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Zimei (Sharon) Shen March 26, 2019

Teenage Pregnancy in Sociological Contexts:
The Relative Effect of Family Characteristics and Formal Sex Education

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Abstract

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The United States has been fighting to reduce teenage pregnancy rate for decades through introduction of various sex education programs. Previous systematic review of the effectiveness of these formal preventative measures shows mixed results. This research aims to put teenage pregnancy into its broader sociological context by examining two areas of influence: 1) family characteristics in terms of intact family status and household dynamic; 2) the specific type and topics of institutional sex education received by teenagers before age 18. Data from the 2013-2015 National Survey of Family Growth are used to assess the relative effects of family characteristics and sex education on females aged 15-44 who have responded with information about their pregnancy history and reproductive health. Logistic regression results indicate adolescents who had lived in intact families are significantly less likely to experience teen pregnancy. Among those within single-parent households, the presence of biological fathers is strongly associated with daughters' lower pregnancy rate. Abstinence programs reduce the likelihood of reported teen pregnancy, whereas having been taught other comprehensive topics such as condom use or birth control access does not affect teen pregnancy outcome. Overall, family characteristics appear to have a larger impact on adolescent pregnancy than formal sex education programs.

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INTRODUCTION

This thesis is an exploration and evaluation of various contemporary solutions for reduction of the teen pregnancy rate in the United States. The U.S. rate has steadily fallen to historic lows in recent years but remains substantially higher than the rate in other industrialized nations. Looking at data from 2011 or the most recent available year, Sedgh et al. (2015) report that the pregnancy rate per 1,000 females aged 15-19 years in the United States was 57, while in other developed nations it was generally much lower. For example, England and Wales together had a rate of 47, while the rate in Canada was 28. The lowest teen pregnancy rate was found in Switzerland (8), followed by Germany (9) and Japan (13) (Sedgh et al. 2015). Even though the rate in the Unites States has consistently fallen over the years, additional efforts are still needed to combat disparities with respect to race, ethnicity, geographic location, and household characteristics such as family composition (see, e.g., Romero et al. 2016; Miller 2010; Miller, Benson and Galbraith 2001).

It is important to study teen pregnancy because it has a variety of social, economic, and health-related consequences (see NCSL 2018). First, teen pregnancy often brings significant social burdens to both women and their households. Becoming pregnant at an early age can creates an obstacle that prevents young people of both sexes, but especially women, from achieving their educational and career goals. Less than half of women who give birth during adolescence receive a high school diploma. In contrast, nationwide 90% of women who are not teen mothers successfully graduate from high school. The disparity for higher educational attainment is even more pronounced (Perper et al. 2010). Lower education can limit the ability to obtain resources and is associated with lower personal income throughout the life course. Such problems become even more severe among teenage females who are already in a disadvantaged

position. For example, research shows that girls who grow up in foster care are at higher risk of becoming pregnant multiple times before age 19 (Boonstra 2011). If the pregnancy results in childbirth, the children themselves face similar challenges growing up. Teen pregnancy thus generates a complex set of disadvantages that are difficult to rise above and reverberate across generations.

Second, teen pregnancy creates high economic costs on both the individual level and national level. Early age at first childbirth can negatively influence the physical and mental well-being of the infant, predisposing them to many long-term medical conditions, such as delays in linguistic ability and lower emotional control (Gibbs et al. 2012). The increasing malnutrition and developmental disability associated with early motherhood require a large financial commitment to pay for expensive treatments that many cannot afford due to their lower earnings. Meanwhile, from a macro perspective, teen pregnancy and childbirth are a drain on governmental resources. Researchers have observed simultaneously a rise in taxpayers' cost for health care efforts and a loss of tax revenue from increased unemployment among pregnant teens (Brace et al. 2008). The difficulty in distributing public resources and the loss of skilled labor impede national economic growth.

Lastly, focusing on teen pregnancy prevention is of great importance to the health and quality of life for adolescents. Teen pregnancy is closely linked to other sexual and reproductive health behaviors such as sexual debut, frequency of sexual practices, number of sexual partners, and condom use. Teen pregnancy prevention efforts potentially result in the improvement of living conditions and promotion of health equity among disadvantaged populations. Further, teen pregnancy prevention efforts may enable public health practitioners to reduce sexual risk behaviors and produce positive long-term impacts through, for example, sex education programs

targeted to appropriate audiences. A wide variety of research has evaluated such programs and concluded their positive influence on preventing teen pregnancy (see, e.g., Lindberg and Maddow-Zimet 2011; Kohler, Manhart and Lafferty 2007; Kirby 2008). Furthermore, because the type of medical services that pregnant teens receive depends on the insurance coverage they are entitled to within the existing healthcare system, a review of teen pregnancy not only helps practitioners understand reproductive health but also drives the agenda of healthcare reform.

The scholarly literature on teenage pregnancy is often concerned with identifying which factors increase and decrease its likelihood of occurrence (see Kirby 2008 and Akella and Jordan 2015 for overviews). In this honors thesis, I will use the National Survey of Family Growth to explore two such factors: the characteristics of formal sex education programs and the characteristics of the family and household. My goal is not theoretical synthesis of these two explanations but rather to examine their relative merits as explanations.

It is with the intention of decreasing teen pregnancy that sex education programs began to be widely implemented in the 20th century. Sex education can be defined as instruction in physiological, sociological, and psychological aspects of sex (Leedon 2008). Specifically, it can include information about sexual anatomy, reproductive health, birth control methods, sexually transmitted diseases, and attitudes and decision making toward sex. Programs differ in their breadth and depth of topics. While some programs emphasize knowledge-based instruction, others may emphasize action-based instruction such as negotiation skills in sexual relationships and contraceptive practices (Kohler et al. 2008). Do such distinctions translate into differing degrees of effectiveness? Are some types of program characteristics more successful than others in decreasing the rate of teen pregnancy? The present honors thesis will examine such questions.

Formal schooling is an important part of the teenager's larger environment, but of course it is not the only institution of socialization that influences teenage behavior. The family is another important source of influence. As Miller, Benson, and Galbraith (2001) note, a wide range of family-related variables can be implicated in teen pregnancy: "Family influences range from hereditary to biological transmission of potentially important characteristics (e.g., early age of menarche, levels of hormones, and genes) to the contextual and structural features of families (e.g., parent's education, marital status, and sibling composition) to the everyday styles or practices of parenting (e.g., parental support. control, or supervision of teenagers)." Thus, the present study will explore the influence of family and household characteristics on the likelihood of teen pregnancy in addition to the influence of formal sex education programs. Although my main focus is on the effects of sex education, and this focus is reflected in the literature review below, I want to also understand how family characteristics influence teen pregnancy. Which matters more— the characteristics of formal schooling or the characteristics of the family?

In the following pages I summarize some of the previous research that has been conducted on these topics in order to provide both an historical and scholarly context for my own study. I then describe the data and methods that I draw upon to address these topics. An analysis of the data is then presented and discussed. Finally, I conclude the thesis by assessing the limitations of my study and suggesting directions for future research.

HISTORICAL BACKGROUND

The evolution of sex education in school is a slow progression across the globe that began more than one hundred years ago. In the United States, the first piece of relevant legislation was the Comstock Act of 1873. This federal law was itself not part of sex education but sought rather to censor it. Its purpose was to suppress "trade in, and circulation of, obscene literature and articles of immoral use" (Comstock Act of 1873). Information about birth control was deemed "immoral" under the Comstock Act, and as a result distribution of birth control information was highly restricted. Such perceived immorality associated with this sexual topic was primarily driven by cultural consensus. People subscribed to the social expectation of premarital purity and their behaviors were governed by that very expectation. For example, open discussion of sex was considered vulgar and inappropriate, while the actual practice of sex was considered only acceptable among married couples (Horowitz 2000).

As we moved into 1880s, some scholars started to acknowledge concerns over women's health. Fredrick J. Garbit (Josephine Long Wishart Collection 2018), for instance, observed a phenomenon that perception of woman's body was directly linked to her marital status. Specifically, he argued, female genitals and pelvic area would change forms and conditions if women initiate sexual intercourse. Anatomy on virgins and mothers would, by the same logic, show differences. Not only did the differences themselves matter, they were again tied back to the morality of women. Should a single girl have a condition similar to a married woman, she would likely be condemned for promiscuity. Though Garbit utilized scientific language to try to help women learn more about their bodies, many of his opinions reflected the gender biases of his times, and little practical information was given on treatment of pregnancy or how to maintain reproductive health outside the realm of marriage.

In general, the pre-1900 time period could be described as lacking any adequate education, let alone sex education. Among those who were able to attend schools, the closest form of sex education they would have received at the time was Rev. John Todd's The Student Manual, a religious pamphlet with directions including but not limited to a discouragement on masturbation. It was indeed a widely spread publication designed to guide students on their moral habits (Millstein 2015).

Entering into the 20th century, Sweden, a country renowned for its high level of sexual freedom, became the first nation to require sex education in school since 1942 (Boethius 1985). For the U.S., the 19th amendment was ratified in 1920, granting women the right to vote. The early decades of the 20th century marked the beginning of a shift in ways people comprehended and experienced sex. Unlike the past, where sex was a taboo topic in public, the 1900s witnessed people's increasing willingness to openly address sexual matters. Such a perspective was shared and praised by Margaret Sanger, the women's rights activist and founder of the birth control movement. Sanger proposed that sex was not just for procreation but also recreation. She considered birth control to be a means by which women could gain sexual and reproductive freedom. At the same time, Prince A. Morrow, the founder of the social hygiene movement, raised concerns over what he identified as general moral degradation given the elevation of sexual activity and the issue of prostitution. Although Sanger and Morrow's schools of thought are in many ways quite different, both played an important role in the development of sex education (Millstein 2015). For proponents like Sanger, sex education was a way to allow women to make more informative decisions around private life. For Morrow, sex education was a solution to the aforementioned moral degradation because it would educate the public about the societal harms resulting from sexual permissiveness.

With the supporting forces from both birth control and social hygiene, the first public school sex education program in the United States was finally implemented in the city of Chicago (Millstein 2015). According to the scholars and experts who made the proposal, school was an ideal setting for social experimentation. A series of three lectures were designed and delivered to 20,000 high school students in the Chicago area during the academic year of 1913-1914. The key person who led the experiment and pushed forward this practice was Ella Flagg Young, the first female superintendent of a major urban school system and the president of National Education Association (Moran 1996). In its early stage, however, such sex education was most commonly taught through analogies to plants and animals, as opposed to human anatomy, mainly due to cultural stigma. Anecdotal evidence suggests that teachers at the time were very cautious and conservative in teaching this material, in fear of parents' complaints. The program coincided with the start of World War I in 1914, when facing large numbers of infected war enlistees, the government budgeted funding to develop effective educational measures to prevent the spread of venereal diseases, as a response to national panic (Cornblatt 2009).

Despite several limitations of the program, the U.S. since then started to lead the way in sex education around the globe, with the establishment of the American Social Hygiene Association, which then turned into other variants within the Western European countries. In 1919, the White House Task Force on child welfare endorsed sex education in schools, thus lending government support to the idea of formal sex education in school. According to Zimmerman (2015), a survey in 1920 revealed that roughly 40% of American high schools provided some form of sex education. Additional efforts continued to be put forth. For example, not only did the Public Health Service write an academic guideline for high school to integrate

sex education into the normal curriculum, the department also began to fund these programs on a large scale (United States et al. 1875).

The 1960-70s were a period of sexual revolution where people started to think that one has every right to use one's body freely. It was a pivotal period in the history of sex education because of the multiple legal leaps the U.S. took. First, in 1960, Gregory Goodwin Pincus, backed by Sanger, invented the first oral birth control pill that was successfully approved by Food and Drug Administration (Dhont 2010). This meant women were able to enjoy sex without the fear of pregnancy, an important expression of reproductive freedom. The Supreme Court ruled contraceptive use a constitutional right in its Griswold v. Connecticut decision in 1965. In the case of Roe v. Wade in 1973, the Supreme Court legalized access to abortion services. These landmark cases provided a legal foundation paving the way for the popularization of sex education.

Throughout its history, sex education was often referred to by other names. Sometimes this was done to avoid controversy and other times it was done to reflect current events in society. For example, after World War II, sex education was rebranded as family life education, which involved discussing gender roles and child rearing. Unfortunately but conveniently, with the discovery of HIV/AIDS in the 1980s, sex education was renamed AIDS education, primarily focusing on contraceptive instruction and homosexuality (Haffner 1988). Though the content of sex education was broadened, these shifts were more reactive than proactive. Since the mid 1990s, national legislation designed to overhaul the welfare system led to Title V Section 510. This law introduced an Abstinence Education Program that provides federal funding to schools across the nation and which includes a detailed definition of what constitutes abstinence-only instruction (Zimmerman 2015). Though statistics have shown an increasing average number of

academic hours spent per year on sex education over time during that period (Zimmerman 2015), sex education in general is still subject to the preferences of local officials and teachers, even as the educational system overall has become more centralized and regulated through the creation of the Department of Education in 1979.

PROGRAM OVERVIEW

According to the National Conference of State Legislatures (2016), all states provide some degree of sex education for public school children. Twenty-four states have published legislation on sex education requirements, and 33 states require instruction about sexually transmitted diseases. A majority of states mandate that abstinence instruction be included. From a federal level, the aforementioned Title V, Section 510 Abstinence Education Program is the legislative centerpiece introduced in 1998 (Clark et al, 2008). Since its inception, it has allocated funding of approximately $50 million annually to programs that teach school-age teenagers abstinence from sexual activity outside the context of marriage. Among those programs that did receive grants, some notable examples include *My Choice, My Future!* in Virginia and *ReCapturing the Vision* in Florida. They need to comply with the A-H definition that Title V outlines, which denotes sexual activity outside marriage to be psychologically and physically harmful. Despite mixed evidence, the federal budget continues to stress the importance of abstinence education, with fiscal year 2016 hitting $85 million. Although President Barack Obama failed in his attempt to terminate Abstinence Only Until Marriage (hereafter AOUE) during his tenure, his policy orientation pushed the national controversy among medical professionals and educators to a new level (Hall et al. 2016).

Currently, two forms of sex education are taught in the United States: abstinence-only, and comprehensive sex education. The former encourages adolescents to be sexually abstinent prior to marriage and excludes other topics of sexual and reproductive health. Those programs tend to either avoid information about contraceptive use or overemphasize the negative effects of contraception. As a part of welfare reform since the late 1990s, abstinence-only programs have maintained a high level of government support and are still more prominent than the alternative

option, comprehensive sex education. The latter provides additional information about sexual risk behaviors and how they can be minimized. It tends to cover a wider range of topics from abstinence and contraception to relationship management, attitudes towards sexuality and prevention of diseases. Instead of providing clear guidelines on the "right" things to do, comprehensive sex education strives to progressively build youth self-empowerment and foster an environment for open dialogue about sexual health (Kirby 2008).

Proponents of abstinence-only program argue that this approach ensures the moral integrity of the nation. By limiting sex to the boundary of marriage, it prevents adolescents from deteriorating into a risky lifestyle of self-indulgence. Moreover, some proponents believe that the abstinence-only model of sex education helps adolescents develop as individuals because of its emphasis on marriage. As one of the main social institutions, marriage represents an ideal unity of two loving people and their responsibility as a household entity. Therefore, if young people are able to control their sexual desire during their puberty, they are more likely to enjoy the ultimate sexual pleasure found within marriage. At the same time, restraining them from premarital sexual activities means, once grown up into adulthood, they can make more mature and intelligent decisions on issues such as family planning and child bearing (Lyon et al. 2006).

However, critics of the abstinence-only model argue that there are many limitations associated with it. First, the model fails to provide accurate and adequate information on sexual and reproductive health and thus undermines the goal of protecting adolescents. Such program design not only assumes sex is a harmful act but also tries to suppress sexual desire, which is a natural developmental stage for youth. Under the A-H definition, schools avoid discussions about practical means to prevent teen pregnancy except for abstinence. In fact, some of the programs have been accused of misusing statistics and intentionally exaggerating the failure rate

of condom use in order to persuade students to stay abstinent (Zimmerman 2015). Given the fact that the percentage of young people who remain abstinent until marriage has been declining rapidly (Santelli 2017), the abstinence-only model does not offer teenagers the useful health-promoting information they need.

Second, critics charge that the abstinence-only model is not effective. Even if theoretically complete abstinence would be the most effective measure against teen pregnancy or sexually transmitted diseases, there is little evidence suggesting that AOUM actually succeeds in postponing sexual activity. A variety of analyses show that not only is it ineffective in preventing students from sexual activities, it also has minimal ability to reduce sexually risky behaviors such as multiple partners and infrequent use of contraception (Pediatrics 2001). A more thorough look at efficacy will be covered in the next section of existing literature.

Third, AOUM relies heavily on individual choice while overlooking socioeconomic factors outside of individual control. Although it is important for teenagers to learn body autonomy and take responsibility for their actions, abstinence-only programs often neglect the environmental influences and relational dynamics involved in sex. Because they advocate absolute abstinence, those who do not conform to the rules and end up becoming pregnant or infected are likely to be deemed as deserving it. However, in reality, some teen pregnancies may be due to intimate partner violence or sexual abuse, situations in which individuals have less bargaining power despite their best intentions to stay abstinent. Therefore, AOUM fails to protect youth from unwanted sexual activities and may even present secondary jeopardy by blaming the victims.

Furthermore, abstinence-only programs underrepresent the experience of sexual minorities and exacerbate gender stigmatization. The underlying concept of AOUM reflects a sense of moralistic commitment. Traditional values such as femininity and saving oneself for one's future

husband are reflected in ritual practices such as the virginity pledge (Zimmerman 2015). They reinforce patriarchal ideology and gender stereotyping: a good girl should be caring, domestic, compliant, and sexually abstinent until marriage. AOUM programs lack the element of elevating self-efficacy and female empowerment. For the LGBT community, whose marriages are not as highly valued or desired from the standpoint of the larger culture, stressing that sexual activities should only happen within marriage could drive them further to the margins of mainstream society. Without offering formal knowledge on safe sexual practices, such programs tend to disproportionately hurt LGBT people because they are already exposed to higher risk for sexually transmitted diseases (Pilkington and D'Augelli 1995).

Comprehensive sex education, on the other hand, tries to cultivate a broader understanding of sex and healthy decision-making instead of shielding students from factual data and useful preventative measures. Though not eligible for federal funding under Title V, comprehensive sex education curricula have gained considerable official support from health committees and academia. Increasing efforts are put into strengthening the arguments for comprehensive programs and pushing towards greater implementation.

REVIEW OF SELECTED SEX EDUCATION STUDIES

Kohler, Manhart and Lafferty (2007) compile a clear and helpful comparison between abstinence only and comprehensive sex education in terms of their impact on the initiation of sexual activity and teen pregnancy. Using secondary data from the National Survey of Family Growth in 2002, they estimate regression equations predicting sexual health risks among adolescents aged 15-19 years, heterosexual and never-married. The primary independent variable of interest is the respondent's report on formal sex education received before his or her first sexual intercourse. In order to distinguish abstinence only and comprehensive sex education, they focus on two survey questions: 1) receiving any formal instruction at school, church, a community center, or some other place about how to say no to sex; 2) receiving any instruction about methods of birth control. The former represents abstinence only and the latter represents comprehensive. Kohler et al. find that young girls who identified as recipients of comprehensive sex education are significantly less likely to report teen pregnancy than those who received no formal sex education, whereas abstinence only education produced no difference. In addition to the focus on sex education, researchers have also conducted multivariate analysis by including other socioeconomic factors, and they conclude that there is a higher probability of teen pregnancy for teens from lower income households, noncentral city metropolitan residence, and nonintact family units (Kohler et al. 2007).

Additional studies explore the differential influence of these two forms of sex education. For example, Lindberg and Maddow-Zimet (2011) find that receipt of sex education, regardless of type, is associated with delays in sexual activity with a partner for both males and females. They further find that respondents who have information on both abstinence and birth control are much more inclined to use contraceptive methods at their first sex act and much less likely to

have an age-discrepant partner, both of which are mediatory behavioral indicators of teen pregnancy (Lindberg and Maddow-Zimet 2011). These authors also utilized the National Survey of Family Growth, but they examined the more recent time period of 2006-2008, thus providing a more updated program assessment. Moreover, they expand the respondents' age range from 15-19 to 15-24 years, permitting the examination of longer-term impacts that sex education could have on youth. Their analysis shows a lack of significant difference between abstinence only recipients and respondents without any formal instruction. At the same time, their analysis confirms the positive influence of comprehensive sex education not just on if or when to have sex, but also the issues of contraception, partner selection, and reproductive health outcomes. Interestingly, in their findings, males demonstrate a stronger association between sex education received before first sex and longer-term outcome improvements (more frequent condom use, reduction of having gotten a partner pregnant, etc.). Their research shows the continued dedication within the academic community in revising previous works and bringing more stakeholders into the conversation of sex education and teen pregnancy prevention (Lindberg and Maddow-Zimet 2011).

While much of the research on sex education makes frequent use of the National Survey of Family Growth, it is worthwhile to note that the survey merely asks whether an individual ever participated in a formal program and whether that involves abstinence or birth control or both. The survey instrument does not include questions measuring the quality, context, or duration of the program. In order to address this limitation, Kirby (2008) conducted an important study that tries to integrate a more holistic view of sex education based on program-specific information. Kirby reviewed a total of 56 studies that assessed the impact of both abstinence and comprehensive sex education (8 on abstinence and 48 on comprehensive) on adolescents' sexual

behavior. Based on the results, abstinence-only programs have little protective influence over the youth to warrant their widespread implementation. Conversely, Kirby's study reveals a strong correlation between comprehensive sex education and health-promoting sexual behaviors, which reaffirms the public health opinion on the need for wider dissemination of comprehensive programs. While some proponents of abstinence programs have previously accused the comprehensive model of mixing conflicting messages and thus impeding the amelioration of the teen pregnancy problem, evaluations of the programs provide a strong rebuttal to the claim by clearly demonstrating that it is possible both to delay first sex and to increase use of contraception among adolescents within the same program.

In contrast, according to experimental research conducted by Trenholm et al. (2008), the four most representative abstinence-only programs under Title V, Section 510 show no impact on teen sexual activity nor change in rates of unprotected sex. These researchers collected data from over 2000 youth through a series of four surveys over the course of each of the four programs. They examined such variables as knowledge of sexual practices, perceptions about the risks of teen pregnancy, and actual behavioral outcomes. None of the programs were found to significantly influence the the rate of sexual abstinence. Program and control group participants also did not differ in the level of engagement in sexual risky behaviors such as the number of partners with whom they had sex or the rate of condom use. If anything, students who received abstinence-only instruction were more likely to report that condoms are not effective at preventing pregnancy and STDs. Such an attitude indeed translates into their sexual practices and calls for attention on important knowledge gaps among the youth (Trenholm et al. 2008).

Relatively few studies have examined program effects from a longitudinal perspective; instead, most have focused on one year or a few particular years in examining youth's receipt of

sex education. Therefore, for future research, multiple waves of the National Survey of Family Growth could be included to explore program influence over time and to cross reference with the change in the national teen pregnancy rate. Additionally, a majority of the evaluative literature tends to emphasize the behavioral outcomes of programs. However, potential mediators of behavior as well as sociodemographic variables are equally important, if not more, for understanding he effectiveness of programs. For example, cultural aspects such as beliefs towards teen sex, social factors like mother's education, religious affiliation, and poverty status, and other characteristics of the family and household could all potentially offer valuable insights into teen pregnancy. While a longitudinal analysis is beyond the scope of the present thesis, I do hope to fill in some gaps in the literature and develop a more complete explanation. In particular, I will examine the influence of family characteristics, and it is to this topic that I now briefly turn.

REVIEW OF SELECTED FAMILY/HOUSEHOLD STUDIES

In addition to formal sex education in schools and churches, the family setting is another realm of social influence on adolescent sexual behavior and teenage pregnancy. Previous studies have looked at how parents' marital status and dating activities could potentially influence their children's risk of pregnancy. For example, Thornton and Camburn (1987) illustrated in their research that divorced couples tended to hold more permissive attitude towards sex and their teen's sexual life, leading to higher rates of pregnancy. Apart from parents, researchers have also investigated the impact of siblings. In research conducted by Rodgers, Rowe and Harris (1992), they demonstrated that having an older sibling who has experienced sexual intercourse increased the risk of pregnancy for the younger sibling through imitation and normalizing similar activities.

A broad range of variables measuring family socioeconomic status, including but not limited to parents' educational level, occupation, and household income, are shown to be highly correlated with teenage pregnancy as well (Miller 2001). Specifically, children whose parents possess higher degree of education and have more skilled professions are more likely to experience sexual debut at a later age; and if they do have sexual experience, they are more likely to use some form of birth control. Interestingly, among all the studies that have looked at socioeconomic and demographic background, many emphasized the mother's education as opposed to the father's education. The higher the education held by the mother, the lower the probability of premarital sexual intercourse for the daughters (Grady et al. 1989; Hayward et al. 1992; Brewster 1994).

In searching for factors contributing to higher teen pregnancy rates, Ellis et al. (2003) went beyond the overall family composition and focused specifically on the absence of the father. They utilized a longitudinal panel design and followed the sample of girls for five

consecutive years through age 18. Results demonstrated a strong association between the absence of father and teenage pregnancy. Earlier onset of father absence, which was defined as lack of a father figure before age five (while later father absence was between 6 to 13), further increased the risk of early sexual debut among the daughters by 7 times, even after controlling for other variables such as race and neighborhood conditions (Ellis et al. 2003).

Apart from variables emphasizing characteristics of the parents only, there is a sea of research on the dynamics of the parent-child relationship. According to Miller's 2001 synthesis of more than 20 studies, this concept of parent-child dynamics can be conceptually divided into three parts: parental support of connectedness, parental control, and family communication. Parental support was mostly measured through self-reports from respondents and, in some studies, by direct observation of family child-rearing practices. Although the wording differs across studies, it is evident that family cohesion and "warm" parenting are inversely related to the risk of pregnancy, most dominantly through postponing the onset of sexual intercourse. As for parental control, there are two subtypes identified in Miller's study, the behavioral and the psychological. The behavioral aspect of parental control is indicated by setting rules and supervision while the psychological aspect of parental control is measured by intrusiveness. Higher levels of strictness and monitoring in the household in general, even if those rules are not themselves related to sex (e.g., curfew), are correlated with later sexual debut and a lower frequency of sexual activities (Miller 2001). However, when overly excessive psychological control was present, adolescents were granted less autonomy and in turn were more likely to engage in high-risk sexual behaviors (Rodgers 1999). The last type of family dynamics is parent-child communication. Although results are mixed across studies, many studies have shown that talking about sex with parents was associated with later onset of sexual intercourse or having

fewer sexual partners (Barnett, Papini and Gbur 1991; Holtzmand and Rubinson 1995; Miller et al. 1999). While other studies suggest that open dialogue about sex at home may not be related to adolescent sexual intercourse, they nonetheless establish a positive relationship between communication and the likelihood of using contraception (Kastner 1984; Handelsman et al. 1987; Christopher et al. 1993). Within this set of studies showing a positive effect, mother's communication seemed to be more effective than father's in reducing the risk of pregnancy (Miller 2001).

DESCRIPTION OF THE SECONDARY DATA SET

In this thesis I analyze unweighted data from the 2013-2015 National Survey of Family Growth (NSFG). The NSFG is an ongoing data-collection project that provides a sample of males and females aged 15-44 in the household population of the United States. It has been conducted repeatedly since 1973 as part of the mission of the National Center for Health Statistics. Previously it was administered every five years for six consecutive cycles on the civilian population of women only. Starting from Cycle 6 the NSFG added the male population into the sample frame in order to achieve a more complete representation of the nation's public health. The main purpose of the survey since its inception has been to provide important national-scale information on sexual and reproductive activities and to plan for health services programs. The NSFG is particularly relevant to the present study of sex education because the survey questions concern factors affecting pregnancy such as use of multiple contraception, relationship history, medical services, and attitudes about sex. The survey utilizes multi-stage (cluster) probability sampling methods. Participants were selected from 121 primary sampling units, defined by metropolitan areas and/or counties. From each primary sampling unit, segments of neighborhoods and adjacent blocks were then selected. The third stage collected street addresses, and individuals living in randomly selected households were thereafter interviewed. The interviews were conducted during September 2013 and September 2015 across the two-year span and received responses from a total of 10,205 participants. For the purpose of this analysis, I only examine individual-level data based on 5,699 female respondents. The response rate for females based on the protocol calculation under NSFG during the recent data release is around 69% (CDC/National Center for Health Statistics 2019).

MEASUREMENT OF VARIABLES

Pregnancy is measured in three steps. The first step filters out those respondents who have ever been pregnant. If a respondent has answered "Yes" to the screener questions, she is then asked the age when her first pregnancy began. For the purpose of focusing on teenage pregnancy, a new variable was created from the aforementioned age variable in order to capture the distribution of respondent pregnancies. Specifically, all pregnancies reported to have occurred under age 20 years old are coded as teen pregnancy, and all other values are not, therefore constructing a comparison group on the binary variable. The independent variables are divided into two parts: family characteristics and formal institutional sex education. Among the several family-related variables, respondents were asked a range of questions that try to identify if they lived in an intact family, on their own, with only one parental figure, or in foster care before age 18. Specific sex education topics are organized into seven categories: how to say no, birth control method, birth control access, condom use, STD information, HIV/AIDS, and wait until marriage (i.e. abstinence). Respondents were asked, for each topic, whether they received any formal educational instruction, and if so, the grade when they first received the particular instruction, ranging from first grade to the second year of college. These and other variables are listed and described in Table 1 below.

METHODS

In exploring the relationship between teenage pregnancy and the impact of family and formal sex education, this research will be using two stages of analysis, starting with the bivariate level to establish preliminary baseline information and ending with a multivariate analysis. To show the bivariate effect that each independent variable has on teen pregnancy, a series of cross-tabulations is conducted. Statistical information for each crosstabulation is presented, including the percentages within categories of each independent variable and the p-values indicating the observed significance of Pearson's chi-square for each bivariate crosstabulation. Once the researcher establishes general frequency distribution, the next stage involves multivariate binary logistic regression to account for the potential interconnected effect different explanatory variables have on sex education that may not otherwise be captured individually through bivariate information. In the multivariate analysis, three sets of independent variables are modelled separately and then jointly, and each is assessed for its statistical significance level within different models, provided that the dependent variable is dichotomous with two possible outcomes, having had teen pregnancy and not.

DATA ANALYSIS

Bivariate Results. As shown in Table 1 (see Appendices), there were a total of 21 independent variables to be analyzed, seven on family characteristics, seven on formal sex education topics, and seven other measures on the school grade that respondent received the sex education. The dependent variable was dichotomous, with respondents grouped into either having experienced teenage pregnancy or not.

Preliminary chi-square tests were conducted to detect associations between the family background variables and the dependent variable. These results were shown in Table 2 (see Appendices). All the variables, with the exception of duration spent in foster care, were significantly associated with teenage pregnancy. Respondents who have lived in a foster home before 18 were more likely to report becoming pregnant during the teenage years (69.7% versus 55.8%; p=.001). For those who lived on their own before age 18, the percentage reporting teen pregnancy is 65.7%, compared to the much lower 39.8% for those who did not (p=.000). Similarly, living in an intact family significantly reduced the likelihood of teen pregnancy compared to those who had another family form (37.1% versus 57.5%; p=.000). Likewise, the likelihood of teen pregnancy was reduced in households with a strong family bond, indicated by parents being married at the time of the respondent's birth (42.3% versus 59.8%; p=.000). Further, we see in Table 2 that living in a single-parent household increased the chance of teen pregnancy, with p-values less than or equal to .01 in the case of both single male-headed households and single female-headed households. The various bivariate relationships shown in Table 2 were in the direction we might expect, and based on the magnitude of the column percent differences, the relationships were often strong and substantively meaningful in addition to being generally statistically significant.

The same preliminary chi-square tests were conducted for the sex education variables and teenage pregnancy. These results were presented in Table 3 (see Appendices). The results consistently showed that those who received formal sex education of various kinds (e.g., how to say no, condom use, etc.) were less likely to report becoming pregnant as a teen than their uneducated counterparts. But the percentage differences were not as pronounced as those observed in Table 2, thus the relationships with teen pregnancy were not as strong, and indeed they failed to reach statistical significance across six out of seven specified sex education topics. The only variable that seemed to have a significant effect was exposure to abstinence instruction, measured as students being told to wait until marriage to start participating in sexual activities. Among the 345 respondents who reported receiving abstinence information, 72.5% reported that they experienced teen pregnancy, as compared to 81.6% among those who were not taught, with a p-value of 0.019 (see Table 3).

Apart from sex education content, which was measured by topics with the binary response of either "Yes, Received" or "No, Did Not Receive," Table 3 also included another set of variables that ask respondents to specify the grade level in which they received sex education on each of the seven topics. Grade level (a proxy for age) was potentially important based on the assumption that the earlier one was exposed to proper sex education, the less likely they were to engage in risky sexual behaviors. For the purpose of this analysis, categories of these variables, ranging from first grade to second year of college, were recoded into three levels: primary school (Grade 1-5), middle school (Grade 6-8) and high school (Grade 9-12), and college was dropped due to low cell frequencies. According to the initial chi-square result, the timing of their reception of formal sex education seems not to be a strong indicator of teenage pregnancy status, as none of the grade level variables exhibited a p-value of less than 0.05.

There are two additional issues to discuss regarding Table 3. First, the sample sizes across crosstabulations are much smaller than in Table 1, and this is due to the sex education variables only being asked of a subset of respondents. The smaller sample sizes lower the power of the chi-square test, i.e., they make it harder to detect statistically significant differences across groups. Second, it is worth noting that the percentages reporting teen pregnancy seem unusually high across groups, much higher than the overall sample average of 47%. Exactly why this is the case is unclear, but it certainly merits further exploration and will be addressed in a follow-up report.

Multivariate Results. Given the binary nature of the dependent variable, the multivariate analyses in the present research are based on a series of logistic regressions. A measure of the size of the effect is presented through the odds ratio between the explanatory variable and the response variable. An odds ratio equal to 1.0 indicates that the variables are unrelated, i.e., the outcome of teen pregnancy is the same across groups. An odds ratio greater than 1.0 indicates a positive covariation of the variables, i.e., the "high" categories of both variables are associated. An odds ratio less than 1.0 indicates a negative covariation, i.e., the "high" category of one variable is associated with the "low" category of the other. The results are presented in Table 4 (see Appendices).

I began the multivariate analysis by including only race and ethnicity as background variables predicting teen pregnancy (see Model 1 in Table 4). The omitted categories for both variables are white and non-Hispanic, respectively. The results revealed that, compared to white respondents, African American respondents had significantly higher odds of teen pregnancy, and the "other" category (which consists mainly of Asians) had significantly lower odds of teen

pregnancy. Similarly, compared to non-Hispanics, Hispanic or Latina respondents had significantly higher odds of teen pregnancy. All these differences were statistically significant at the .001 level.

The first general hypothesis that this analysis was seeking to test was whether stronger family ties result in a lower teen pregnancy rate. These results were presented in Model 2 of Table 4 (see appendices). As shown in Model 2, three of the five family variables showed significant relationships with teen pregnancy. Compared to those who lived with their parents before age 18, those who reported living on their own had higher odds of becoming pregnant as a teenager ($p<.001$). Those whose parents were married at time of respondent's birth also had lower odds of experiencing teenage pregnancy compared to those whose parents were not married at birth ($p<.05$). Regardless of the parent's marital status at a later point, the fact that parents were married when the respondent was born significantly reduced her likelihood of being pregnant as a teen, as indicated by the 0.773 coefficient. In addition, being raised by only a stepfather was associated with higher odds of becoming pregnant as a teenager ($p<.01$) compared to those who lived with their biological father. These results were all consistent with what we observed at the bivariate level in Table 2, albeit the foster home and women-raised variables no longer showed significant effects in the multivariate context.

The second general hypothesis tested in this analysis concerned the effects of the sex education variables. We expect to find that those who received any type of formal institutional sex education will have a lower odds of teen pregnancy compared to those who did not receive sex education, and that those who received their sex education earlier in their school life will also be less prone to teen pregnancy. While some previous scholars have demonstrated that learning about birth control methods and condom use were closely connected to prevention of teenage

pregnancy, the statistical results in this analysis failed to support this finding. Indeed, as shown in Model 3 of Table 4, only abstinence instruction, i.e. teaching students to wait until marriage to have sexual intercourse, appeared to reduce the pregnancy odds ($p<.05$). In other words, teenage females who learned about abstinence had significantly lower odds of becoming pregnant. None of the other variables had significant effects on pregnancy at the .05 level. These findings mirrored those at the bivariate level shown in Table 3, where the abstinence variable had the lowest p-value.

Models 4 and 5 in Table 4 presented additional logistic regression equations. These equations combined demographic variables with family characteristics (Model 4) and repeated the procedure for demographic and sex education variables (Model 5). This analysis was conducted to determine whether the effects of predictor variables remain stable and robust under different specifications of the models. The question here is, do family characteristics and sex education continue to show similar effects on teen pregnancy when the background variables of race and ethnicity are held constant? As shown in Models 4 and 5, the results were indeed consistent with the previous two stand-alone models (Models 2 and 3), albeit in Model 4, the married parents variable lost its statistical significance.

Finally, when all variables measuring both family characteristics and sex education were combined into one equation, together with race and ethnicity, none of the variables displayed a statistically significant effect on the odds of teen pregnancy. This appeared to be due to multicollinearity, which could inflate standard errors and thereby reduce the ability to detect significant differences. Those variables with low tolerances (less than .40) were excluded from the equation to see whether the significance of effects would change. The results are shown in the column labeled Model 6 in Table 4. Model 6 omitted those variables that were collinear with

other predictor variables (specifically, ethnicity, grade level when STD education received, and grade level when HIV/AIDS information received were omitted). The results remain the same regardless of whether the collinear variables are included or excluded from the equation.

DISCUSSION AND CONCLUSION

Does intact family structure decrease girls' risk of teenage pregnancy, and how does this effect compare to the type of sex education girls received when they were young? In addressing the question, the current study utilized 2013-2015 data from the National Survey of Family Growth (NSFG) to explore the relative effects of two prevalent explanations for teen pregnancy. Previous research has examined extensively either one of the two explanations, but an explicit comparison of the two and an analysis of their combined effects has been absent from the literature. The current research has attempted to fill in the gap and hopefully increase our understanding of risk factors and reproductive health among youth.

Overall, based on the statistical results, family characteristics are a much stronger predictor of teen pregnancy than the characteristics of formal sex education one might have received. As social institutions, the family is likely to be an earlier, more immediate, and more persistent source of influence than formal schooling on young females, so perhaps it is not surprising that family characteristics appear to matter more. Young girls who live with both parents in an intact family or live with biological parents rather than other parental figures before age 18, have a lower tendency to be pregnant. Sex education, in contrast, appears to be a weaker force shaping sexual behaviors. In the present analysis, formal sex education had little to no discernable effect on the likelihood of teen pregnancy. This was true at the bivariate level as well as the multivariate. However, multicollinearity problems as well as other potentially undiagnosed problems in the latter analysis prevent us from reaching any firm conclusion about the preventive role played by formal sex education. Regarding the measurement of sex education, it is worth noting that women in the NSFG sample were asked to recall specific topics that might have been addressed in their sex education. There is no independent verification of

which forms of sex education they did or did not receive. This raises the issue of measurement error that may be exacerbated among older women in the sample, for whom recall ability might be more compromised. Apart from recall bias, there could be a reporting error due to the sensitivity nature of this topic. Women may answer the survey questions associated with sexual life and reproductive choices in certain patterns that are not true reflection of their experience in order to achieve a social desirability attached to them.

This research has focused primarily on the direct effects of family characteristics and sex education on the dependent variable. There are also numerous questions within the National Survey of Family Growth and in other surveys that allow for deeper analysis of the complex relationship between other sex-related variables and teen pregnancy. For example, age at first sexual intercourse, sexual partner's age, cohabitation before marriage, and use of different types of contraception could all potentially be intervening variables between family/sex education and teen pregnancy, as shown in Figure 1 (see Appendices).

This causal logic has been assumed but not formally tested in the present analysis. To test this chain of influences, we would first need to establish that the exogenous variables are related to the intervening variables and that the intervening variables are, in turn, related to teen pregnancy. It may be the case that formal sex education has only an indirect effect on teen pregnancy while family characteristics may have both direct and indirect effects. Other variables, such as exposure to adverse life experiences in childhood, are important to consider as well, along with controlling for any other confounding variables. In addition, different measures of family characteristics and sex education than those available in the present study might yield different conclusions. Whether results are sensitive to changes in operational measures of key concepts, and whether the diagram above is empirically accurate, will need to await future

research. Based on the present study, however, policies to reduce teen pregnancy would seem to be best directed towards intervention at the household and family level. Alternatively, schools may want to invite parents to become involved in the school-based discussion of sex education so that discussion of this topic is not conducted in institutional isolation.

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Appendices

Table 1. Variables in the Analysis

Variables	Label	Name	Description	Variable Type
Demographic	Ethnicity	HISP	Whether respondent is of Hispanic/Latina origin	Binary, 1394 responded "Yes"
	Race	RSCRRACE	Respondent's race as reported in screener	Categorical, categories including Black or African American, White, Hispanic, and Other race groups
Family Characteristics	On own before 18	ONOWN18	Whether respondent has ever lived on own before age 18	Binary, 1246 responded "Yes"
	Intact Family before 18	INTACT18	Whether respondent has always lived in intact family before age 18	Binary, 2998 responded "Yes"
	Parents married	PARMARR	Whether respondent's parents are married at birth	Binary, 4151 responded "Yes"
	Raised by woman	WOMRASDU	Woman who raised respondent during teens	Categorical, catefories including "Biological mother", "Other mother figure" and "No mother figure"
	Raised by man	MANRASDU	Man who raised respondent during teens	Categorical, categories including "Biological father", "Step-father", "No father figure" and "Other father figure"
	Foster home	EVRFSTER	Whether respondent ever lived in a foster home	Binary, 195 responded "Yes"
	Duration in foster home	DURFSTER	Total time respondent spent in foster care	Ordinal, ranging from "less than six months" to "three years or more"
Sex Education	How to say no	SEDNO	Whether the respondent received formal sex education on how to say no to sex	Binary, 1359 responded "Yes"
		SEDNOG	Grade when first received instruction on how to say no to sex	Ordinal, ranging from 1st grade to 1st year of college

	Birth Control Method	SEDBC	Whether the respondent received formal sex education on birth control	Binary, 1150 responded "Yes"
		SEDBCG	Grade when first received instruction on birth control	Ordinal, ranging from 1st grade to 1st year of college
	Birth Control Access	SEDWHBC	Whether the respondent received formal sex education on where to get birth control	Binary, 873 responded "Yes"
		SEDWHBCG	Grade when first received instruction on where to get birth control	Ordinal, ranging from 4th grade to 1st year of college
	Condom	SEDCOND	Whether the respondent received formal sex education on how to use condom	Binary, 972 responded "Yes"
		SEDCONDG	Grade when first received instruction on how to use condom	Ordinal, ranging from 1st grade to 2nd year of college
	STD	SEDSTD	Whether the respondent received formal sex education on sexually transmitted diseases	Binary, 1514 responded "Yes"
		SEDSTDG	Grade when first received instruction on where to get birth control	Ordinal, ranging from 1st grade to 12th grade
	HIV/AIDS	SEDHIV	Whether the respondent received formal sex education on HIV/ADIS	Binary, 1405 responded "Yes"
		SEDHIVG	Grade when first received instruction on HIV/ADIS	Ordinal, ranging from 1st grade to 1st year of college
	Wait Until Marriage	SEDABST	Whether the respondent received formal sex education on abstinence (waiting to have sex until marriage)	Binary, 1127 responded "Yes"
		SEDABSTG	Grade when first received instruction on abstinence	Ordinal, ranging from 1st grade to 12th grade
Pregnancy	Pregnancy History	EVERPREG	Whether respondent has ever been pregnant	Binary, 3511 responded "Yes"

	First Pregnancy	AGECON01	Age when R's 1st pregnancy began	Continuous numerical

Source: Webdoc Interactive Codebook
https://www.icpsr.umich.edu/icpsradmin/nsfg/index?studyNumber=9999

Table 2. Teenage Pregnancy by Family Characteristics

Independent variables: Family characteristics		Dependent variable: Did respondent become pregnant as a teenager?	
		Percent saying Yes (Base number)	p-value of chi-square
Live on own before 18			0.000
	No	39.8% (2488)	
	Yes	65.7% (988)	
Live in intact family before 18			0.000
	No	57.5% (1711)	
	Yes	37.1% (1765)	
Parents married at birth			0.000
	No	59.8% (958)	
	Yes	42.3% (2488)	
Raised by only woman			0.011
	Biological mother	55.2% (1195)	
	Other mother figure	62.6% (473)	
	No mother figure	66.7% (42)	
Raised by only man			0.003
	Biological father	51.8% (593)	
	Step father	62.1% (348)	
	No father figure	57.5% (353)	
	Other father figure	61.9% (417)	
Ever in foster home			0.001
	No	55.8% (1522)	
	Yes	69.7% (155)	
Duration in foster home			1.000
	Less than 3 yrs	71.4% (98)	
	More than 3 yrs	71.4% (91)	

Table 3. Teenage Pregnancy by Sex Education Topic

Independent variables: Formal Sex Education before 18		Dependent variable: Did respondent become pregnant as a teenager?	
		Percent saying Yes (Base number)	p-value of Chi-square
How to say no to sex			0.091
	No	81.5% (119)	
	Yes	74.0% (411)	
When learnt how to say no to sex			0.590
	Primary school	70.3% (60)	
	Middle school	73.3% (217)	
	High School	76.7% (133)	
Methods of birth control			0.087
	No	81.0% (137)	
	Yes	73.7% (392)	
When learnt birth control			0.563
	Primary school	67.7% (31)	
	Middle school	72.7% (194)	
	High School	76% (167)	
Birth control access			0.203
	No	79.1% (201)	
	Yes	74.2% (326)	
When learnt birth control access			0.886
	Primary school	78.9% (19)	
	Middle school	73.7% (156)	
	High School	74.2% (151)	
How to use condom			0.511
	No	77.4% (186)	
	Yes	74.9% (342)	
When learnt how to use condom			0.854
	Primary school	76.2% (21)	
	Middle school	73.4% (169)	
	High School	76.0% (150)	
STD			0.232
	No	82.1% (56)	
	Yes	74.9% (474)	
When learnt STD			0.078
	Primary school	61.4% (44)	
	Middle school	75.5% (237)	
	High School	77.6% (192)	
HIV/AIDS			0.247
	No	80.8% (78)	
	Yes	74.7% (450)	
When learnt HIV/AIDS			0.054
	Primary school	59.0% (39)	
	Middle school	75.4% (228)	
	High School	77.3% (181)	

Waiting until marriage			0.019
	No	81.6% (185)	
	Yes	72.5% (345)	
When learnt waiting until marriage			0.538
	Primary school	67.8% (59)	
	Middle school	74.6% (193)	
	High School	70.7% (92)	

Table 4. Effects of Predictor Variables on Teen Pregnancy: Logistic Regression Models

Independent Variable			**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**
Demographic								
	Race							
		Black	1.81***			1.474**	0.830	0.766
		Other	0.534***			0.758	0.623	
	Hispanic		2.937***			1.844*	1.451	
Family Characteristics								
	Live on own			1.777***		1.823***		1.619
	Parents married			0.773*		0.866		1.476
	Ever in foster			1.332		1.380		0.710
	Woman raised							
		Other mother		1.068		1.081		1.173
		No mother		1.227		1.213		0.662
	Man raised							
		Step father		1.512**		1.561**		1.107
		No father		1.089		1.036		0.523
		Other father		1.284		1.255		0.588
Sex Education								
	How to say no				0.990		0.978	0.668
	Birth control				0.745		0.738	0.720
	Abstinence				0.553*		0.558*	0.777
	Birth control access				0.916		0.901	0.674
	Condom use				1.108		1.104	1.537
	STD grade				1.056		1.042	
	HIV grade				0.888		0.890	
N (number of cases included in analysis)			3475	1660	435	1660	435	330
R square (Nagelkerke)			0.04	0.049	0.050	0.053	0.053	0.080
*p<.05, **p<.01, ***p<.001								

Figure 1. Causal Model of Teenage Pregnancy