (Copyright © 2002-2008 SAS Institute Inc.) All analysis was performed using Stata Statistical Software, version 11. (StataCorp LP).

RESULTS

Descriptive Statistics

Individuals receiving CSE are more likely to be female, non-Hispanic white, go on to receive a high school degree, have a more educated mother, have a higher income, discuss sex with their parents, and have a mother who had her first child later in life when compared to individuals who do not receive CSE (Table 7).

TABLE 7: SAMPLE CHARACTERISTICS BY CSE CLASSIFICATION.

	Sample N=1,980 (100%)	CSE N=1,404 (70.91%)	No CSE N=576 (29.09%)	p-value
Age	21.53 (1.73)	21.51 (1.73)	21.60 (1.73)	0.2507
Gender				
Female	56.77%	58.97%	51.39%	0.0020**
Male	43.23%	41.03%	48.61%	0.0020**
Educational Attainment				
No HS Degree	18.18%	15.31%	25.17%	<0.0001**
HS degree or higher	81.82%	84.69%	74.83%	<0.0001**
Parental Marital Status				
Non-Intact	47.42%	47.22%	47.92%	0.7787
Intact	52.58%	52.78%	52.08%	0.7787
Race/Ethnicity				
Non-Hispanic White	52.58%	54.49%	47.92%	0.0078**
Non-Hispanic Black	20.61%	19.66%	22.92%	0.1035
Hispanic	22.37%	21.51%	24.48%	0.1499
Non-Hispanic Other	4.44%	4.34%	4.69%	0.7368
Maternal Education				
Less than HS	18.88%	16.63%	24.39%	<0.0001**
HS degree	31.30%	30.75%	32.63%	0.4483
Some college	27.38%	28.67%	24.21%	0.0395**
College degree	22.44%	23.94%	18.77%	0.0113**
Urbanicity				
MSA- Central City	44.19%	43.95%	44.79%	0.7307
MSA	35.76%	37.61%	31.25%	0.0074**
Non-MSA	20.05%	18.45%	23.96%	0.0054**
Religion				
No Affiliation	23.13%	24.86%	18.92%	0.0045**
Affiliated	76.87%	75.14%	81.08%	0.0045**
Income				
<$25,000	39.65%	37.89%	43.92%	0.0127**
$25,000-49,999	28.99%	28.35%	30.56%	0.3254
$50,000-74,999	16.67%	17.81%	13.89%	0.0336**
>$75,000	14.70%	15.95%	11.63%	0.0136**
Parental Communication				

Sex Not Discussed	33.74%	29.99%	42.88%	<0.0001**
Sex Discussed	66.26%	70.01%	57.12%	<0.0001**
Maternal Age at Birth				
19 or Younger	32.93%	31.48%	36.46%	0.0323**
20-29	56.82%	57.48%	55.21%	0.3543
30 or Older	8.94%	9.69%	7.12%	0.0688*

Note: * p<0.10 **p<0.05

Sexual behaviors also differ across CSE and non-CSE classification groups (Table 8). Individuals receiving CSE are not only significantly more likely than individuals not receiving CSE to use contraceptives at both first and last sex, but also use more effective methods of contraception at both timings.

TABLE 8: CONTRACEPTIVE USE BEHAVIORS BY CSE CLASSIFICATION.

	Sample N=1,980 (100%)	CSE N=1,404 (70.57%)	No CSE N=576 (29.43%)	p-value
Contraception at First Sex				
Not Used	20.05%	17.38%	26.56%	<0.0001**
Used	79.95%	82.62%	73.44%	<0.0001**
Contraception at Last Sex				
Not Used	18.11%	15.86%	23.64%	<0.0001**
Used	81.89%	84.14%	76.36%	<0.0001**
First Sex- Method Effectiveness				
None	20.05%	17.38%	26.56%	<0.0001**
Low	2.53%	2.14%	3.47%	0.0854*
Moderate	55.66%	57.69%	50.69%	0.0044**
High	21.77%	22.79%	19.27%	0.0846*
Last Sex- Method Effectiveness				
None	18.11%	15.86%	23.64%	<0.0001**
Low	6.74%	6.38%	7.64%	0.3200
Moderate	30.10%	32.68%	27.82%	0.0609*
High	45.71%	47.66%	40.91%	0.0073**

Note: * p<0.10 **p<0.05

Specific at-risk groups were identified from the literature. For this study we focused on three at-risk populations commonly identified in previous research—populations of Black subjects, Hispanic subjects, and subjects with teen mothers (mothers who had their first child before the age of twenty). These at-risk populations differ in both sample characteristics (Appendix A) and outcome behaviors (Table 9). Black subjects are more likely to drop out of high school, come from a non-intact family, live in a city, report a religious affiliation, have a lower income, and have a teen mother than

non-Black subjects. Hispanic subjects are more likely than non-Hispanics to be male, have no high school degree, live in a city, have less educated and younger mothers, and never discuss sex with their parents. Children of teen mothers were more likely to be female, have no high school degree, be of a minority race, have less educated mothers, and come from lower incomes than children with mothers who had their first child after entering their twenties.

At first sex, all three at-risk populations had significantly lower use of contraceptives, in general, and had lower use of contraceptives classified as high-effectiveness. At last sex, Hispanic subjects were not significantly less likely to use contraceptives, but did have significantly lower rates of use of high-effectiveness methods. Black subjects and subjects with teen mothers were significantly less likely to use contraceptives and also used significantly less effective contraceptive methods at this timing.

TABLE 9: CONTRACEPTIVE USE BEHAVIORS FOR AT-RISK POPULATIONS.

	Sample N=1,980 (100%)	Black N=408 (20.61%)	Hispanic N=443 (22.37%)	Teen Mothers N=652 (33.37%)
Contraception at First Sex				
Not Used	20.05%	25.74%**	25.28%**	28.53%**
Used	79.95%	74.26%**	74.72%**	71.47%**
Contraception at Last Sex				
Not Used	18.11%	25.70%**	20.67%	26.93%**
Used	81.89%	74.30%**	79.33%	73.07%**
First Sex- Method Effectiveness				
None	20.05%	25.74%**	25.28%**	28.53%**
Low	2.53%	1.23%*	2.71%	2.30%
Moderate	55.66%	58.09%	59.37%*	50.77%**
High	21.77%	14.95%**	12.64%**	18.40%**
Last Sex- Method Effectiveness				
None	18.11%	25.70%**	20.67%	26.93%**
Low	6.74%	6.11%	8.31%	5.20%*
Moderate	29.44%	34.10%**	33.02%*	27.40%
High	45.71%	34.10%**	38.00%**	40.47%**

Note: *p<0.10 **p<0.05
Significance levels are in comparison to non-Black/non-Hispanic/non-teen mother samples

We also investigated the role of timing of first exposure to CSE on the outcomes of interest, and therefore constructed a CSE-only sample population to analyze the effects of first exposure timing. This sample included 1,404 subjects. Early timing of first exposure to CSE was defined as first receiving CSE in middle school (grade 6-8). Later timing was defined as receiving CSE in high school (grade 9-12). Individuals receiving CSE during middle school were more likely to be white, have no high school degree, and come from a non-intact family than individuals receiving CSE in high school. However there were no significant differences between the two timing of exposure groups on use of contraceptives at the $p<0.05$ significance level (Appendix A).

The main factors analyzed in this study are contraceptive use at first sex, contraceptive use at last sex, and contraceptive effectiveness level at first and last sex. Analyses of contraceptive use rates were modeled using probit regression models, while analyses of contraceptive effectiveness levels were modeled using ordered probit regression models.

Contraceptive Use at First Sex

The results of the first series of probit models support our initial hypothesis that CSE is significantly ($p<0.05$) associated with increased contraceptive use at first sex. However the results for the at-risk populations were mixed and do not fully support the hypothesis that CSE increases contraceptive use in at-risk populations at a greater magnitude. Finally the results for the CSE-only population do not support the hypothesis that an earlier exposure to CSE results in increased use of contraception at first sex.

TABLE 10: PROBIT MODEL WITH CONTRACEPTIVE USE AT FIRST SEX AS DEPENDENT VARIABLE.

	General Population		*Black Population*		*Hispanic Population*		*Children of Teen Mothers Population*	
Variable	*Coef (SE)*	*ME (SE)*	*Coef (SE)*	*ME (SE)*	Coef (SE)	*ME (SE)*	*Coef (SE)*	*ME (SE)*
CSE	0.230**	0.059*	0.205	0.059	0.380*	0.109*	0.253	0.081
	(0.11)	(0.03)	(0.18)	(0.05)	(0.20)	(0.06)	(0.17)	(0.06)
Age	0.077**	0.019**	0.077	0.021	0.035	0.009	0.031	0.010
	(0.03)	(0.01)	(0.05)	(0.01)	(0.04)	(0.01)	(0.04)	(0.01)
Male	0.293**	0.071**	0.471**	0.131**	0.884**	0.250**	0.522**	0.160**
	(0.11)	(0.03)	(0.18)	(0.05)	(0.22)	(0.06)	(0.17)	(0.05)
HS degree or higher	0.159	0.041	0.101	0.029	0.398*	0.114*	0.071	0.022
	(0.16)	(0.04)	(0.22)	(0.07)	(0.21)	(0.06)	(0.18)	(0.06)
Intact Family	0.010	0.003	-0.188	-0.054	-0.106	-0.028	-0.158	-0.049
	(0.11)	(0.03)	(0.20)	(0.06)	(0.20)	(0.05)	(0.15)	(0.05)
Race								
Black	-0.194	-0.050	-	-	-	-	-0.418**	-0.139**
	(0.14)	(0.04)					(0.18)	(0.07)
Hispanic	-0.190	-0.049	-	-	-	-	-0.425**	-0.139*
	(0.14)	(0.04)					(0.22)	(0.07)
Other	-0.181	-0.047	-	-	-	-	-0.690*	-0.251
	(0.24)	(0.07)					(0.40)	(0.16)
Maternal Education								
Less than HS	0.081	0.019	0.497*	0.118**	0.404	0.109	0.286	0.085
	(0.16)	(0.04)	(0.30)	(0.06)	(0.28)	(0.08)	(0.23)	(0.06)
HS degree	0.138	0.033	0.202	0.055	0.648**	0.151**	0.219	0.067
	(0.12)	(0.03)	(0.23)	(0.06)	(0.30)	(0.06)	(0.21)	(0.06)
College degree	0.035	0.008	-0.027	-0.008	0.406	0.095	0.551	0.142*
	(0.17)	(0.04)	(0.28)	(0.08)	(0.47)	(0.09)	(0.39)	(0.08)
Maternal Age at Birth								
19 or Younger	-0.242**	-0.062**	-0.426**	-0.122**	-0.317	-0.087	-	-
	(0.11)	(0.03)	(0.18)	(0.05)	(0.22)	(0.06)		
30 or Older	0.316*	0.067*	0.126	0.034	-0.588	-0.194	-	-
	(0.19)	(0.04)	(0.50)	(0.13)	(0.50)	(0.19)		
Urbanicity								
MSA	-0.258**	-0.065**	-0.693**	-0.217**	0.041	0.011	-0.071	-0.022
	(0.12)	(0.03)	(0.21)	(0.07)	(0.21)	(0.06)	(0.19)	(0.06)
Non-MSA	-0.139	-0.035	-0.488*	-0.152*	-0.574*	-0.183	-0.190	-0.061
	(0.14)	(0.04)	(0.26)	(0.09)	(0.31)	(0.11)	(0.21)	(0.07)
Religiosity	0.237*	0.062*	0.402	0.127	0.141	0.040	0.551**	0.186**
	(0.13)	(0.03)	(0.28)	(0.10)	(0.24)	(0.07)	(0.19)	(0.07)
Income								
$25,000-49,999	0.063	0.015	0.235	0.063	-0.508**	-0.149**	-0.111	-0.035
	(0.12)	(0.03)	(0.22)	(0.06)	(0.21)	(0.07)	(0.17)	(0.06)
$50,000-74,999	0.313**	0.068**	-0.174	-0.051	0.141	0.037	0.372	0.105*
	(0.14)	(0.03)	(0.26)	(0.08)	(0.35)	(0.09)	(0.24)	(0.06)
>$75,000	0.157	0.036	-0.163	-0.048	0.140	0.036	0.237	0.068
	(0.17)	(0.04)	(0.32)	(0.10)	(0.32)	(0.08)	(0.31)	(0.08)
Sex Discussed with Parents	0.154	0.038	0.097	0.028	0.230	0.063	0.358**	0.115**
	(0.10)	(0.03)	(0.19)	(0.05)	(0.20)	(0.05)	(0.16)	(0.05)

*p<0.10 **p<0.05

In the general population, the results indicate that when an individual receives CSE, contraceptive use at first sex increases by 5.9 percentage points. The other significant independent variables in the model included age, gender, age of mother at first birth, urbanicity, religiosity, and income. All coefficient signs were in the expected direction, agreeing with previous literature. Being older at first sex, male, reporting a higher income and affiliating with a religion were associated with increased contraceptive use. Having a mother who gave birth before the age of twenty and living outside a city were associated with decreased rates of use. The variables with the greatest magnitude of effect were gender and urbanicity. Table 10 presents the results for the general population as well as the at-risk populations.

For black and children of teen mothers at-risk populations there was no significant association between contraceptive use at first sex and CSE. However, coefficients were both in the expected direction. For the Hispanic at-risk population, results indicate that CSE is moderately significant ($p<0.10$) in relation to increased contraceptive use at first sex. For this population, the results indicate that when an individual receives CSE, contraceptive use at first sex increases by 10.9 percentage points. This is higher than the marginal effect for the general population (5.9) indicating that CSE may be more effective at enacting change for this at-risk population, and therefore supporting the hypothesis that CSE enacts increases in contraceptive use at first sex of greater magnitude in the Hispanic at-risk population than in the general population. Among the at-risk populations, being male was the only consistent significant protective factor. Among the Black population, having a mother who was a teen mother and living outside a city were both associated with lower contraceptive use. For the Hispanic population,

higher educational attainment was associated with increased contraceptive use. For the children of teen mothers, being of a minority race was associated with decreased use, while reporting a religious affiliation and communicating with parents about sex was associated with increased use. For all three populations, gender again had the greatest magnitude of effect. For the CSE-only population there was no significant relationship between contraceptive use at first sex and CSE timing. See Appendix B for the full results.

Contraceptive Use at Last Sex

The results of the second series of probit models support our initial hypothesis that CSE is significantly ($p<.0.05$) associated with increased contraceptive use at last sex. However the results for the at-risk populations were again mixed and do not fully support the hypothesis that CSE increases contraceptive use in at-risk populations at a greater magnitude. Finally, the results for the CSE-only population do not support the hypothesis that an earlier exposure to CSE results in increased use of contraception at last sex.

In the general population, the results indicate that when an individual receives CSE, contraceptive use at last sex increases by 7.7 percentage points. The other significant variables included age, gender, education, and parental marital status. Being male, holding a high school degree, and having an intact family were associated with increased use at last sex. Unlike contraceptive use at first sex, age was negatively related to contraceptive use. The variables with the greatest magnitude of effect were gender and educational attainment. Table 11 presents the regression results for the general and at-risk populations.

TABLE 11: PROBIT MODEL WITH CONTRACEPTIVE USE AT LAST SEX AS DEPENDENT VARIABLE.

	General Population		*Black Population*		*Hispanic*		*Children of Teen Mothers Population*	
Variable	*Coef (SE)*	*ME (SE)*	*Coef (SE)*	*ME (SE)*	Coef (SE)	*ME (SE)*	*Coef (SE)*	*ME (SE)*
CSE	0.326**	0.077**	0.469**	0.142*	0.044	0.012	-0.161	-0.048
	(0.12)	(0.03)	(0.23)	(0.07)	(0.21)	(0.06)	(0.17)	(0.05)
Age	-0.107**	-0.024**	0.048	0.014	-0.043	-0.012	-0.121**	-0.037**
	(0.03)	(0.01)	(0.05)	(0.02)	(0.05)	(0.01)	(0.04)	(0.01)
Male	0.362**	0.081**	0.599**	0.173**	0.538**	0.154**	0.217	0.066
	(0.11)	(0.02)	(0.20)	(0.05)	(0.19)	(0.05)	(0.15)	(0.05)
HS degree or higher	0.347**	0.086**	0.056	0.016	0.440*	0.128*	0.189	0.059
	(0.15)	(0.04)	(0.22)	(0.07)	(0.23)	(0.07)	(0.16)	(0.05)
Intact Family	0.233**	0.053*	-0.244	-0.072	-0.048	-0.013	0.204	0.062
	(0.12)	(0.03)	(0.22)	(0.07)	(0.21)	(0.06)	(0.16)	(0.05)
Race								
Black	-0.195	-0.046	-	-	-	-	0.084	0.025
	(0.15)	(0.04)					(0.19)	(0.06)
Hispanic	-0.170	-0.040	-	-	-	-	-0.100	-0.031
	(0.14)	(0.04)					(0.21)	(0.07)
Other	0.161	0.033	-	-	-	-	-0.321	-0.108
	(0.25)	(0.05)					(0.39)	(0.14)
Maternal Education								
Less than HS	-0.133	-0.031	-0.313	-0.098	-0.252	-0.069	-0.470**	-0.151*
	(0.17)	(0.04)	(0.33)	(0.11)	(0.28)	(0.08)	(0.24)	(0.08)
HS degree	-0.073	-0.016	-0.115	-0.034	-0.235	-0.068	-0.139	-0.043
	(0.13)	(0.03)	(0.25)	(0.07)	(0.29)	(0.09)	(0.21)	(0.06)
College degree	0.057	0.012	0.402	0.104	0.271	0.067	-0.621*	-0.218
	(0.19)	(0.04)	(0.30)	(0.07)	(0.42)	(0.09)	(0.36)	(0.14)
Maternal Age at Birth								
19 or Younger	-0.232*	-0.054	0.271	0.077	-0.066	-0.018	-	-
	(0.13)	(0.03)	(0.20)	(0.06)	(0.22)	(0.06)		
30 or Older	0.314	0.060	0.509	0.119	-0.248	-0.075	-	-
	(0.24)	(0.04)	(0.61)	(0.11)	(0.63)	(0.21)		
Urbanicity								
MSA	0.064	0.014	-0.058	-0.017	-0.421**	-0.116**	0.539**	0.156**
	(0.12)	(0.03)	(0.24)	(0.07)	(0.20)	(0.06)	(0.18)	(0.05)
Non-MSA	0.075	0.016	0.176	0.048	-0.255	-0.076	-0.077	-0.024
	(0.14)	(0.03)	(0.28)	(0.07)	(0.36)	(0.11)	(0.20)	(0.06)
Religiosity	-0.009	-0.002	-0.177	-0.048	-0.044	-0.012	0.272	0.087
	(0.13)	(0.03)	(0.24)	(0.06)	(0.26)	(0.07)	(0.18)	(0.06)
Income								
$25,000-49,999	-0.103	-0.023	0.229	0.064	-0.105	-0.029	-0.126	-0.039
	(0.12)	(0.03)	(0.25)	(0.07)	(0.22)	(0.06)	(0.17)	(0.05)
$50,000-74,999	0.073	0.016	0.172	0.047	0.606*	0.138**	0.189	0.055
	(0.18)	(0.04)	(0.27)	(0.07)	(0.33)	(0.06)	(0.24)	(0.06)
>$75,000	0.290*	0.057*	0.135	0.037	0.470	0.110	0.296	0.082
	(0.17)	(0.03)	(0.38)	(0.10)	(0.38)	(0.07)	(0.37)	(0.09)
Sex Discussed with Parents	0.026	0.006	-0.336	-0.098	0.054	0.015	0.143	0.044
	(0.11)	(0.02)	(0.22)	(0.11)	(0.20)	(0.06)	(0.16)	(0.05)
Constant	2.598**		-0.376		1.289		2.880**	
	(0.67)		(0.92)		(0.96)		(0.95)	

*p<0.10 **p<0.05

For the Hispanic and children of teen mothers at-risk populations, there was no significant association between contraceptive use at last sex and CSE. However, for the

Black at-risk population, there was a significant ($p<0.05$) relationship between CSE and contraceptive use at last sex. The results indicate that when a Black individual receives CSE, contraceptive use at last sex increases by 14.2 percentage points. This is greater than the marginal effect for the general population (7.7), indicating that CSE may be more effective at enacting change for the Black population, thereby supporting the hypothesis that CSE may increase contraceptive use to a greater magnitude among at-risk populations than among the general population. Among the Black population the only other significant variable was gender, with males having significantly higher rates of use. Among the Hispanic population, significant variables include gender, educational attainment, and urbanicity. Among the children of teen mothers population age, maternal education, and urbanicity were all significantly related to contraceptive use at last sex.

For the CSE-only population again there was no significant relationship between contraceptive use at last sex and CSE timing. The variables that remained significant included age, gender, Hispanic race, and maternal age at first birth. Maternal age at first birth had the greatest magnitude of effect (Appendix B).

Contraceptive Effectiveness at First Sex

An ordered probit regression model was used to estimate the likelihood of a subject using contraception of a certain level of effectiveness at first and last sex. While we cannot directly interpret the ordered probit coefficients, we are able to analyze the overall trends and the marginal effects on use of each effectiveness category. In the general population, the results support our initial hypothesis that CSE is significantly related to contraceptive effectiveness at first sex.

TABLE 12: ORDERED PROBIT MODEL WITH CONTRACEPTIVE USE EFFECTIVENESS AT FIRST SEX AS DEPENDENT VARIABLE AMONG GENERAL POPULATION.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.157*	-0.039	-0.004	-0.002	0.045*
	(0.09)	(0.02)	(0.00)	(0.00)	(0.03)
Age	0.099**	-0.024**	-0.002**	-0.003	0.029**
	(0.02)	(0.00)	(0.00)	(0.00)	(0.01)
Male	0.087	-0.021	-0.002	-0.002	0.025
	(0.08)	(0.02)	(0.00)	(0.00)	(0.02)
HS degree or higher	0.167	-0.043	-0.004	-0.000	0.047
	(0.12)	(0.03)	(0.00)	(0.00)	(0.03)
Intact Family	0.038	-0.009	-0.001	-0.001	0.011
	(0.08)	(0.02)	(0.00)	(0.00)	(0.02)
Race					
Black	-0.272**	0.072**	0.006**	-0.005	-0.073**
	(0.11)	(0.03)	(0.00)	(0.01)	(0.03)
Hispanic	-0.356**	0.096**	0.008**	-0.009	-0.095**
	(0.10)	(0.03)	(0.00)	(0.01)	(0.03)
Other	-0.207	0.055	0.005	-0.004	-0.056
	(0.20)	(0.06)	(0.00)	(0.01)	(0.05)
Maternal Education					
Less than HS	0.009	-0.002	-0.000	-0.000	0.002
	(0.13)	(0.03)	(0.00)	(0.00)	(0.04)
HS degree	0.066	-0.016	-0.002	-0.002	0.019
	(0.10)	(0.02)	(0.00)	(0.00)	(0.03)
College degree	0.107 (	-0.025	-0.002	-0.004	0.032
	0.12)	(0.03)	(0.00)	(0.01)	(0.04)
Maternal Age at Birth					
19 or Younger	-0.170**	0.043**	0.004*	0.002	-0.048**
	(0.08)	(0.02)	(0.00)	(0.00)	(0.02)
30 or Older	0.125	-0.029	-0.003	-0.006	0.038
	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)
Urbanicity					
MSA	-0.206**	0.051**	0.005**	0.003	-0.059**
	(0.09)	(0.02)	(0.00)	(0.00)	(0.03)
Non-MSA	-0.018	0.004	0.000	0.000	-0.005
	(0.11)	(0.03)	(0.00)	(0.00)	(0.03)
Religiosity	0.194**	-0.050*	-0.004*	-0.000	0.054**
	(0.09)	(0.03)	(0.00)	(0.00)	(0.03)
Income					
$25,000-49,999	0.020	-0.005	-0.000	-0.001	0.006
	(0.09)	(0.02)	(0.00)	(0.00)	(0.03)
$50,000-74,999	0.177	-0.041*	-0.004	-0.009	0.054
	(0.11)	(0.02)	(0.00)	(0.01)	(0.03)
>$75,000	0.142	-0.033	-0.003	-0.007	0.043
	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)
Sex Discussed with Parents	0.119	-0.030	-0.003	-0.002	0.034
	(0.08)	(0.02)	(0.00)	(0.00)	(0.02)

* p<0.10 **p<0.05

For the general population, CSE is moderately significant (p<0.10) in relation to contraceptive effectiveness at first sex. The results indicate that when an individual receives CSE, the individual has a higher likelihood of using more effective contraceptive

methods. Specifically, the individual has a higher likelihood of using a contraceptive method categorized as high-effectiveness. Table 12 provides the results of the ordered probit regression of general population sample. Age and religiosity also significantly increased the likelihood of choosing more effective methods of contraceptives. Black race, Hispanic race, having a teen mother, and living outside of a city significantly decreased the likelihood of using more effective methods of contraceptives. Hispanic race had the greatest effect on contraceptive effectiveness level.

Again, however, the results for the at-risk groups were mixed and do not wholly support the hypothesis that CSE increases contraceptive effectiveness level at first sex in at-risk populations at a greater magnitude than for the general population. For the children of teen mothers at-risk population there was a significant relationship ($p<0.05$) between contraceptive effectiveness at first sex and CSE. As displayed in Table 13, the results indicate that for children of teen mothers that receive CSE, the likelihood of using contraceptives classified as high-effectiveness increases by 5.3 percentage points, while use of moderate-effectiveness contraceptive methods also increases. These marginal effects are greater than that of the general population, and have higher significance levels, indicating that CSE may increase use of high-effectiveness contraceptives more substantially among children of teen mothers than among the general population. For the Black and Hispanic at-risk populations there was no significant relationship between CSE and contraceptive effectiveness at first sex (Appendix C).

TABLE 13: ORDERED PROBIT MODEL WITH CONTRACEPTIVE USE EFFECTIVENESS AT FIRST SEX AS DEPENDENT VARIABLE AMONG AT-RISK CHILDREN OF TEEN MOTHERS POPULATION.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.262**	-0.086**	-0.005	0.037*	0.053**
	(0.13)	(0.04)	(0.00)	(0.02)	(0.03)
Age	0.049	-0.016	-0.001	0.006	0.011
	(0.03)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.163	-0.052	-0.003	0.020	0.035
	(0.12)	(0.04)	(0.00)	(0.01)	(0.03)
HS degree or higher	0.117	-0.038	-0.002	0.015	0.025
	(0.14)	(0.05)	(0.00)	(0.02)	(0.03)
Intact Family	-0.113	0.036	0.002	-0.014	-0.024
	(0.13)	(0.04)	(0.00)	(0.02)	(0.03)
Race					
Black	-0.192	0.063	0.003	-0.028	-0.039
	(0.15)	(0.05)	(0.00)	(0.02)	(0.03)
Hispanic	-0.209	0.068	0.004	-0.029	-0.043
	(0.16)	(0.05)	(0.00)	(0.03)	(0.03)
Other	-0.282	0.097	0.004	-0.049	-0.052
	(0.43)	(0.16)	(0.01)	(0.10)	(0.07)
Maternal Education					
Less than HS	0.108	-0.034	-0.002	0.012	0.024
	(0.18)	(0.06)	(0.00)	(0.02)	(0.04)
HS degree	0.155	-0.049	-0.003	0.018	0.034
	(0.18)	(0.06)	(0.00)	(0.02)	(0.04)
College degree	0.189	-0.057	-0.004	0.017	0.044
	(0.24)	(0.07)	(0.01)	(0.01)	(0.06)
Urbanicity					
MSA	-0.046	0.015	0.001	-0.006	-0.010
	(0.14)	(0.04)	(0.00)	(0.02)	(0.03)
Non-MSA	0.117	-0.037	-0.002	0.013	0.026
	(0.19)	(0.06)	(0.00)	(0.02)	(0.04)
Religiosity	0.186	-0.061	-0.003	0.027	0.038
	(0.17)	(0.06)	(0.00)	(0.03)	(0.03)
Income					
$25,000-49,999	-0.128	0.041	0.002	-0.017	-0.027
	(0.14)	(0.05)	(0.00)	(0.02)	(0.03)
$50,000-74,999	0.351*	-0.103**	-0.007	0.025**	0.085*
	(0.18)	(0.05)	(0.00)	(0.01)	(0.05)
>$75,000	0.057	-0.018	-0.001	0.006	0.013
	(0.19)	(0.06)	(0.00)	(0.02)	(0.04)
Sex Discussed with Parents	0.338**	-0.111**	-0.006*	0.048**	0.069**
	(0.13)	(0.04)	(0.00)	(0.02)	(0.02)

* p<0.10 **p<0.05

Thirdly, the results for the CSE-only population do not support the hypothesis that an earlier exposure to CSE results in increased effectiveness level of contraception at first sex. There was no significant relationship between CSE-timing and contraceptive effectiveness level at this timing. The variables that remained significant included age,

Black race, Hispanic race, and urbanicity. Hispanic race had the greatest magnitude of effect (Appendix B).

Contraceptive Effectiveness at Last Sex

The results of the second series of ordered probit models support our initial hypothesis that CSE is significantly ($p<0.05$) associated with increased contraceptive effectiveness at last sex. There were no significant relationships for any of the at-risk groups or for the CSE-only population.

In the general population, CSE was significantly ($p<0.05$) associated with contraceptive effectiveness at last sex. The results indicate that when an individual receives CSE the individual has a higher likelihood of using more effective contraceptive methods at this timing. Specifically, the individual has a higher likelihood of using a contraceptive method categorized as high-effectiveness, and lower likelihood of using contraceptives classified as mid, low, or no effectiveness. The results indicate that the likelihood of an individual receiving CSE to use a contraceptive method classified as high-effectiveness increases by 10.5 percentage points. Gender and having an income over $75,000 also significantly increased likelihood of using more effective methods. Variables of Black race, Hispanic race, and maternal education of a high school degree were all significantly related to decreased likelihood of using more effective methods. Table 14 presents the full results of the regression model.

Although there was no significant relationship between CSE and contraceptive effectiveness at last sex for the at-risk populations, coefficients and marginal effects were in the expected direction for the Black and Hispanic populations. Having a higher income

remained a very strong indicator of higher effectiveness usage. See Appendix C for the full regression results.

TABLE 14: ORDERED PROBIT MODEL WITH CONTRACEPTIVE USE EFFECTIVENESS AT LAST SEX AS DEPENDENT VARIABLE AMONG GENERAL POPULATION.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.266**	-0.065**	-0.014**	-0.026**	0.105**
	(0.09)	(0.02)	(0.01)	(0.01)	(0.04)
Age	-0.034	0.008	0.002	0.004	-0.014
	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.231**	-0.054**	-0.012**	-0.026**	0.092**
	(0.09)	(0.02)	(0.00)	(0.01)	(0.03)
HS degree or higher	0.200	-0.049	-0.010	-0.019*	0.079
	(0.13)	(0.03)	(0.01)	(0.01)	(0.05)
Intact Family	0.134	-0.031	-0.007	-0.015	0.053
	(0.09)	(0.02)	(0.00)	(0.01)	(0.04)
Race					
Black	-0.376**	0.099**	0.019**	0.029**	-0.147**
	(0.12)	(0.03)	(0.01)	(0.01)	(0.05)
Hispanic	-0.301**	0.077**	0.016**	0.026**	-0.118**
	(0.12)	(0.03)	(0.01)	(0.01)	(0.05)
Other	-0.296*	0.078*	0.015*	0.022**	-0.116*
	(0.16)	(0.05)	(0.01)	(0.01)	(0.06)
Maternal Education					
Less than HS	-0.033	0.008	0.002	0.004	-0.013
	(0.15)	(0.04)	(0.01)	(0.02)	(0.06)
HS degree	-0.228**	0.055**	0.012**	0.023**	-0.090**
	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)
College degree	0.047	-0.011	-0.003	-0.005	0.019
	(0.13)	(0.03)	(0.01)	(0.02)	(0.05)
Maternal Age at Birth					
19 or Younger	-0.127	0.030	0.007	0.014	-0.050
	(0.11)	(0.03)	(0.01)	(0.01)	(0.04)
30 or Older	0.200	-0.042	-0.011	-0.026	0.079
	(0.14)	(0.03)	(0.01)	(0.02)	(0.06)
Urbanicity					
MSA	-0.104	0.024	0.006	0.011	-0.041
	(0.09)	(0.02)	(0.00)	(0.01)	(0.04)
Non-MSA	0.080	-0.018	-0.004	-0.009	0.032
	(0.12)	(0.03)	(0.01)	(0.01)	(0.05)
Religiosity	0.134	-0.032	-0.007	-0.014	0.053
	(0.10)	(0.03)	(0.01)	(0.01)	(0.04)
Income					
$25,000-49,999	-0.085	0.020	0.005	0.009	-0.034
	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)
$50,000-74,999	0.074	-0.017	-0.004	-0.009	0.029
	(0.12)	(0.03)	(0.01)	(0.02)	(0.05)
>$75,000	0.362**	-0.074**	-0.019**	-0.050**	0.143**
	(0.13)	(0.02)	(0.01)	(0.02)	(0.05)
Sex Discussed with Parents	0.078	-0.018	-0.004	-0.009	0.031
	(0.08)	(0.02)	(0.00)	(0.01)	(0.03)

* $p<0.10$ **$p<0.05$

Among the CSE-only population, significant variables in the model included Black race, Hispanic race, other minority race, maternal education, maternal age at first birth and income. Income and race had the largest marginal effects on use of high-effectiveness categories of contraception. See Appendix B for the full results.

DISCUSSION

This study measured the effect of receiving CSE on contraceptive behaviors. The major findings of this analysis support the hypotheses that receiving CSE results in higher rates of contraceptive use and greater likelihood of using of more effective contraceptive methods. With regard to the sub-hypotheses, we had mixed results concerning the relationship between CSE and contraceptive behaviors for at-risk groups and found no evidence of a relationship between timing of first exposure to CSE and contraceptive behavioral outcomes.

To our knowledge, this analysis is the first to evaluate the effectiveness of CSE programs using a multi-level contraceptive effectiveness outcome variable. It is also, to our knowledge, the first to explicitly examine the role of timing of first exposure to CSE on resultant behaviors.

Key Findings

In the general population we found statistically significant relationships between CSE and contraceptive use and contraceptive effectiveness at first and last sex. The consistency of the relationship between CSE and contraceptive behavior into young adulthood indicates that the lessons and resultant effects of CSE are not short-lived. These effects last into young adulthood and continue to affect contraceptive use patterns among the general population. These results support the bulk of research on sex

education, which finds CSE programs to be more effective than abstinence-only programs, due to their ability to increase overall contraceptive use. Our analysis also examined the role of CSE in affecting the choice of contraceptive methods. Not only were individuals receiving CSE more likely to use contraceptives overall, they were also specifically more likely to use contraceptives classified as highly effective and less likely to use moderate and low-effectiveness contraceptives. These choices significantly decrease the chance of an unintended pregnancy and the associated negative outcomes. This outcome measure has not, to our knowledge, been used before to explicitly evaluate the effectiveness of sex education programs.

The results for the at-risk groups were mixed. Each at-risk group showed improvement over the general population in one outcome, but not all four, due to receiving CSE. However, for each at-risk group, the relationships between CSE and the other three outcomes, though in the expected directions, were insignificant. These results indicate that the relationship between receiving CSE and contraceptive behaviors differs for at-risk individuals and the general population. This is in agreement with previous literature that focuses on the importance of specially tailoring programs to specific at-risk groups.

While CSE is important in improving contraceptive behaviors among teens, other covariates had greater magnitudes of effect on the outcomes and may have the potential to improve behaviors even further. The relationships between these variables and the outcomes agree with the previous literature on the topic with contraceptive behaviors showing significant associations to gender, urbanicity, race/ethnicity, and income.

In regards to our timing of exposure sub-hypotheses, we found no significant results concerning the timing of first exposure to CSE and contraceptive behaviors. However, we believe that this is largely due to a weakness in the timing construct, which we will discuss in the limitations section. Of note however, is that an earlier timing of first exposure to CSE does not negatively affect outcomes, allaying the fears of many parents and policymakers.

Study Implications

The past few years have seen a federal movement away from abstinence-only education and towards CSE and other evidence-based pregnancy prevention programs. When evaluating such programs it is important that, in addition to traditional outcome measures (i.e. overall contraceptive use, age of initiation, frequency of sex, number of partners, etc.), contraceptive effectiveness be used as evaluating criteria. Not all use of contraceptives is equal—as different methods have varying levels of effectiveness—yet in evaluative studies it is currently treated as so. The majority of evaluations currently group all contraceptive use together. Yet, there is a big difference between withdrawal's 27% typical failure rate and an implant's 0.05%. These significant differences should be reflected in the outcome measures of contraceptive/policy evaluations.

Furthermore, while CSE programs require financial investment, they provide social benefits that may balance out these costs in the long-term. Very few studies examine the long-term benefits of CSE programs, but our study is in agreement with another recent study suggesting a steady stream of benefits into young adulthood (Rosenthal, Ross et al. 2009). This result indicates that future studies on the cost-

effectiveness of CSE programs should examine not only immediate benefits, but also long-term benefits.

Our results for the at-risk groups indicate that there is evidence to suggest that CSE can increase use and effectiveness for these groups at significantly greater magnitudes than the general population. These facts indicate that at-risk groups could benefit more from specially tailored CSE interventions.

In addition to CSE, gender, urbanicity, race/ethnicity, and income were all consistently significantly related to outcomes, agreeing with previous literature. While many of the antecedents cannot be altered directly via intervention, some of these factors can possibly be targeted through alternative approaches that could be integrated into CSE programs. Gender was significantly related to contraceptive behaviors at first and last sex—being male increased overall contraceptive use among all populations and increased use of more effective methods. This may be due to the fact that it is often considered more socially acceptable for males to initiate the use of contraceptives—specifically condoms. Urbanicity also had a large effect at first sex among the populations, with living outside of a city resulting in lower use and lower effectiveness of contraceptives. This finding points to the importance of location in determining community norms surrounding teen sexual behaviors. This finding also raises the issue of access, as teens residing in cities may have greater access to higher effectiveness contraceptives. Racial minority status decreased the likelihood of using effective contraceptives at both timings, as did having a teen mother. These relationships remained even after we controlled for income and maternal education. This again points to the importance of community norms in determining behaviors. Having a high income had the strongest relationship with

contraceptive effectiveness at last sex, increasing the likelihood of using more effective methods substantially, again pointing to the importance of access.

Interestingly, specific additional factors were of differential importance among the at risk groups, indicating that specific risk and protective factors may be at work among these groups. These differential factors again suggest that these at-risk groups have different antecedents to their behavior than the general population, and more understanding is needed into what these factors are and how they can be incorporated into sex education programs targeting these groups. In the Hispanic population being male, having a higher educational attainment, and discussing sex with one's parents were significantly and substantially related to choosing more effective contraceptive methods at first sex. Similarly, in the children of teen mothers, discussing sex with one's parents significantly increased use and effectiveness at first sex. Both of these results again appear to point to social norms as a major determinant of teen sexual behaviors.

As such, CSE programs can be improved through an incorporation of various intervention strategies. First, programs can be improved through an aim to change social and community norms surrounding sex and contraceptives. Second, teens should be taught not only about contraceptive methods, but also where and how to obtain them. Third, targeting teen girls through self-esteem building and negotiation skills workshops might be an important strategy to increase the proportion of girls who initiate use of contraceptives. Lastly, there is room to improve teen-parent communication about sex, an area that not many CSE programs explicitly address.

Limitations

Certain study limitations should be considered when interpreting the results. The format and content of the NSFG dataset is responsible for two major limitations of the study. First, the NSFG dataset relies on retrospective interviews concerning sexual behavior, a sensitive subject, and thus the data is subject to both selection and recall bias. Second, the NSFG public-use dataset was de-identified to protect the privacy of the respondents. All geographic and other identifying information was eliminated from the public use files. Thus, a three-value recode variable describing the respondent's proximity to a metropolitan area was used as a proxy for geographic residence. Contraceptive use, social norms concerning teen sex, and implementation of CSE varies widely on regional, state, and local levels, and we feel that this geographic variable may not have captured this variation adequately enough.

Another limitation stems from the research design. In the general population we found statistically significant relationships between CSE and all four outcomes. Further, the strength of these relationships was greater at the last sex timing. This may be due to a weakness in the design, as any subject receiving CSE was classified as such, regardless of when they received the education. As subjects received CSE at different points in their education, many who were classified as receiving CSE did so after initiating sex for the first time. This likely biases the results for the first sex timing downward, thereby indicating a less significant relationship between CSE and contraceptive behaviors. Thus, the strength of the relationship at first sex between receiving CSE and contraceptive behaviors may be even more pronounced than our results suggest.

The sample sizes for the at-risk populations were relatively small. The majority of our insignificant results for these populations were in the expected direction, indicating that larger sample sizes may yield similar results with statistical significance. A larger scale study is also needed to examine the specific effects of CSE on at-risk groups to determine why there are such stark differences compared to the general population and to determine the true relationships between CSE and contraceptive behaviors.

Another study limitation concerned our examination of the effect of timing of exposure to CSE on contraceptive behaviors. When designing a timing variable, we wanted to capture not only first exposure to CSE but also continuity/frequency of that exposure. Specifically, we wanted to compare students who received CSE in middle and high school to students who solely received CSE in high school. Given the data, this was not possible, and the timing variable could only capture timing of first exposure to CSE. Some subjects who indicated first being exposed to CSE in middle school may not have received it consistently throughout their education, and may not have received it at all in high school—when the majority of sexual behavior under observation occurs. For these students the education may come too early and without reinforcements during high school. In fact, the data suggests that CSE in high school (when more subjects are sexually active) may be more influential than CSE that occurs before the sexual behavior begins. This leads us to believe that timing of first exposure and continuity of CSE may be important in improving outcomes. Using this dataset, however, there is no way to determine the continuity of CSE exposure, and therefore no way of determining the importance of timing.

Future Research

While this study supports the claim that CSE provides long lasting effects on sexual behaviors of its recipients, little is still known about the cost-effectiveness of such programs. More research is needed in estimating the long-term social benefits of CSE programs, as well as determining the short-term and long-term cost-effectiveness of school-based CSE.

The results for the at-risk populations emphasize that more research is needed, as well as a better understanding of how CSE affects these groups, in order to develop effective programs to target them. These populations not only experience different effects of CSE, but they also are influenced by different risk and protective factors. The mixed results for at-risk populations indicate that certain groups may benefit from targeting by such CSE programs and interventions, but that more information is needed into how to optimize the results for these groups. It is clear that these at-risk groups need to be recognized as different from the general population, and treated as so in targeted interventions.

With regard to the timing of CSE programs, our results indicate that the timing of first exposure to CSE alone does not significantly affect outcomes. However it raises the question of whether an earlier timing, in conjunction with continuity of exposure, could improve outcomes. Future studies are needed to examine how timing can improve outcomes and cost-effectiveness of CSE programs.

CONCLUSION

This study reinforces previous findings of higher overall contraceptive use by individuals receiving CSE. It also lends a greater understanding to the relationship between CSE and contraceptive behaviors by demonstrating a positive association with contraceptive effectiveness. The results highlight the ability of sex education programs to positively affect teen contraceptive use behaviors and potentially decrease teen pregnancy rates. This study also suggests the necessity of more research into these effects for specific at-risk groups, as all individuals do not seem to benefit equally from such programs. Overall, this analysis may help to identify future metrics for evaluating the effectiveness of sex education programs and areas necessitating future attention for increasing the effectiveness of such programs.

APPENDIX A

Descriptive Statistics

Table 1A. Sample characteristics for at-risk populations.

	Sample N=1,980 (100%)	Black N=408 (20.61%)	Hispanic N=443 (22.37%)	Teen Mom N=652 (33.37%)
Age	21.53 (1.73)	21.51 (1.74)	21.37 (1.74)**	21.47 (1.73)
Gender				
Female	56.77%	60.29%	51.47%**	62.42%**
Male	43.23%	39.71%	48.53%**	37.58%**
Educational Attainment				
No HS Degree	18.18%	23.77%**	29.35%**	30.83%**
HS degree or higher	81.82%	76.23%**	70.65%**	69.17%**
Parental Marital Status				
Non-Intact	47.42%	67.89%**	44.47%	60.28%**
Intact	52.58%	32.11%**	55.53%	39.72%**
Race/Ethnicity				
Non-Hispanic White	52.58%	-	-	37.73%**
Non-Hispanic Black	20.61%	100%	-	28.22%**
Hispanic	22.37%	-	100%	30.37%**
Non-Hispanic Other	4.44%	-	-	3.68%
Maternal Education				
Less than HS	18.88%	13.72%**	48.53%**	34.52%**
HS degree	31.30%	36.91%**	23.13%**	37.93%**
Some college	27.38%	30.92%*	17.23%**	19.35%**
College degree	22.44%	18.45%**	11.11%**	8.20%**
Urbanicity				
MSA- Central City	44.19%	57.35%**	49.89%**	44.94%
MSA	35.76%	25.74%**	43.57%**	33.59%
Non-MSA	20.05%	16.91%*	6.55%**	21.47%
Religion				
No Affiliation	23.13%	13.97%**	21.90%	21.93%
Affiliated	76.87%	86.03%**	78.10%	78.07%
Income				
<$25,000	39.65%	50.74%**	40.41%	46.63%**
$25,000-49,999	28.99%	27.21%	31.38%	31.60%*
$50,000-74,999	16.67%	13.24%**	15.80%	13.96%**
>$75,000	14.70%	8.82%**	12.42%	7.82%**
Parental Communication				
Sex Not Discussed	33.74%	28.68%**	43.79%**	36.66%*
Sex Discussed	66.26%	71.32%**	56.21%**	63.34%*
Maternal Age at First Birth				
19 or Younger	32.93%	45.10%**	44.70%**	100%
20-29	56.82%	48.04%**	49.66%**	-
30 or Older	8.94%	4.176%**	4.97%**	-

Note: * p<0.10 **p<0.05
Significance levels are in comparison to non-Black/non-Hispanic/non-teen mother samples

Table 2A. Sample characteristics for timing classifications.

	CSE Sample N=1,404 (100%)	Early CSE Timing N= 768 (54.70%)	Later CSE Timing N=636 (45.30%)	p-value
Age	21.51 (1.73)	21.58 (1.72)	21.42 (1.74)	0.0851*
Gender				
Female	58.97%	57.68%	60.53%	0.2794
Male	41.03%	42.32%	39.47%	0.2794
Educational Attainment				
No HS Degree	15.31%	17.71%	12.42%	0.0062**
HS degree or higher	84.69%	82.29%	87.58%	0.0062**
Parental Marital Status				
Non-Intact	47.22%	51.04%	42.61%	0.0016**
Intact	52.78%	48.96%	57.39%	0.0016**
Race/Ethnicity				
Non-Hispanic White	54.49%	57.29%	51.10%	0.0204**
Non-Hispanic Black	19.66%	20.05%	19.18%	0.6831
Hispanic	21.51%	18.88%	24.69%	0.0084**
Non-Hispanic Other	4.34%	3.78%	5.03%	0.2507
Maternal Education				
Less than HS	16.63%	13.91%	19.91%	0.0028**
HS degree	30.75%	33.46%	27.49%	0.0160**
Some college	28.67%	29.40%	27.80%	0.5127
College degree	23.94%	23.23%	24.80%	0.4927
Urbanicity				
MSA- Central City	43.95%	43.75%	44.18%	0.8709
MSA	37.61%	36.72%	38.68%	0.4503
Non-MSA	18.45%	19.53%	17.14%	0.2499
Religion				
No Affiliation	24.86%	25.26%	24.37%	0.7011
Affiliated	75.14%	74.74%	75.63%	0.7011
Income				
<$25,000	37.89%	39.58%	35.85%	0.1511
$25,000-49,999	28.35%	27.47%	29.40%	0.4248
$50,000-74,999	17.81%	17.84%	17.77%	0.9723
>$75,000	15.95%	15.10%	16.98%	0.3392
Parental Communication				
Sex Not Discussed	29.99%	30.21%	29.72%	0.8415
Sex Discussed	70.01%	69.79%	70.28%	0.8415
Maternal Age at First Birth				
19 or Younger	31.48%	33.07%	29.56%	0.1583
20-29	57.48%	55.86%	59.43%	0.1775
30 or Older	9.69%	9.51%	9.91%	0.8006

Note: * p<0.10 **p<0.05

Table 3A. Contraceptive use behaviors for timing classifications.

	Sample N=1,404 (100%)	Early CSE Timing N=768 (54.70%)	Late CSE Timing N=636 (45.30%)	p-value
Contraception at First Sex				
Not Used	17.38%	18.10%	16.51%	0.4340
Used	82.62%	81.90%	83.49%	0.4340
Contraception at Last Sex				
Not Used	15.86%	16.89%	14.61%	0.2545
Used	84.14%	83.11%	85.39%	0.2545
First Sex- Method Effectiveness				

None	17.38%	18.10%	16.51%	0.4340
Low	2.14%	2.08%	2.20%	0.8791
Moderate	57.69%	55.86%	59.91%	0.1266
High	22.79%	23.96%	21.38%	0.2523
Last Sex- Method Effectiveness				
None	15.86%	16.89%	14.61%	0.2545
Low	6.38%	7.03%	5.58%	0.2800
Moderate	30.10%	27.97%	32.68%	0.0609*
High	47.66%	48.11%	47.13%	0.7194

Note: * p<0.10 **p<0.05

APPENDIX B

Regression Results for Timing of First Exposure Series

Table 1B. Probit and ordered probit models with contraceptive use and contraceptive effectiveness at first sex as dependent variables among CSE-only population with CSE-timing variable.

	Contraceptive Use		*Contraceptive Effectiveness*				
Variable	*Coef (SE)*	*ME (SE)*	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High Eff ME (BC)*
CSE-Timing	0.089	0.019	-0.008	0.002	0.000	0.000	-0.002
	(0.13)	(0.03)	(0.09)	(0.02)	(0.00)	(0.01)	(0.03)
Age	0.094**	0.020**	0.109**	-0.024**	-0.002**	-0.007**	0.033**
	(0.03)	(0.01)	(0.02)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.181	0.039	0.033	-0.007	-0.001	-0.002	0.010
	(0.12)	(0.02)	(0.09)	(0.02)	(0.00)	(0.01)	(0.03)
HS degree or higher	0.039	0.009	0.073	-0.016	-0.002	-0.003	0.021
	(0.17)	(0.04)	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)
Intact Family	0.031	0.007	0.017	-0.004	-0.000	-0.001	0.005
	(0.13)	(0.03)	(0.10)	(0.02)	(0.00)	(0.01)	(0.03)
Race							
Black	-0.322*	-0.079*	-0.388**	0.098**	0.008**	-0.002	-0.104**
	(0.17)	(0.05)	(0.13)	(0.04)	(0.00)	(0.01)	(0.03)
Hispanic	-0.285*	-0.068	-0.511**	0.132**	0.011**	-0.009	-0.134**
	(0.17)	(0.04)	(0.12)	(0.04)	(0.00)	(0.01)	(0.03)
Other	-0.376	-0.097	-0.443*	0.118	0.009*	-0.015	-0.112**
	(0.28)	(0.08)	(0.24)	(0.07)	(0.01)	(0.03)	(0.05)
Maternal Education							
Less than HS	0.045	0.010	-0.037	0.008	0.001	0.002	-0.011
	(0.20)	(0.04)	(0.17)	(0.04)	(0.00)	(0.01)	(0.05)
HS degree	0.067	0.014	-0.050	0.011	0.001	0.003	-0.015
	(0.14)	(0.03)	(0.11)	(0.03)	(0.00)	(0.01)	(0.03)
College degree	0.181	0.038	0.215	-0.045*	-0.005	-0.018	0.067
	(0.18)	(0.04)	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)
Maternal Age at Birth							
19 or Younger	-0.226*	-0.052	-0.099	0.022	0.002	0.005	-0.029
	(0.14)	(0.03)	(0.10)	(0.02)	(0.00)	(0.00)	(0.03)
30 or Older	0.274	0.053	0.085	-0.018	-0.002	-0.006	0.026
	(0.23)	(0.04)	(0.15)	(0.03)	(0.00)	(0.01)	(0.05)
Urbanicity							
MSA	-0.394**	-0.090**	-0.304**	0.069**	0.007**	0.013*	-0.089**
	(0.14)	(0.03)	(0.11)	(0.03)	(0.00)	(0.01)	(0.03)
Non-MSA	-0.450**	-0.111**	-0.250*	0.059*	0.005*	0.007	-0.071**
	(0.16)	(0.04)	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)

Religiosity	0.152	0.034	0.143	-0.033	-0.003	-0.006	0.042
	(0.16)	(0.04)	(0.11)	(0.03)	(0.00)	(0.00)	(0.03)
Income							
$25,000-49,999	-0.002	-0.000	0.039	-0.008	-0.001	-0.002	0.012
	(0.14)	(0.03)	(0.11)	(0.02)	(0.00)	(0.01)	(0.03)
$50,000-74,999	0.262	0.052	0.124	-0.026	-0.003	-0.010	0.038
	(0.17)	(0.03)	(0.13)	(0.03)	(0.00)	(0.01)	(0.04)
>$75,000	0.097	0.020	0.138	-0.029	-0.003	-0.011	0.043
	(0.21)	(0.04)	(0.15)	(0.03)	(0.00)	(0.02)	(0.05)
Sex Discussed with Parents	0.132	0.030	0.066	-0.015	-0.001	-0.004	0.020
	(0.13)	(0.03)	(0.10)	(0.02)	(0.00)	(0.01)	(0.03)

Note: * p<0.10 **p<0.05

Table 2B. Probit and ordered probit models with contraceptive use and contraceptive effectiveness at last sex as dependent variables among CSE-only population with CSE-timing variable.

	Contraceptive Use		*Contraceptive Effectiveness*				
Variable	*Coef (SE)*	*ME (SE)*	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High Eff ME (BC)*
CSE-Timing	0.056	-0.010	-0.059	0.012	0.003	0.009	-0.023
	(0.13)	(0.02)	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)
Age	-0.120**	-0.022**	-0.030	0.006	0.002	0.004	-0.012
	(0.03)	(0.01)	(0.03)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.343**	0.062**	0.166*	-0.033*	-0.009*	-0.024	0.066*
	(0.13)	(0.02)	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)
HS degree or higher	0.167	0.032	0.032	-0.006	-0.002	-0.005	0.013
	(0.18)	(0.04)	(0.15)	(0.03)	(0.01)	(0.02)	(0.06)
Intact Family	0.222*	0.041	0.174*	-0.035*	-0.009*	-0.025*	0.069*
	(0.13)	(0.03)	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)
Race							
Black	-0.255	-0.051	-0.490**	0.118**	0.025**	0.049**	-0.192**
	(0.17)	(0.04)	(0.13)	(0.03)	(0.01)	(0.01)	(0.05)
Hispanic	-0.322**	-0.066*	-0.369**	0.084**	0.019**	0.043**	-0.146**
	(0.16)	(0.04)	(0.14)	(0.04)	(0.01)	(0.01)	(0.05)
Other	0.100	0.017	-0.473**	0.118**	0.024**	0.042**	-0.184**
	(0.30)	(0.05)	(0.18)	(0.05)	(0.01)	(0.01)	(0.07)
Maternal Education							
Less than HS	0.045	0.010	-0.112	0.023	0.006	0.015	-0.045
	(0.20)	(0.04)	(0.17)	(0.04)	(0.01)	(0.02)	(0.07)
HS degree	0.067	0.014	-0.276**	0.059**	0.015**	0.036**	-0.110**
	(0.14)	(0.03)	(0.11)	(0.03)	(0.01)	(0.01)	(0.04)
College degree	0.181	0.038	0.074	-0.014	-0.004	-0.011	0.030
	(0.18)	(0.04)	(0.14)	(0.03)	(0.01)	(0.02)	(0.05)
Maternal Age at Birth							
19 or Younger	-0.255	-0.051	-0.283**	0.060**	0.015**	0.038**	-0.113**
	(0.17)	(0.04)	(0.13)	(0.03)	(0.01)	(0.01)	(0.05)
30 or Older	-0.322**	-0.066*	0.242	-0.043*	-0.013	-0.040	0.096*
	(0.16)	(0.04)	(0.15)	(0.02)	(0.01)	(0.03)	(0.06)
Urbanicity							
MSA	0.120	0.021	-0.112	0.023	0.006	0.016	-0.045
	(0.14)	(0.03)	(0.11)	(0.02)	(0.01)	(0.02)	(0.04)
Non-MSA	-0.073	-0.013	-0.116	0.024	0.006	0.016	-0.046
	(0.16)	(0.03)	(0.13)	(0.03)	(0.01)	(0.02)	(0.05)
Religiosity	-0.031	-0.006	0.156	-0.032	-0.008	-0.021	0.062
	(0.15)	(0.03)	(0.11)	(0.02)	(0.01)	(0.01)	(0.04)
Income							
$25,000-49,999	0.107	0.019	0.015	-0.003	-0.001	-0.002	0.006
	(0.14)	(0.02)	(0.11)	(0.02)	(0.01)	(0.02)	(0.04)
$50,000-74,999	0.020	0.004	-0.016	0.003	0.001	0.002	-0.006
	(0.20)	(0.04)	(0.14)	(0.03)	(0.01)	(0.02)	(0.06)

>$75,000	0.352	0.055*	0.328**	-0.057**	-0.017**	-0.055*	0.129**
	(0.23)	(0.03)	(0.16)	(0.02)	(0.01)	(0.03)	(0.06)
Sex Discussed with Parents	0.091	0.017	0.117	-0.024	-0.006	-0.017	0.047
	(0.12)	(0.02)	(0.10)	(0.02)	(0.01)	(0.01)	(0.04)

Note: * p<0.10 **p<0.05

APPENDIX C

Regression Results for At-Risk Populations

Table 1C. Ordered probit model with contraceptive use effectiveness at first sex as dependent variable among at-risk Black population.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.121	-0.036	-0.001	0.013	0.025
	(0.15)	(0.04)	(0.00)	(0.02)	(0.03)
Age	0.051	-0.015	-0.001	0.005	0.011
	(0.04)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.105	-0.031	-0.001	0.010	0.022
	(0.15)	(0.05)	(0.00)	(0.02)	(0.03)
HS degree or higher	0.027	-0.008	-0.000	0.003	0.006
	(0.19)	(0.06)	(0.00)	(0.02)	(0.04)
Intact Family	-0.090	0.027	0.001	-0.009	-0.019
	(0.16)	(0.05)	(0.00)	(0.02)	(0.03)
Maternal Education					
Less than HS	0.269	-0.074	-0.003	0.014	0.063
	(0.23)	(0.06)	(0.00)	(0.01)	(0.06)
HS degree	0.229	-0.066	-0.003	0.018	0.051
	(0.18)	(0.05)	(0.00)	(0.01)	(0.04)
College degree	0.114	-0.033	-0.001	0.009	0.025
	(0.24)	(0.07)	(0.00)	(0.02)	(0.05)
Maternal Age at Birth					
19 or Younger	-0.183	0.055	0.002	-0.019	-0.038
	(0.15)	(0.05)	(0.00)	(0.02)	(0.03)
30 or Older	0.274	-0.074	-0.003	0.011	0.066
	(0.41)	(0.10)	(0.01)	(0.01)	(0.11)
Urbanicity					
MSA	-0.336*	0.106	0.004	-0.044	-0.065**
	(0.19)	(0.07)	(0.00)	(0.04)	(0.03)
Non-MSA	-0.148	0.046	0.002	-0.018	-0.030
	(0.22)	(0.07)	(0.00)	(0.03)	(0.04)
Religiosity	0.172	-0.054	-0.002	0.022	0.034
	(0.28)	(0.09)	(0.00)	(0.05)	(0.05)
Income					
$25,000-49,999	0.218	-0.063	-0.003	0.017	0.048
	(0.17)	(0.05)	(0.00)	(0.01)	(0.04)
$50,000-74,999	0.180	-0.051	-0.002	0.012	0.041
	(0.26)	(0.07)	(0.00)	(0.01)	(0.06)
>$75,000	-0.258	0.082	0.003	-0.037	-0.049
	(0.25)	(0.08)	(0.00)	(0.05)	(0.04)
Sex Discussed with Parents	0.078	-0.023	-0.001	0.008	0.016
	(0.16)	(0.05)	(0.00)	(0.02)	(0.03)

* p<0.10 **p<0.05

Table 2C. Ordered probit model with contraceptive use effectiveness at first sex as dependent

variable among at-risk Hispanic population.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.032	-0.009	-0.001	0.006	0.004
	(0.16)	(0.05)	(0.00)	(0.03)	(0.02)
Age	0.036	-0.010	-0.001	0.006	0.005
	(0.04)	(0.01)	(0.00)	(0.01)	(0.01)
Male	0.363**	-0.107**	-0.009	0.066*	0.050**
	(0.16)	(0.05)	(0.01)	(0.04)	(0.02)
HS degree or higher	0.354**	-0.107**	-0.008	0.070*	0.046**
	(0.17)	(0.05)	(0.01)	(0.04)	(0.02)
Intact Family	-0.117	0.034	0.003	-0.020	-0.017
	(0.15)	(0.04)	(0.00)	(0.03)	(0.02)
Maternal Education					
Less than HS	0.122	-0.035	-0.003	0.021	0.017
	(0.24)	(0.07)	(0.01)	(0.04)	(0.03)
HS degree	0.348	-0.094	-0.009	0.047*	0.055
	(0.23)	(0.06)	(0.01)	(0.03)	(0.04)
College degree	0.227	-0.061	-0.006	0.030	0.036
	(0.30)	(0.07)	(0.01)	(0.03)	(0.05)
Maternal Age at Birth					
19 or Younger	-0.098	0.029	0.002	-0.017	-0.014
	(0.16)	(0.05)	(0.00)	(0.03)	(0.02)
30 or Older	-0.567	0.194	0.010	-0.151	-0.054**
	(0.37)	(0.14)	(0.01)	(0.13)	(0.02)
Urbanicity					
MSA	-0.017	0.005	0.000	-0.003	-0.002
	(0.16)	(0.04)	(0.00)	(0.03)	(0.02)
Non-MSA	-0.147	0.044	0.003	-0.029	-0.019
	(0.34)	(0.11)	(0.01)	(0.07)	(0.04)
Religiosity	0.097	-0.029	-0.002	0.018	0.013
	(0.18)	(0.05)	(0.00)	(0.04)	(0.02)
Income					
$25,000-49,999	-0.264	0.079	0.006	-0.051	-0.035
	(0.17)	(0.05)	(0.00)	(0.04)	(0.02)
$50,000-74,999	0.120	-0.034	-0.003	0.019	0.018
	(0.22)	(0.06)	(0.01)	(0.03)	(0.03)
>$75,000	0.468*	-0.116**	-0.012	0.044**	0.084
	(0.25)	(0.05)	(0.01)	(0.02)	(0.06)
Sex Discussed with Parents	0.376**	-0.109**	-0.009	0.065**	0.053**
	(0.16)	(0.05)	(0.01)	(0.03)	(0.02)

* p<0.10 **p<0.05

Table 3C. Ordered probit model with contraceptive use effectiveness at last sex as dependent variable among at-risk Black population.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.161	-0.049	-0.007	-0.002	0.058
	(0.19)	(0.06)	(0.01)	(0.00)	(0.07)
Age	-0.022	0.007	0.001	0.000	-0.008
	(0.04)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.209	-0.063	-0.009	-0.004	0.076
	(0.16)	(0.05)	(0.01)	(0.01)	(0.06)
HS degree or higher	-0.060	0.018	0.003	0.002	-0.022
	(0.19)	(0.06)	(0.01)	(0.01)	(0.07)
Intact Family	-0.019	0.006	0.001	0.000	-0.007
	(0.18)	(0.06)	(0.01)	(0.00)	(0.07)
Maternal Education					
Less than HS	0.046	-0.014	-0.002	-0.001	0.017

	(0.32)	(0.09)	(0.02)	0.01)	(0.12)
HS degree	-0.190	0.058	0.008	0.002	-0.069
	(0.20)	(0.06)	(0.01)	(0.01)	(0.07)
College degree	0.235	-0.067	-0.011	-0.010	0.089
	(0.21)	(0.06)	(0.01)	(0.01)	(0.08)
Maternal Age at Birth					
19 or Younger	0.159	-0.048	-0.007	-0.004	0.059
	(0.17)	(0.05)	(0.01)	(0.01)	(0.06)
30 or Older	0.415	-0.106	-0.021	-0.033	0.161
	(0.43)	(0.09)	(0.02)	(0.06)	(0.17)
Urbanicity					
MSA	-0.195	0.060	0.008	0.001	-0.070
	(0.19)	(0.06)	(0.01)	(0.01)	(0.07)
Non-MSA	0.163	-0.047	-0.008	-0.006	0.061
	(0.23)	(0.06)	(0.01)	(0.01)	(0.09)
Religiosity	0.115	-0.036	-0.005	-0.001	0.041
	(0.18)	(0.06)	(0.01)	(0.00)	(0.06)
Income					
$25,000-49,999	0.337*	-0.096*	-0.016	-0.014	0.126*
	(0.20)	(0.05)	(0.01)	(0.02)	(0.08)
$50,000-74,999	0.517**	-0.132**	-0.026*	-0.041	0.199**
	(0.23)	(0.05)	(0.01)	(0.03)	(0.09)
>$75,000	0.346	-0.093	-0.017	-0.022	0.133
	(0.32)	(0.07)	(0.02)	(0.04)	(0.13)
Sex Discussed with Parents	-0.117	0.034	0.005	0.004	-0.043
	(0.17)	(0.05)	(0.01)	(0.01)	(0.06)

* p<0.10 **p<0.05

Table 4C. Ordered probit model with contraceptive use effectiveness at last sex as dependent variable among at-risk Hispanic population.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	0.159	-0.046	-0.009	-0.005	0.059
	(0.17)	(0.05)	(0.01)	(0.01)	(0.06)
Age	-0.035	0.010	0.002	0.001	-0.013
	(0.05)	(0.01)	(0.00)	(0.00)	(0.02)
Male	0.301*	-0.088*	-0.016*	-0.008	0.112*
	(0.17)	(0.05)	(0.01)	(0.01)	(0.06)
HS degree or higher	0.217	-0.064	-0.012	-0.006	0.081
	(0.20)	(0.06)	(0.01)	(0.01)	(0.07)
Intact Family	-0.013	0.004	0.001	0.000	-0.005
	(0.16)	(0.04)	(0.01)	(0.01)	(0.06)
Maternal Education					
Less than HS	-0.266	0.076	0.015	0.009	-0.100
	(0.24)	(0.07)	(0.01)	(0.01)	(0.09)
HS degree	-0.209	0.062	0.011	0.004	-0.077
	(0.26)	(0.08)	(0.01)	(0.01)	(0.10)
College degree	0.048	-0.013	-0.003	-0.002	0.018
	(0.29)	(0.08)	(0.02)	(0.01)	(0.11)
Maternal Age at Birth					
19 or Younger	0.186	-0.053	-0.010	-0.007	0.070
	(0.19)	(0.05)	(0.01)	(0.01)	(0.07)
30 or Older	-0.109	0.032	0.006	0.002	-0.040
	(0.35)	(0.11)	(0.02)	(0.00)	(0.13)
Urbanicity					
MSA	-0.372**	0.106**	0.020**	0.013	-0.140**
	(0.16)	(0.05)	(0.01)	(0.01)	(0.06)
Non-MSA	0.022	-0.006	-0.001	-0.001	0.008
	(0.32)	(0.09)	(0.02)	(0.01)	(0.12)
Religiosity	0.030	-0.009	-0.002	-0.001	0.011

	(0.19)	(0.06)	(0.01)	(0.01)	(0.07)
Income					
$25,000-49,999	-0.223	0.066	0.012	0.005	-0.083
	(0.17)	(0.05)	(0.01)	(0.01)	(0.06)
$50,000-74,999	0.553**	-0.134**	-0.033**	-0.049	0.215**
	(0.24)	(0.05)	(0.02)	(0.04)	(0.10)
>$75,000	0.609*	-0.141**	-0.036*	-0.060	0.238*
	(0.34)	(0.06)	(0.02)	(0.06)	(0.13)
Sex Discussed with Parents	0.131	-0.037	-0.007	-0.005	0.049
	(0.16)	(0.04)	(0.01)	(0.01)	(0.06)

* p<0.10 **p<0.05

Table 5C. Ordered probit model with contraceptive use effectiveness at last sex as dependent variable among at-risk children of teen mothers population.

Variable	*Coef (SE)*	*No BC ME (SE)*	*Low-Eff ME (SE)*	*Mid-Eff ME (SE)*	*High-Eff ME (SE)*
CSE	-0.013	0.004	0.000	0.000	-0.005
	(0.14)	(0.04)	(0.00)	(0.00)	(0.05)
Age	-0.060*	0.019*	0.002	0.002	-0.023*
	(0.03)	(0.01)	(0.00)	(0.00)	(0.01)
Male	0.193	-0.061	-0.006	-0.006	0.074
	(0.13)	(0.04)	(0.00)	(0.01)	(0.05)
HS degree or higher	0.073	-0.023	-0.002	-0.002	0.028
	(0.15)	(0.05)	(0.00)	(0.00)	(0.06)
Intact Family	0.067	-0.021	-0.002	-0.002	0.026
	(0.13)	(0.04)	(0.00)	(0.00)	(0.05)
Race					
Black	-0.093	0.030	0.003	0.002	-0.035
	(0.15)	(0.05)	(0.00)	(0.00)	(0.06)
Hispanic	-0.028	0.009	0.001	0.001	-0.011
	(0.18)	(0.06)	(0.01)	(0.00)	(0.07)
Other	-0.331	0.115	0.009	-0.005	-0.118
	(0.29)	(0.11)	(0.01)	(0.02)	(0.10)
Maternal Education					
Less than HS	-0.317	0.104	0.010	0.004	-0.118
	(0.21)	(0.07)	(0.01)	(0.01)	(0.08)
HS degree	-0.240	0.078	0.008	0.005	-0.090
	(0.17)	(0.06)	(0.01)	(0.01)	(0.06)
College degree	-0.520	0.185	0.012**	-0.017	-0.180*
	(0.32)	(0.12)	(0.00)	(0.03)	(0.10)
Urbanicity					
MSA	0.269*	-0.084*	-0.009*	-0.010	0.103*
	(0.14)	(0.04)	(0.01)	(0.01)	(0.05)
Non-MSA	0.161	-0.050	-0.005	-0.007	0.062
	(0.19)	(0.06)	(0.01)	(0.01)	(0.07)
Religiosity	0.099	-0.032	-0.003	-0.002	0.037
	(0.17)	(0.06)	(0.01)	(0.00)	(0.06)
Income					
$25,000-49,999	-0.119	0.038	0.004	0.003	-0.045
	(0.15)	(0.05)	(0.00)	(0.00)	(0.06)
$50,000-74,999	0.052	-0.016	-0.002	-0.002	0.020
	(0.18)	(0.06)	(0.01)	(0.01)	(0.07)
>$75,000	0.323	-0.093	-0.012	-0.022	0.126
	(0.30)	(0.08)	(0.01)	(0.03)	(0.12)
Sex Discussed with Parents	0.085	-0.027	-0.003	-0.002	0.032
	(0.13)	(0.04)	(0.00)	(0.00)	(0.05)

* p<0.10 **p<0.05

BIBLIOGRAPHY

Albert, B, Brown S, Flanigan C, ed. (2003). 14 and younger: The sexual behavior of young adolescents. National Campaign to Prevent Teen Pregnancy: Washington, DC.

Bennett, S & Assefi N. (2005). School-based teenage pregnancy prevention programs: a systematic review of randomized controlled trials. Journal of Adolescent Health 36(1): 72-81.

Chen, Y, Stiffman A, Cheng L, Dore P. (1997). Mental health, social environment and sexual risk behaviors of adolescent service users: a gender comparison. Journal of Child and Family Studies 6(1): 9-25.

Constantine, N, Jerman P, Huang A. (2007). California parents' preferences and beliefs on school-based sexuality education policy. Perspectives on Sexual and Reproductive Health 39(3): 167-175.

Darroch, J, Singh S, Frost J. (2001). Differences in teenage pregnancy rates among five developed countries: The roles of sexual activity and contraceptive use. Family Planning Perspectives 33(6): 244-250.

Eng, T & Butler WT, ed. The Hidden Epidemic: Confronting Sexually Transmitted Diseases. National Academy Press: Washington DC, 1997.

Glei, D. (1999). Measuring contraceptive use patterns among teenage and adult women. Family Planning Perspectives 31(2): 73-80.

Guttamacher Institute. (2010). Sex and STI/HIV Education, in State Policies. Guttmacher Institute: Washington, DC. 1-3.

Halpern, C, Joyner K, Udry J, Suchindran C. (2000). Smart teens don't have sex (or kiss much either). Journal of Adolescent Health 26(3): 213-225.

Hamilton, B, Martin J, Ventura S. (2010). Briths: Preliminary data for 2008. National Vital Statistics Reports. National Center for Health Statistics 58(16): 1-17.

Hofferth, S, Reid L, Mott F. (2001). The effects of early childbearing on schooling over time. Family Planning Perspectives 33(6): 259-267.

Hoffman, S. (2006). By the numbers: The public costs of teen childbearing. The National Campaign to Prevent Teen Pregnancy: Washington, DC.

Hotz, V, McElroy S, Sanders S. (1997). "The impacts of teenage childbearing on the mothers and the consequences of those impacts for government". Kids Having Kids: The Economic Costs and Social Consequences of Teen Pregnancy. Maynard, R. Ed. Urban Institute Press.

Ito, K, Gizlice Z, Owen-O'Dowd J, Foust E, Leone P, Miller W. (2006). Parent opinion of sexuality education in a state with mandated abstinence education: Does policy match parental preference? Journal of Adolescent Health 39(5): 634-641.

Jones, E, Forrest J, Goldman N, Henshaw S, Lincoln R, Rosoff J, Westoff C, Wulf D. (1985). Teenage pregnancy in developed countries: determinants and policy implications. Family Planning Perspectives 17(2): 53-63.

Jossens, M, Schachter J, Sweet R. (1994). Risk factors associated with pelvic inflammatory disease of differing microbial etiologies. Journal of Obstetrics and Gynocology 83(6): 989-997.

Kaiser Family Foundation. (2002). Sex Education in the U.S.: Policy and Politics, in Issue Update. Henry J. Kaiser Family Foundation: Menlo Park, CA. 1-5.

Kirby, D. (2002). Antecedents of adolescent initiation of sex, contraceptive use, and pregnancy. Journal of Adolescent Health 26(6): 473-485.

Kirby, D, Laris B, Rolleri L. (2007). Sex and HIV education programs: Their impact on sexual behaviors of young people throughout the world. Journal of Adolescent Health 40(3): 206-217.

Kost, K, Henshaw S, Carlin L. (2010). U.S. teenage pregnancies, births and abortions: National and state trends by race and ethnicity. Guttmacher Institute: 1-25.

Kowaleski-Jones, L & Mott F. (1998). Sex, contraception and childbearing among high-risk youth: do different factors influence males and females? Family Planning Perspectives, 30(4).

Lammers, C, Ireland M, Resnick M, Blum R. (2000). Influences on adolescents' decision to postpone onset of sexual intercourse: A survival analysis of virginity among youths aged 13 to 18 years. Journal of Adolescent Health 26(1): 42-48.

Landry, D, Kaeser L, Richards C. (1999). Abstinence promotion and the provision of information about contraception in public school district sexuality education policies. Family Planning Perspectives 31(6): 280-286.

Landry, D, Singh S, Darroch J. (2000). Sexuality education in fifth and sixth grades in U.S. Public Schools, 1999. Family Planning Perspectives 32(5): 212-219.

Lemoine, L. (2010). Teen sexual behavior and contraceptive use: A summary of data from the Youth Risk Behavior Survey, 2009. The National Campaign to Prevent Teen Pregnancy. Science Says: 1-6.

Lindberg, L. (2006). Changes in formal sex education: 1995-2002. Perspectives on Sexual and Reproductive Health 38(4): 182-189.

Manlove, J, Terry E, Gitelson L, Papillo A, Russel S. (2000). Explaining demographic trends in teenage fertility, 1980-1995. Family Planning Perspectives 32(4): 166-175.

Manlove, J, Franzetta K, McKinney K, Papillo A, Terry-Humen E. (2004). No time to waste: programs to reduce teen pregnancy among middles school-aged youth. National Campaign to Prevent Teen Pregnancy: Washington, DC.

Manlove, J, Papillio A, Ikramullah E. (2004). Not yet: programs to delay first sex among teens. The National Campaign to Prevent Teen Pregnancy: Washington DC.

Marsiglio, W. (1986). The impact of sex education on sexual activity, contraceptive use and premarital pregnancy among American teenagers. Family Planning Perspectives 18(4): 151-162.

Meschke, L, Zweig J, Barber B, Eccles J. (2000). Demographic, biological, psychological, and social predictors of the timing of first intercourse. Journal of Research on Adolescence 10(3): 315-338.

The National Campaign to Prevent Teen Pregnancy. (2006). Teen birth rates: How does the United States Compare?

Perper, K, Peterson K, Manlove J. (2010). Diploma attainment among teen mothers. Child Trends: Fact Sheet. Washington, DC.

Quinn, T & Cates W. (1992). "Epidemiology of sexually transmitted diseases in the 1990s". Sexually Transmitted Diseases. Quinn, T., Ed. Raven: New York. 1-37.

Resnick, M, Bearman P, Blum R, Bauman K, Harris K, Jones J, Tabor J, Beuhring T, Sieving R, Shew M, Ireland M, Bearinger L, Udry R. (1997). Protecting adolescents from harm. Journal of the American Medical Association 278(10): 823-832.

Rosenthal, M, Ross J, Bilodeau R, Richter R, Palley J, Bradley E. (2009). Economic evaluation of a comprehensive teenage pregnancy prevention program: Pilot program. American Journal of Preventative Medicine 37(6): 280-287.

Santelli, J, Ott M, Lyon M, Rogers J, Summers D, Schleifer R. (2006). Abstinence and abstinence-only education: A review of U.S. policies and programs. Journal of Adolescent Health 38: 72-81.

Santelli, J, Lindberg L, Abma J, McNeely C, Resnick M. (2000). Adolescent sexual behavior: estimates and trends from four nationally representative surveys. Family Planning Perspectives 32(4): 156-165.

Santelli, J, Orr M, Lindberg L, Diaz D. (2009). Changing behavioral risk for pregnancy among high school students in the United States, 1991-2007. Journal of Adolescent Health 45(1): 25-32.

Santelli, J, Lindberg L, Finer L, Singh S. (2007). Explaining recent declines in adolescent pregnancy in the United States: The contribution of abstinence and improced contraceptive use. Journal of Public Health 97(1): 150-156.

Santelli, J, Kaiser J, Hirsch L, Radosh A, Simkin L, Middlest S. (2004). Initiation of sexual intercourse among middles school adolescents: the influence of psychosocial factors. Journal of Adolescent Health 34(3): 200-208.

Scott-Jones, D & Turner S. (1988). Sex education, contraceptive and reproductive knowledge, and contraceptive use among Black adolescent females. Journal of Adolescent Research 3: 171-187.

Singh, S, & Darroch J. (2000). Adolescent pregnancy and childbearing: levels and trends in developed countries. Family Planning Perspectives 32(1): 14-23.

Smith, C. (1997). Factors associated with early sexual activity among urban adolescents. Journal of Social Work, 42(4).

Suellentrop, K. (2006). Teen Contraceptive Use. Science Says: 1-10.

Trenholm, C, Devaney B, Fortson K, Quay L, Wheeler J, Clark M. (2007). Impacts of Four Title V, Section 510 Abstinence Education Programs. Mathematica Policy Research: Princeton, NJ.

Trussel, J. (2007). "Contraceptive efficacy". Contraceptive Technology: Nineteenth Revised Edition. R. Hatcher, et al., Ed. Ardent Media: New York.

Trussel, J. (2011) Emergency contraception: A last chance to prevent unintended pregnancy. Princeton University.

Tubman, J, Windle M, Windle R. (1996). The onset and cross-temporal patterning of sexual intercourse in middle adolescence: prospective relations with behavioral and emotional problems. Child Development 67.

Ventura, S, Mathews T, Hamilton B. (2001) Births to teenagers in the United States, 1940-2000. National Vital Statistics Reports. National Center for Health Statistics 49(10): 1-24.

Ventura, S, Abma J, Mosher W. (2009). Estimated pregnancy rates for the United States, 1990-2005: An update. National Vital Statistics Reports. National Center for Health Statistics 58(4): 1-16.

Weinstock, H, Berman S, Cates W. (2004). Sexually transmitted diseases among American youth: Incidence and prevalence estimates, 2000. Perspectives on Sexual and Reproductive Health 36(1): 6-10.

Yang, Z & Gaydos L. (2010). Reasons for and challenges of recent increases in teen birth rates: a study of family planning service policies and demographic changes at the state level. Journal of Adolescent Health 46: 517-524.