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The Sex Generation: The impact of teen attitudes views and knowledge of contraceptives and sexual activity on the teen pregnancy and std rates in the United States

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**The sex generation: the impact of teen attitudes, views, and knowledge of
contraceptives and sexual activity on the teen pregnancy and std rates in the
united states**

by

Haritha Sishtla

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Submitted in partial fulfillment
of the requirements for
Honors in the Department of Economics

UNION COLLEGE
June, 2011

ABSTRACT

SISHTLA, HARITHA The Sex Generation: The impact of teen attitudes, views, and knowledge of contraceptives and sexual activity on the teen pregnancy and STD rates in the United States

Department of Economics, June 2011

Among all industrialized nations, the United States faces the highest rates of teen pregnancies and sexually transmitted diseases (STDs). Previous studies have indicated that teens use engagement in sexual activity as a social mechanism to gain popularity among their peers. This paper focuses on two issues: social factors such as peer perceptions towards other peers engaging in sex and using contraceptives, and assesses the level of knowledge teens have about sex, STDs, pregnancy, and contraceptives that could have an effect on the teen pregnancy and STD rates in the United States.

Cross-sectional data from Waves I and II (1994-96) National Longitudinal Study of Adolescent Health was analyzed using a probit regression model in order to investigate the effect of a teen's attitudes, perceptions, and knowledge of contraceptives and sexual activity on pregnancy for females and STD rates for males and females separately in the United States. The survey asks both male and female youth various knowledge and perception questions about sex, contraceptives, and STDs. An indexed knowledge and responsible perception variable were created and regressed against pregnancy and STD rates in the following wave.

Results suggest that the knowledge variable does not have a significant effect on the pregnancy and STD rates whereas the perception variable has a significant effect on the pregnancy rate only. This suggests that further sex education initiatives

should be more focused on realistic scenarios of pregnancy and STDs and facilitate discussion among peer groups on the issues of sex, pregnancy, and STDs so that teens develop a better understanding of sexual activity and the impact it may have on their futures.

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CHAPTER ONE

INTRODUCTION

A. The Importance of Studying Pregnancy and Sexually Transmitted Disease (STD) Rates Among Teenagers

Teen pregnancy has become a rising public health issue in the United States. The Guttmacher Institute calls teen pregnancy an ‘epidemic’ (Boonstra, 2010). According to the Youth Risk Behavior Survey among U.S. high school students as of 2009, 46% had sexual intercourse, 6% had sexual intercourse for the first time before age 13, 14% had sexual intercourse with four or more persons during their life, and 34% had sexual intercourse with at least one person during the 3 months before the survey. Of these students, 39% did not use a condom during last sexual intercourse, 77% did not use birth control pills or Depo-Provera¹ to prevent pregnancy, and 22% drank alcohol or used drugs before their last sexual intercourse (CDC, 2010). The facts are simply stated, and more teens are unaware of the effects of sexual intercourse on their future.

Teenagers more often than adults partake in risky behaviors, and there are a number of determinants and implications of their actions. Teens, like adults, make decisions by weighing costs and benefits. Their decision-making is altered by a variety of sources. A major factor contributing to this is the social environment consisting of the media, family, and friends. Among a variety of reasons, teens become involved in drinking and drug use because of peer pressure, bad role models at home, or through media influences. The involvement in one risky behavior is the gateway to other similar activities. Teen sexual activity is considered a risky behavior

¹ Depo-Provera is an injection that is used to prevent pregnancies. It is a very effective method of birth control, but does not prevent human immunodeficiency virus (HIV), acquired immunodeficiency syndrome (AIDS), or other sexually transmitted diseases (CDC, 2010).

because teens are not well informed and do not take proper precautions to practice safe sex. Safe sex is a method of practicing sex by taking precautions to protect against sexually transmitted diseases using proper contraception (CDC, 2010). By studying teen knowledge and perception patterns, more effective measures can be taken to educate teens properly and reduce social influences.

B. Contributions and Organization of This Paper

This paper uses an economic framework developed by Jonathan Gruber (2000) to explore sexual activity among teens through three components: rational-choice economics, developmental psychology, and behavioral economics. Using 1994-96 data from the National Longitudinal Study of Adolescent Health (Add Health) this paper investigates the effect of knowledge and attitudes toward pregnancy, sexually transmitted diseases (STDs), contraception, and sexual intercourse on teen pregnancy and STD rates in the United States.

Controlling for background variables such as race, ethnicity, age, income level, mother and father's educational background, family structure, alcohol and drug use, previous sexual activity, and whether or not the respondent's mother was a teenage mother, this paper finds that overall knowledge does not decrease the pregnancy and STD rates among teenagers. In fact, some of the knowledge questions individually increase the pregnancy and STD rates. This paper also finds that the overall responsible perception of sex, contraceptives, pregnancy, and STDs has a significant effect in lowering the pregnancy rates among females. Thus to lower the pregnancy and STD rates among teenagers, a restructuring of current sex education programs

should take place. These programs should be more focused on open discussion with peers on sex, STDs, contraceptives, and pregnancy. By facilitating communication, teenagers will have a better understanding about the consequences of sex on their futures. This paper also looks at other risky behaviors, such as smoking, and finds that they have a significant effect in increasing STD rates among males.

The organization of this paper is as follows. Chapter Two provides a review of the existing literature regarding the effects of knowledge and perceptions on teen pregnancy and STD rates. Chapter Three describes the economic model which serves as the basis for the econometric regression analysis. Chapter Four provides a description of the data and the econometric model used. Chapter Five provides the results of the econometric analysis, and Chapter Six provides conclusions.

CHAPTER TWO

A REVIEW OF TEEN ATTITUDES AND PERCEPTIONS TOWARD CONTRACEPTIVES, SEX, AND STDs

This chapter provides a review of the existing literature concerning teen pregnancy and STD rates and teen's knowledge and perceptions toward contraceptives, sex, STDs, and pregnancy. In particular, this chapter reviews empirical studies that examine sex education programs and other influences of risky behavior such as alcohol, drugs, media, and family along with teen pregnancy and STD patterns.

A. Factors Contributing to Teen Pregnancy and STD Outcomes

Societal factors influence teenagers' judgment and play a role in fostering teen involvement in sexual activity. One study by Little & Rankin (2001) suggested that risk behaviors associated with the 'problem syndrome', that is as marijuana and alcohol use, are powerful predictors of early-teen sexual activity. Biglan et al. (1990) also found that high-risk sexual behavior was significantly related to cigarette, alcohol, and illicit drug use. In addition, the social setting can also have a major influence on teens' decisions to engage in sexual activity. For females, having a boyfriend and seeking peer approval are two of the reasons why they may partake in sexual intercourse. On the other hand for males, sexual activity is seen as a status-seeking method (Little & Rankin, 2001).

Prinstein et al. (2003) investigated how teenagers' perceptions of sex change when they know that their best friends are having sex. Engagement in oral sex serves

as a social mechanism among peers to gain popularity. Oral sex may be perceived as a less risky method of contracting a sexually transmitted infection (STI); however, reviews suggest that this method of intercourse is significant in transmitting bacterial and viral infections (Edwards & Carne, 1998). Media, family, and the community dictate social norms that guide teenagers' behaviors toward sexual activity. However, the study of perceptions of their best friends' behavior is one that has been examined rarely. Friends are the most available and relevant reference group for teens on practices, norms, and risks associated with sexual behavior (Prinstein et al., 2003). For example, females with friends who have engaged in sexual intercourse before high school are more likely to initiate sexual activity than females with friends who are virgins (Billy & Udry, 1985).

B. Sex Education and Teen Pregnancy and STD Outcomes

Several studies on sex education programs indicate mixed reviews on their effectiveness in preventing teen pregnancy and STDs. Oettinger (1999) found that the effects of sex education were larger among women who appear to have had fewer alternative sources of sexual information, such as the media or family. Teens who received sex education earlier in school were more likely to transition into sexual activity but not necessarily pregnancy. Some programs included "resistance skills" as part of the educational curriculum leading to later transitions into sexual activity. Sex education programs also include abstinence education, which focuses on promoting abstinence² rather than safe sex practices. Abstinence education programs did not reduce teen sexual activity, but they also did not increase the risks of teen pregnancy

² Abstinence is refraining from some or all sexual intercourse (CDC, 2009).

and STDs. Since teens have gaps in knowledge about STDs, targeting them at a young age may not be effective. Teaching young teenagers about abstinence may be ineffective because when they become older, social influences play a heavier role causing them to disregard the abstinence view (Trenholm et al., 2008).

The availability of contraceptives and contraception education also affects teen pregnancy and STD rates in the United States. In a 1976 survey, 58% of women who did not use contraception during premarital sex believed that they could not conceive. The remaining women stated that they did not expect they would engage in intercourse. By the age of 18, 81% of females had received sex education in school and 74% had discussed methods of contraception (Zelnik & Kantner, 1979). Even though a large percentage of students are receiving education, it is important to look at the comprehensiveness of the program. A 1984 survey of urban school districts revealed that although 75% of school districts ran sex education programs, only 10% had spent at least one class period before the ninth grade discussing contraceptives and where they are available (Sonenstein & Pittman, 1984). Older, sexually active females who had a sex education course are significantly more likely to use an effective contraceptive, 73%, than those who have not, 64% (Marsiglio & Mott, 1986). Sonenstein & Pittman (1984) also found that of those who began having sex by age 18, no more than half have had a course on sex and no more than 40% have had instruction on birth control. A common misconception is that teaching students about contraception will encourage promiscuity. However, a study using the 1982 National Survey of Family Growth revealed that the age at which formal contraceptive education is first provided has been declining and exposing adolescents

to contraception did not increase likelihood of them engaging in sexual activity (Dawson, 1986).

Sex education is part of many school curricula and although teens partake in the program their attitudes towards pregnancy and sex may not change. An endogenous factor, personality, is a factor in teen decisions. Dawson (1986) found that teens that receive sex education are more tolerant towards the sexual behavior of others but change little of the values that govern their own personal behavior. Teenagers who have higher educational aspirations are more likely to use a condom because they have the motivation to establish themselves before starting a family, whereas teenagers, who are not doing well in school, have lower 'measured ability', and lack high aspirations, are more likely to become pregnant (Luker, 1991).

C. Consequences of Teen Pregnancy

The Guttmacher Institute found that teen mothers are poorer in health, more likely to be on welfare, and do not finished their education (Luker, 1991). About half of all families supported by Aid to Families with Dependent Children³ (AFDC) started while the mother was a teenager. In 1975, the estimated costs for these families amounted to \$5 billion and increased to \$8.3 billion in 1985. In her book *Dubious Conceptions*, Kristen Luker (1996) states that the social context in which teens make their life decisions is from three decades of changes in public attitudes towards gender roles, marriage, sexual and reproductive behavior, family structures, and

³ The AFDC was a federally mandated program that guaranteed cash assistance to families with needy children. In 1996, Congress abolished AFDC in favor of a Temporary Assistance to Needy Families (TANF) grant which gives money to states that design their own welfare program (Page & Larner, 1997).

single mothers. Indeed, much of teenagers' decisions to engage in sexual activity and become pregnant has stemmed from social conceptions.

Many of the aforementioned studies have looked at sex education and teen perceptions as key variables for teen pregnancy and STD outcomes. In this study, indexed knowledge and perception variables are created. These key variables are regressed against teen pregnancy and STDs along with many important background variables. Gruber's economic model of youth risky behavior (2000) is also heavily incorporated into the econometric model and analysis, a novel idea, which no previous study has encompassed. Findings from this paper could provide insight for policymakers in restructuring sexual education programs making them more effective.

CHAPTER THREE
ECONOMIC MODEL TO ANALYZE TEEN KNOWLEDGE AND
PERCEPTIONS TOWARD SEX, CONTRACEPTIVES, TEEN PREGNANCY
AND STDS

This chapter describes the economic model that serves as the basis for the econometric model. Jonathan Gruber (2000) analyzes risky behavior among youth in three major components: utility maximization, developmental psychology, and behavioral economics.

A. Utility Maximization: Decision-Making Model

The Gruber model (2000) depicts the determinants of risky behavior among youth. Gruber explores youth engagement in risky behavior through three major concepts. The first is through the economic concept of decision-making, which is similar to the economic model of human behavior created by Becker (1976). Becker's theory builds on the theory of individual choice by using individual behavior at the micro level and deriving implications at the group or macro level. Becker acknowledges that behavior is not only driven by self-interest but also by other values and preferences. The goal of individuals is to maximize their welfare, no matter what their individual preferences are. However, individuals' actions are constrained by limited resources such as income, time, and the views and norms of society. These resources are largely determined by the actions of other individuals and organizations in the surrounding environment. Scholars can use the rational choice model as a basis for analyzing the social world (Becker, 1976).

Gruber acknowledges the traditional economic approach to modeling decision making by saying that individuals face risky choices with benefits and costs, incorporating both into a utility maximization problem. However, youths may assess their benefits and costs differently because they are economically not in the same position as adults. In the case of teen pregnancy, the costs of becoming pregnant may not be as apparent if the teen has good financial or social support from friends or family.

In this paper, we look at the rational choices that teens make with regards to sexual intercourse. Teenagers, being ‘economic individuals’ know about the risks of engaging in sexual intercourse such as becoming pregnant, a change of lifestyle filled with economic and social hardships, and contracting an STD, but at the same time have the desire to benefit from the experience. The expected benefits of engaging in unprotected sex are having a child, becoming more intimate with or married to their partner, a new and different lifestyle, and gaining popularity amongst their peers. Research has shown that the ability for teenagers to make rational decisions may not yet be fully developed until the age of 13 or 15, especially when it comes to abstract reasoning or reasoning in an ‘if/then’ mode (Leibowitz et al., 1986).

Constraints in this model include the knowledge and perceptions that teens have regarding pregnancy, STDs, and contraceptives, which they receive from a limited pool of knowledge. Media, family, and the community dictate social norms that guide teenagers’ behavior towards sexual activity. If teens are limited to these information sources then they will make decisions according to them. The attitudes and perceptions individuals have and the decisions they make regarding teen pregnancy,

STDs, and contraceptives can then influence a larger group of teenagers who are also thinking about these behaviors. Those individuals who view pregnancy and sexual intercourse as a social mechanism to gain popularity will make a rational choice to engage in unprotected sex. This in turn can influence a larger group of teens to do the same.

The rational decision making model can also be used to look at contraceptive use. If teenagers have limited knowledge regarding contraceptives, and their decision to use or not use one is influenced by other teenagers, they are less likely to use protection. Their rational decision-making is affected more by social norms than textbook-based knowledge.

Ultimately, if teens decide to engage in sex, it can affect both the pregnancy and STD rates. The foundation for this decision comes from how the individual engages in rational decision making and what determinants affect their behavior. By studying the rational decision making of individuals and applying the economic behavior model to teenagers, policymakers understand the social impact on teen pregnancy and STD rates, and use this information to reduce the increasing number of cases.

B. Developmental Psychology and Behavioral Economics

Besides the standard economic framework, developmental psychology has been the primary field to study youth and risky behavior. Developmental psychologists look at the decision making capacities of teens and adults, pointing out similarities and differences. When adults and teens were asked about short and long term costs and benefits of partaking in different activities, adults outperformed youths by taking

into consideration all of the options, risks, and long-term consequences (Steinberg & Cauffman, 1996). Another differing factor between teens and adults, is that teens are more susceptible to peer influences as opposed to self-reliance when making decisions. The peak of social influence occurs when teenagers are around the age of 14, and declines during the high school years.

Another theory suggests that teens have a harder time controlling their impulses (Fischhoff, 1992). Classic examples of this include teen smoking, alcohol and drug use. Teens become involved in these risky behaviors impulsively instead of thinking about consequences as adults would. Teens usually do not plan ahead when they are having sex, but instead can make the decision impulsively during a heated moment. Hence, they are less likely to be prepared with the proper knowledge to use contraceptives or have any form of protection, leading to unexpected outcomes. Lastly, Gruber points out that with age, adolescents will recognize the risks and future consequences of decisions.

Applying developmental psychology to the economic model of decision-making creates a field of behavioral economics, which serves to expand the original economic model towards youth decision-making. The first alteration we can make to the original economic model is taking into account the discount rate of teens. Teens often discount the future, meaning their preferences are not time consistent. If teens engage in unprotected sex today, then they may regret their decision tomorrow or in the next couple of days when they realize the consequences. It is important to note that among teens, discount rates vary. The next alteration is introducing the notion that teens may inappropriately project the current moment's preferences onto their future tastes,

known as projection bias. At the current moment, teens are not fully aware of their capabilities after leaving high school, especially those who do not have high aspirations for their future; hence, everything in the future seems unappealing. Lastly, many risky activities have a permanent one time cost. When teens engage in unprotected sex and contract an STD, the marginal risk of future engagements is lower. For teens who find unprotected sex more enjoyable, they will continue to engage in it even after contracting an STD; due to the fact that they already have the disease and further unprotected sex will not create additional risk for them.

This paper takes into consideration the economic models developed by Gruber and Becker when estimating the effects of teen perceptions and knowledge of STDs, sex, and contraceptives on teen pregnancy and STD rates. The econometric model developed in this thesis consists of two main categories of variables, individual perception and knowledge variables. These variables capture the cost-benefit analysis decision-making that teens go through when engaging in sexual intercourse. Background variables include alcohol and drug use as well as smoking among teenagers to model the impulsive behavior mentioned in the developmental psychology component of the model. Lastly, previous sexual activity is captured in the regression model to mirror Gruber's behavioral economics component especially when looking at marginal risk and STDs. The empirical results from this paper can be used to develop future theories to explain youths and risky behavior.

CHAPTER FOUR

ESTIMATING THE EFFECTS OF TEEN KNOWLEDGE AND PERCEPTION

VARIABLES ON THE TEEN PREGNANCY AND STD RATES

This chapter describes the data set and the econometric models used for the regression analysis. In addition to discussing each of the dependent and independent variables, the chapter outlines the statistical methodology used in this study.

A. Data-National Longitudinal Study of Adolescent Health

The data is obtained from the National Longitudinal Study of Adolescent Health (Add Health), a school-based study on health-related behaviors of adolescents. This study takes a nationally representative sample of adolescents in grades 7 to 12 in the United States, spanning four waves from 1994 to 2008. Add Health combines longitudinal survey data on topics such as social, economic, psychological, and physical well being with data on family, relationships, community, school, friendships, peer groups, and romantic relationships. The results allow for a unique look at how social environment impacts youth's health and achievement outcomes.

The University of North Carolina Population Center collects data on U.S. 7th to 12th graders, their parents and family members, peers and friends, and school administrators. The study design uses clustering and stratification to select high schools based on region, urbanicity, size, type, and ethnicity. A total of 132 schools in 80 communities participated in the study, and 90,118 in-school adolescent questionnaires were completed. The public use data set does not contain the full

number of observations, does not include variables which would control for stratification and clustering, and only includes sampling weights.

The regression analysis contains independent variables from Wave I, September 1994 to December 1995, and dependent variables from Wave II, 1996. In order to reduce a reverse causation effect, the econometric model looks at how knowledge gained in Wave I affects pregnancy and STD outcomes in Wave II, hence two waves of data are used. The response rate for in-home questionnaires was 78.9%. In Wave II, 65 new respondents were added to the sample and the response rate was 88.2%.

B. Econometric Models to Estimate Pregnancy and STD Outcomes

To examine the effects of knowledge on and perceptions toward sex, pregnancy, contraceptives, and STDs on the pregnancy and STD rates among teenagers, the following general econometric models are used:

$$\begin{aligned} \text{W2PREGNANT} = & \beta_0 + \beta_1 \text{HISPANIC} + \beta_2 \text{BLACK} + \beta_3 \text{OTHER} + \beta_4 \text{AGE15} + \beta_5 \\ & \text{AGE16} + \beta_6 \text{AGE17} + \beta_7 \text{AGE18} + \beta_8 \text{ALCOHOL} + \beta_9 \text{SMOKE} \\ & + \beta_{10} \text{DRUGS} + \beta_{11} \text{INCOME1} + \beta_{12} \text{INCOME2} + \\ & \beta_{13} \text{INCOME3} + \beta_{14} \text{INCOME4} + \beta_{15} \text{INCOME5} \\ & + \beta_{16} \text{MOTHERSOMEHIGH SCHOOL} + \\ & \beta_{17} \text{MOTHERHIGH SCHOOL} + \\ & \beta_{18} \text{MOTHERSOME COLLEGE} + \beta_{19} \text{MOTHER COLLEGE} + \\ & \beta_{20} \text{FATHERSOMEHIGH SCHOOL} + \\ & \beta_{21} \text{FATHERHIGH SCHOOL} + \beta_{22} \text{FATHERSOME COLLEGE} \\ & + \beta_{23} \text{FATHER COLLEGE} + \beta_{24} \text{OLDERBRO} + \beta_{25} \text{OLDERSIS} \\ & + \beta_{26} \text{TEENMOM} + \beta_{27} \text{PROTESTANT} + \beta_{28} \text{CATHOLIC} + \\ & \beta_{29} \text{JEW} + \beta_{30} \text{ISLAM} + \beta_{31} \text{OTHERRELIG} + \beta_{32} \text{ALCOHOL} + \\ & \beta_{33} \text{SMOKE} + \beta_{34} \text{DRUGS} + \beta_{35} \text{SEX} + \beta_{36} \text{SPERMDIECORR} + \\ & \beta_{37} \text{EJACPULLCORR} + \beta_{38} \text{OVULATECORR} + \\ & \beta_{39} \text{CONDOMFITCORR} + \beta_{40} \text{VASELINECORR} + \\ & \beta_{41} \text{PREGNANTTIMECORR} + \beta_{42} \text{PULLOUTCORR} + \\ & \beta_{43} \text{CONDOMROLLCORR} + \beta_{44} \text{PREGNANTPERIODCORR} \\ & + \beta_{45} \text{LIFEWORSE} + \beta_{46} \text{HASSLE} + \beta_{47} \text{FRIENDRESPECT} + \\ & \beta_{48} \text{PARTNERRESPECT} + \beta_{49} \text{GUILTY} + \beta_{50} \text{PLEASURE} + \end{aligned}$$

$$\begin{aligned} & \beta_{51}\text{ATTRACTIVE} + \beta_{52}\text{EMBARRASSING} + \\ & \beta_{53}\text{QUITSCHOOL} + \beta_{54}\text{MARRIAGE} + \beta_{55}\text{GROWUP} + \\ & \beta_{56}\text{HICHANCEPREGNANCY} + \beta_{57}\text{BIRTHCONTROLPLAN} \\ & + \beta_{58}\text{KNOWLEDGE} + \beta_{59}\text{PERCEPTION} + \varepsilon \end{aligned}$$

$$\begin{aligned} \text{W2STD} = & \beta_0 + \beta_1 \text{HISPANIC} + \beta_2 \text{BLACK} + \beta_3 \text{OTHER} + \beta_4 \text{AGE15} + \beta_5 \text{AGE16} + \\ & \beta_6 \text{AGE17} + \beta_7 \text{AGE18} + \beta_8 \text{ALCOHOL} + \beta_9 \text{SMOKE} + \\ & \beta_{10} \text{DRUGS} + \beta_{11} \text{INCOME1} + \beta_{12} \text{INCOME2} + \beta_{13} \text{INCOME3} \\ & + \beta_{14} \text{INCOME4} + \beta_{15} \text{INCOME5} \\ & + \beta_{16} \text{MOTHERSOMEHIGH SCHOOL} + \\ & \beta_{17} \text{MOTHERHIGH SCHOOL} + \\ & \beta_{18} \text{MOTHERSOME COLLEGE} + \beta_{19} \text{MOTHER COLLEGE} + \\ & \beta_{20} \text{FATHERSOMEHIGH SCHOOL} + \\ & \beta_{21} \text{FATHERHIGH SCHOOL} + \beta_{22} \text{FATHERSOME COLLEGE} \\ & + \beta_{23} \text{FATHER COLLEGE} + \beta_{24} \text{OLDERBRO} + \beta_{25} \text{OLDERSIS} \\ & + \beta_{26} \text{TEENMOM} + \beta_{27} \text{PROTESTANT} + \beta_{28} \text{CATHOLIC} + \\ & \beta_{29} \text{JEW} + \beta_{30} \text{ISLAM} + \beta_{31} \text{OTHERRELIG} + \beta_{32} \text{ALCOHOL} + \\ & \beta_{33} \text{SMOKE} + \beta_{34} \text{DRUGS} + \beta_{35} \text{SEX} + \\ & \beta_{36} \text{CONDOMFITCORR} + \beta_{37} \text{VASELINECORR} + \\ & \beta_{38} \text{CONDOMROLLCORR} + \beta_{39} \text{FRIENDRESPECT} + \\ & \beta_{40} \text{PARTNERRESPECT} + \beta_{41} \text{GUILTY} + \beta_{42} \text{PLEASURE} + \\ & \beta_{43} \text{ATTRACTIVE} + \beta_{44} \text{HICHANCESTD} + \\ & \beta_{45} \text{BIRTHCONTROLPLAN} \quad \varepsilon \end{aligned}$$

where ε is the error term.

Dependent Variable

W2PREGNANT

0 if the youth has never been pregnant and 1 if the youth has been pregnant. This is during Wave II of the survey and excludes those who were pregnant during Wave I.

W2STD

0 if they have never had an STD and 1 if they have. This is during Wave II of the survey and excludes those who had an STD during Wave I.

Independent Variables

Background Variables

Race/Ethnicity Variables (Reference group: White)

HISPANIC

1 if the respondent is Hispanic and 0 otherwise

BLACK

1 if the respondent is non-Hispanic black and 0 otherwise

OTHER	1 if the respondent is of a race or ethnicity other than non-Hispanic black, non-Hispanic white, or Hispanic and 0 otherwise
Age Variables (Reference group: age 19)	
AGE15	1 if the respondent's age is 15; 0 otherwise
AGE16	1 if the respondent's age is 16; 0 otherwise
AGE17	1 if the respondent's age is 17; 0 otherwise
AGE18	1 if the respondent's age is 18; 0 otherwise
Income Variables (Reference group: missing income)	
INCOME1	1 if the household income in 1994 was \$0-30,000; 0 otherwise
INCOME2	1 if the household income in 1994 was \$30,000-60,000; 0 otherwise
INCOME3	1 if the household income in 1994 was \$60,000-90,000; 0 otherwise
INCOME4	1 if the household income in 1994 was \$90,000-120,000; 0 otherwise
INCOME5	1 if the household income in 1994 was above \$120,000; 0 otherwise
Mother's Education Variables (Reference group: no mother)	
MOTHERSOMEHIGH SCHOOL	1 if the biological mother did not graduate from high school, did not complete a GED, or went to business/trade/vocational school instead; 0 otherwise
MOTHERHIGH SCHOOL	1 if the biological mother is a high school graduate or completed a GED; 0 otherwise
MOTHERSOME COLLEGE	1 if the biological mother did not graduate college or went to business/trade/vocational school instead; 0 otherwise
MOTHERCOLLEGE	1 if the biological mother is a college graduate or went to professional training beyond college; 0 otherwise

Father's Education Variables
(Reference group: no father)

FATHERSOMEHIGH SCHOOL	1 if the biological father did not graduate from high school, did not complete a GED, or went to business/trade/vocational school instead; 0 otherwise
FATHERHIGH SCHOOL	1 if the biological father is a high school graduate or completed a GED; 0 otherwise
FATHERSOME COLLEGE	1 if the biological father did not graduate college or went to business/trade/vocational school instead; 0 otherwise
FATHERCOLLEGE	1 if the biological father is a college graduate or went to professional training beyond college; 0 otherwise
OLDERBRO	1 if the respondent has an older brother; 0 otherwise
OLDERSIS	1 if the respondent has an older sister; 0 otherwise
TEENMOM	1 if the respondent's biological mother was a teen mother when she had the respondent; 0 otherwise

Religion Variables (Reference group: no religion)

PROTESTANT	1 if the respondent is Protestant; 0 otherwise
CATHOLIC	1 if the respondent is Catholic; 0 otherwise
JEW	1 if the respondent is Jewish; 0 otherwise
ISLAM	1 if the respondent is Muslim; 0 otherwise
OTHERRELIG	1 if the respondent is of another religion besides Protestant, Catholic, Jewish, or Islam; 0 otherwise

Risky Behaviors

ALCOHOL	1 if the respondent drinks alcohol; 0 otherwise
SMOKE	1 if the respondent smokes cigarettes; 0 otherwise
DRUGS	1 if the respondent uses drugs; 0 otherwise

SEX	1 if the respondent had sexual intercourse; 0 otherwise
Knowledge Factors	
SPERMDIECORR	1 if respondent correctly answered the question “When a woman has sexual intercourse, almost all sperm die inside her body after about six hours”; 0 otherwise
EJACPULLCORR	1 if respondent correctly answered the question “When using a condom, the man should pull out of the woman right after he has ejaculated (come)”; 0 otherwise
OVULATECORR	1 if respondent correctly answered the question “Most women’s periods are regular, that is, they ovulate (are fertile) fourteen days after their periods begin”; 0 otherwise
CONDOMFITCORR	1 if respondent correctly answered the question “When putting on a condom, it is important to have it fit tightly, leaving no space at the tip”; 0 otherwise
VASELINECORR	1 if respondent correctly answered the question “Vaseline can be used with condoms, and they will work just as well”; 0 otherwise
PREGNANTTIMECORR	1 if respondent correctly answered the question “The most likely time for a woman to get pregnant is right before her period starts”; 0 otherwise
PULLOUTCORR	1 if respondent correctly answered the question “Even if the man pulls out before he ejaculates (even if ejaculation occurs outside of the woman’s body) it is still possible for the woman to become pregnant”; 0 otherwise
CONDOMROLLCORR	1 if respondent correctly answered the question “As long as the condom fits over the tip of the penis, it doesn’t matter how far down it is unrolled”; 0 otherwise

PREGNANTPERIODCORR

1 if respondent correctly answered the question “In general, a woman is most likely to get pregnant if she has sex during her period, as compared with other times of the month”; 0 otherwise

Risk Perceptions

LIFEWORSE

The degree to which teens feel that getting pregnant or getting someone else pregnant will make their life worse; 1 if they agree, 0 if they disagree

HASSLE

The degree to which teens feel that protecting themselves from getting an STD would be a hassle; 1 if they agree and 0 if they disagree

FRIENDRESPECT

A friend respect you more because you had sex; 1 if they agree and 0 if they disagree

PARTNERRESPECT

A partner would lose respect for you because you had sex; 1 if they agree and 0 if they disagree

GUILTY

You would feel guilty because you had sex; 1 if they agree and 0 if they disagree

PLEASURE

Having sex would give you a great deal of physical pleasure; 1 if they agree and 0 if they disagree

ATTRACTIVE

If you had sex, it would make you more attractive to the opposite sex; 1 if they agree and 0 if they disagree

EMBARRASSING

If you got pregnant or got someone pregnant, it would be an embarrassment; 1 if they agree and 0 if they disagree

QUITSCHOOL

If you got someone pregnant you would have to quit school; 1 if they agree and 0 if they disagree

MARRIAGE

If you get someone pregnant or got pregnant, you might marry the wrong person; 1 if they agree and 0 if they disagree

GROW UP

If you got someone pregnant or got pregnant, it would force you to grow up too fast; 1 if they agree and 0 if they disagree

Chance Variables

HICHANCESTD	The degree to which teens feel it is possible to contract an STD when protection is not used; 1 if there is a high chance and 0 otherwise
HICHANCEPREGNANT	The degree to which teens feel it is possible to get someone pregnant when protection is not used; 1 if there is high chance and 0 otherwise
BIRTHCONTROLPLAN	Would the respondent be prepared for sexual intercourse with birth control? 1 if prepared and 0 otherwise

In total, there are two regression models and two dependent variables.

Specifically, we look at Wave II data for the pregnancy (*W2PREGNANT*) and STD (*W2STD*) outcomes. The Add Health data set asks respondents whether they have ever been pregnant and whether they have contracted an STD. The sample excludes respondents who had pregnancies in Wave I; therefore, we are exclusively looking at only Wave II pregnancy outcomes. The STD dependent variable is analyzed by sex, creating two separate regression results. Again, the respondents who had contracted an STD in Wave I are eliminated from the sample, strictly keeping a sample of outcomes in Wave II. The models use the same background variables. The STD regressions use those knowledge, perception, and risk variables that pertain to STDs and sex only.

Many of the independent characteristic variables are socio-demographic and typical of most studies focused on teen pregnancy and STDs. These variables include, race/ethnicity (*BLACK*, *HISPANIC*, *OTHER*, reference group white), ages 15 to 19 (*AGE15*, *AGE16*, *AGE17*, *AGE18*, with reference group 19 year olds), and income level (*INCOME 1*, *INCOME2*, *INCOME3*, *INCOME4*, *INCOME5*, with reference

group missing income). Blum et al. (2000) used many of these background variables to study teen pregnancy, however found that only 10 percent of the variation in teen pregnancy was explained by them. Therefore, the regression models include more characteristic background variables.

Family structure variables include education levels of the biological mother and father (*MOTHERSOMEHIGH SCHOOL*, *MOTHERHIGH SCHOOL*, *MOTHERSOME COLLEGE*, *MOTHERCOLLEGE*, *FATHERSOMEHIGH SCHOOL*, *FATHERHIGH SCHOOL*, *FATHERSOME COLLEGE*, *FATHERCOLLEGE*) and whether or not the respondent has an older brother (*OLDERBRO*) or sister (*OLDERSIS*). The reference group for both the mother and father's education levels is no mother or no father respectively; therefore, we can determine the type of household the respondent lives in, two parent, single parent, or no parent. Having an older brother or sister can either encourage or discourage the respondent to engage in sexual activity at a younger age. An older brother or sister act as role models and if they engage in risky behavior and do not make educated decisions, the respondent could follow suit. On the other hand, a responsible older brother or sister could teach the younger respondent about safe sex practices and the consequences of STDs and pregnancy. Oettinger (1999) added older brother and older sister variables to his study to find that for those teens without an older brother or sister, sex education had a greater effect on their decision making to engage in sexual activity.

Another important independent variable is whether or not the respondent's biological mother was a teenager when the respondent was born (*TEENMOM*). If the respondent grew up in a household where the mother was a teenage mother, it may

influence him or her to engage in sex at an earlier age. It could also have the opposite effect where the mother plays a big role in the respondent's sex life by talking more openly about sex, contraceptives, pregnancy, and STDs; therefore, the respondent would be more educated and teen pregnancy and STDs could be avoided.

Religion variables (*PROTESTANT*, *CATHOLIC*, *JEW*, *ISLAM*, *OTHERREILG*, reference group no religion) are also added to the regression model. A few previous studies look at religiosity as a whole and its effects on sex education and pregnancy and STD outcomes (Trenholm et al., 2008; Oettinger, 1999), however they have not looked at specific religious groups and their effects on pregnancy and STD outcomes. The regression model includes variables for other risky behaviors such as alcohol and drug usage (*ALCOHOL*, *DRUGS*) and cigarette consumption (*SMOKE*). These variables are added to study impulsive behavior patterns among teenagers as mentioned previously in Gruber's economic model (2000). If any of these variables are significant in the models, it shows that they are more likely to partake in other impulsive behavior such as unprotected sex.

The sexual activity variable (*SEX*), takes into account whether the respondent has had previous sexual intercourse. This variable is used to remove some of the endogeneity in the model. Teens who have had sexual intercourse previously could have more knowledge on sex and contraceptives that could affect knowledge variables and ultimately affect the dependent variables pregnancy and STD. Nine regression models are analyzed in the next chapter with the individual knowledge variables being the dependent variables and the *SEX* variable an independent variable.

Previous economic literature has acknowledged the importance of this unobserved heterogeneity but has not dealt with it empirically (Oettinger, 1999).

The key independent variables are the knowledge and perceptions that teens have towards sex, STDs, and contraceptives. The Add Health survey includes two sections, “Knowledge Quiz” and “Motivations to Engage in Risky Behavior”, from which individual knowledge and perception variables are generated. Knowledge factors test the comprehensiveness of educational programs already instituted in schools and the general knowledge students have on the topic of sex, pregnancy, STDs, and contraception. By assessing the knowledge that students have regarding these topics, policymakers can revise existing educational programs to create ones that hone in on areas students are unfamiliar with (Trenholm et al., 2008). The knowledge factors here are assessments of whether students are confident in their answer to the specific knowledge question asked and with more knowledge teens can practice safer sex in order to prevent the chance of pregnancy and contracting an STD.

Risk perception variables ask teens to estimate their risk of pregnancy and contracting sexually transmitted diseases. Important variables include *LIFEWORSE* asking teens how they feel their life would be after becoming pregnant or getting someone pregnant, *HASSLE* if teens feel that using protection will be a hassle, *PARTNERRESPECT* and *FRIENDRESPECT* if teens feel that their friends or partner would like or dislike them more for engaging in sex, and *ATTRACTIVE* whether or not teens feel more attractive to the opposite sex once they have had sexual intercourse. Research shows that adolescents’ perceptions of sex change when they

know their best friends are having sex (Prinstein et al., 2003). Add Health also asks teenagers whether they would feel guilty, pleased, embarrassed, or have an impaired future, either in school, growing up, or marriage. As Gruber (2000) mentioned in his economic model of youth and risky behavior, teens may not know the outcomes or chances of pregnancy or contracting an STD because they do not think rationally like adults and therefore inappropriately project the current moment's preferences onto their future tastes. Teens also make these decisions in an uncertain environment with many social influences. Hence, these perception variables give an insight into the thought process of teens.

The individual variables are then indexed to create overall knowledge (*KNOWLEDGE*) and perception (*RESPONSIBLE PERCEPTION*) variables. For each correct answer to a knowledge question, the knowledge variable increases by 1. The indexed perception variable reflects the positive perceptions teens have towards sex, meaning they have a more responsible outlook. Teens who understand that sexual intercourse can lead to STDs and pregnancy, wait for the right time to have sex, and use protection, have the responsible and positive perception. Trenholm et al. (2008) includes a "knowledge of STDs" variable in his study however it narrowly focused on STDs only. Variations of the indexed knowledge variable are also added in separate regression models. Knowledge questions that significantly affect pregnancy (*KNOW1*) are indexed, knowledge questions that have no significance in affecting pregnancy (*KNOW2*) are indexed, knowledge questions that are significantly affected by the sex variable (*SEXKNOW1*) are indexed, and knowledge questions that are not significantly affected by the sex variable (*SEXKNOW2*) are indexed. These variables

are only created after running regressions with individual knowledge questions regressed against Wave II pregnancy and the individual knowledge question regressions.

Chance or risk variables that are not indexed into the overall perceptions variable are *HICHANCESTD*, *HICHANCEPREGNANCY*, and *BIRTHCONTROLPLAN*. The chance variables refer to respondents who think their chances of contracting an STD or becoming pregnant are high. The birth control variable asks respondents how prepared they would be with some form of birth control before they had sex. Trenholm et al. (2008) used chance variables, specifically looking at high and low consequences of sex, in his study of abstinence based sex education and pregnancy and STD outcomes.

This paper estimates nearly all variations of the econometric model using probit with weights correcting for sampling methods. Probit is used because the dependent variable is binary. The econometric models pertain to pregnancy outcomes in females, STD outcomes in females, and STD outcomes in males. We can then explore the idea that teens with different knowledge and perceptions on sex, STDs, pregnancy, and contraceptives result in different outcomes of pregnancy, and STDs.

CHAPTER FIVE

**QUANTIFYING THE EFFECTS OF TEEN PERCEPTIONS AND
KNOWLEDGE ON SEX, STDS, AND CONTRACEPTIVE USE ON TEEN
PREGNANCY AND STD OUTCOMES**

This chapter presents descriptive statistics and the results of the regression analysis. It is divided into five subsections. The first sub-section discusses descriptive statistics. The second sub-section discusses the effect of knowledge and perceptions on pregnancy. The third subsection discusses the correlations among individual knowledge questions and among individual perception questions. The fourth subsection discusses the effect of knowledge and perceptions on male STD outcomes. Finally, the fifth sub-section discusses the effect of knowledge and perceptions on female STD outcomes.

A. Descriptive Statistics

From the 90,118 observations in the public use data set, only 1,153 observations were used for the pregnancy regression, 1,325 observations were used for the STD male regression, and 1,241 observations were used for the STD female regression. The sample size was selected from a set of limitations. Only respondents aged 15 to 19 years were selected since most questions are restricted to respondents above age 15. To measure the impact of knowledge and perceptions on pregnancy and STDs, respondents who were pregnant or contracted an STD in Wave I were eliminated. Family structure variables only included full siblings, as opposed to half or adopted

siblings. For all knowledge and perception variables, respondents who refused to answer or legitimately skipped the question were eliminated.

Table 1 presents the descriptive statistics for the samples used in three regression models using the Add Health data set. On average, the percentage of female teenagers who were pregnant in Wave II is 6.3%. The average percentage of female teenagers with an STD is 5.5%. The average percentage of male teenagers with an STD is lower than the females at 3.1%. The average percentage of males contracting an STD could be lower because the instances of oral sex are much higher among teenagers, hence females are more susceptible to contract an STD than males (Prinstein et al., 2003). Also, more females could be sexually active with males older than 19, hence those males are not included in the sample. Males are more sexually active having sex on average 45.6% of the time, whereas females had sex 36.5%.

Looking at the averages for other impulsive behaviors between males and females, male respondents reported a higher average for partaking in alcohol consumption, smoking, and drug usage. According to Gruber, most youth behave impulsively, and the statistics show that males more than females display this.

The main knowledge and perception indexed variables provide information between genders and between STD contracted and pregnant females. For males, the average score for the knowledge quiz is 5.17, for females in the STD sample it is 5.27, and females in the pregnancy sample it is 5.26. This suggests that males and females have almost the same knowledge capacity on facts about sex, pregnancy, and STDs compared to females. For the indexed perception variable, females have a more responsible outlook on sex. Looking at the perception variable, attractive, 13.6% of

males agree with the statement that having sex would make you more attractive to the opposite sex whereas only 6.3% of females agree with this statement. Therefore, males more than females seek attention and popularity amongst their peers after having sex.

B. Regression Model Estimates-Model for Pregnancy

Estimates of the marginal effects for the Wave II pregnancy regressions are presented in Table 2 with 1,153 observations. Columns 1 to 8 contain the probit regression estimates controlling for the background variables. The focus of the regression results is on the knowledge, perception, sex, teenage mother, alcohol and drugs, chance, and family structure variables. In Column 1, only the background variables are regressed against pregnancy. Controlling for other factors, female respondents who have a mother completing only a high school education (or GED equivalent) are 6 percentage points more likely to become pregnant compared to those respondents with no mother. Likewise a respondent whose father completed a high school education (or GED equivalent) is significantly likely to become pregnant in Wave II compared to those respondents with no father. Teens who grow up in a household like this may also have low educational aspirations like their parents. Because of this, the decision to have sex and start a family now is less costly than continuing their education. These teens may inappropriately project the current moment's preferences onto their future tastes by not thinking about the financial, physical, social, and emotional consequences of pregnancy. Also, studies have shown that teenagers who come from families where the mother and father completed higher

education and maintain a good job and lifestyle are more likely to use contraception (Luker, 1991).

Previous sexual activity also has a significant role in increasing the likelihood of pregnancy. Female respondents who have had sexual intercourse in Wave I increase the chances of pregnancy in Wave II by 5 percentage points relative to those who did not have previous sexual activity. As mentioned before, the effect of the sex variable removes endogeneity in the model so that variation in the dependent variable can be better explained. Alcohol, smoking, and drugs do not have a significant effect on pregnancy. In testing for joint significance, the three variables are still insignificant. Females do not exhibit impulsive behavior as Gruber suggests in the economic model.

The next set of regressions look at all the variables in the model as well as separate effects from individual knowledge and perception variables. Column 2 regresses all variables in the model against Wave II pregnancy controlling for various background variables. Almost all background variables that are significant in the Column 1 are significant in Column 2. Having a father who completed high school (or GED equivalent) increases the likelihood of pregnancy by 5 percentage points. Again, the educational background of the mother and father can influence the lifestyle the respondent grew up in and can affect their decisions.

Some of the individual knowledge questions are significant in increasing the chances of pregnancy. Correct answers to questions pertaining to ejaculation, how a condom should fit properly, and a woman's menstrual cycle significantly increase the chances of pregnancy by the same magnitude. Even though previous knowledge on

these questions should have informed teens on being safe and prevent pregnancies, the chances of Wave II pregnancies actually increase. However, it could be due to the fact that many of these teenagers had previous sexual experience, which could be correlated with their knowledge. In Table 3, another regression is included which looks at individual knowledge questions and the effects of previous sexual activity on knowledge. This regression and the correlation between the individual knowledge questions are discussed in the following sub-section.

Also, the individual perception question regarding sexual activity making you more attractive to the opposite sex is significant, increasing the likelihood of pregnancy by 5 percentage points for those who agree with the statement. This correlates with the utility maximization theory from the economic model, which states that teens outweigh the benefits and costs of engaging in sex before doing it. Those teens that felt that sex would make them more attractive saw it as a benefit and motive for sex and therefore increased their chances of pregnancy. For the individual perception variables a correlation matrix and joint significance tests were conducted and discussed in the next sub-section. Finally, chance variables are significant in decreasing the likelihood of pregnancy in this regression. Having a birth control plan reduces the chances of pregnancy by 3 percentage points. Although the economic model mentions that teens discount the future, the degree to which they discount it varies among the group.

Column 3 shows regression results for just background variables and individual knowledge questions. When perception variables are removed from the model, having a father who did not complete a high school education is not significant in affecting

the chances of teen pregnancy. The same knowledge questions pertaining to ejaculation and the menstrual cycle are significant; however, the question pertaining to the proper fit of a condom does not have a significant effect. Column 4 only regresses the indexed knowledge variable that was created controlling for background variables. Although some of the individual knowledge questions showed significant in the previous regressions, the indexed knowledge variable has no significant effect. The explanation for this is covered in the following sub-section.

Column 5 regresses pregnancy on only the individual perception variables controlling for background variables. None of the individual perception variables are significant in affecting the probability of pregnancy in Wave II. However, Column 6 including only the indexed responsible perception variable controlling for background variables shows that the index is significant. Females with an overall responsible perception of teen pregnancy, sex, and STDs decrease their chance of pregnancy by 1 percentage point. Columns 7 and 8 contain variations on the indexed knowledge variable based on those individual questions that were significant and insignificant. In Column 7, controlling for background variables, having knowledge in questions pertaining to ejaculation, the fit of a condom, and the woman's menstrual cycle together has an insignificant effect on the chances of pregnancy. Column 8 contains variations of the indexed knowledge variable based on previous sexual activity. These variables are not significant.

In summary, the mother and father's educational background both affect the chances of pregnancy outcomes in Wave II. Those teens that grew up in a household where the mother and father only received some high school or completed a high

school education increased their chances of pregnancy than those without parents. Also, previous sexual activity has a significant effect in increasing pregnancy outcomes. Surprisingly, teens having knowledge of sex, pregnancy, and contraceptives actually leads to an increase in the likelihood of pregnancy. These female respondents who had an overall responsible perception of sex, pregnancy, and contraceptives decreased the chances of pregnancy in Wave II. Finally, teens that said they would plan ahead for adequate birth control decrease pregnancy outcomes.

C. Correlations Among Individual Knowledge Variables and Among Perception Variables

Table 3 contains a regression for each of the individual knowledge questions regressed against perception variables and chance variables, controlling for background variables. The number of observations for each of these regressions varies because many of the respondents who gave the same responses for the background and knowledge questions are automatically dropped from the sample. In the model, we look in particular at the sex variable, and its effects on the knowledge questions. Previous sexual experience is significant in causing an increase in the knowledge of particular quiz questions. These regressions show endogeneity in the model by demonstrating the significant correlation between knowledge variables and previous sexual experience. In the original regression model, the error term contains factors that are increasing the independent variable, knowledge, and the dependent variable, pregnancy. By creating the sex variable, we are trying to reduce some of the endogeneity in the model contained in the error term. The regression results (Table

2) indicate that previous sexual activity leads to an increase in the chances of pregnancy.

A correlation matrix is added for the individual knowledge and perception questions. The knowledge matrix (Figure A1) indicates that the correlation between the individual knowledge questions is very small. Also, the perceptions matrix (Figure A2) has low correlations among perception question; therefore, the low correlations are not enough to perform a principal component analysis. The knowledge and perception questions that are insignificant in the pregnancy regression are also tested for joint significance. The tests indicate that these variables are not jointly significant in impacting the likelihood of pregnancies in Wave II.

D. Regression Model Estimates-STD Males Only

Table 4 presents marginal effects from the probit STD (males only) regression equation with 1,325 observations. Column 1 regresses only background variables against Wave II STDs. Unlike the previous pregnancy model, smoking alone has a significant impact in increasing the STD rate for males. Male respondents who smoke increase their chances of contracting an STD by 2 percentage points compared to those males who do not smoke. The developmental psychology aspect of Gruber's economic model finds that adolescents have a harder time controlling impulses, and regression results show that this is especially true with males. If male teens smoke, then they will not be able to control other impulsive behaviors such as engaging in unprotected sex. Also, having an older brother decreases the likelihood of contracting an STD by 4 percentage points compared to those respondents without an older

brother. In other studies an older sibling was not significant in affecting the transition into earlier sexual activity or contracting an STD (Oettinger, 1999). For male respondents having a mother who was a teenager when the respondent was born, increases STD occurrences by 2 percentage points. Especially for mothers who are single mothers, they struggle to provide for their family, and therefore are not able to talk to their son about sex, pregnancy, STDs, and contraception. Males who grow up in this type of environment are more likely to engage in sex and not use protection (Luker, 1991). Surprisingly, males with previous sexual activity have no significant effect on the Wave II STD outcomes.

Column 2 includes all variables in the regression model. The individual knowledge question pertaining to whether or not a condom can be rolled down when put on is significant. Respondents who answered this question correctly decrease the likelihood of contracting an STD by 2 percentage points compared to those who answered incorrectly. Those males who are educated on sex are more likely to use an effective contraceptive method than those who are not (Marsiglio & Mott, 1986). This differs from the earlier pregnancy regression in which knowledge increases the chances of pregnancy. Having knowledge in other areas of sex leads to different outcomes in the case of STDs.

Column 3 includes the background variables and only the chance variable for STDs. Surprisingly, male respondents who feel that their chances of contracting an STD are high has no effect on the actual likelihood of STDs in Wave II. Column 4 includes just knowledge questions controlling for background variables. Males who answered the question regarding whether or not a condom can be rolled down when

put on is significant and reduces the chances of contracting an STD by 2 percentage points. Column 5 includes just the perception variables controlling for background variables. None of the perception variables are significant in this column. Lastly, the indexed knowledge and perception variables are not included in this regression because not all the individual knowledge and perception questions can be applied to sex in general or STDs.

In summary, only a few variables have a significant effect on the chances of contracting STDs among males in Wave II. Smoking leads to an increased chance of contracting an STD, again tying into Gruber's model of impulsive behavior. Having an older brother decreases the chances of STD contraction and having a mother who was a teenager when the respondent was born increases the likelihood of contracting an STD. Only the knowledge question pertaining to rolled condoms leads to a decrease in the chance of contracting an STD.

E. Regression Model Estimates-STD Females Only

Table 5 presents marginal effects from the probit STD (females only) regression equation with 1,223 observations. Column 1 shows regression output for just background variables regressed against Wave II STDs. Female respondents with a father who completed a high school education is significant in increasing STD occurrences by 3 percentage points compared to those with no father. Females who grow up with no motivation or encouragement for their future, find that the benefits of becoming pregnant and starting their own family outweigh the costs. In that setting, females have not thought about risks associated with having unprotected sex,

such as contracting an STD. This analysis is consistent with the economic model explained previously where teens make decisions to engage in risky behavior by weighing the costs and benefits in an uncertain environment. Also, female respondents who have previous sexual intercourse increase STD occurrences by 6 percentage points. As described in the economic model, once teens engage in the activity, the marginal risk from additional engagements is lower (Gruber, 2000). If the respondent has sex the first time and contracts an STD, the marginal cost of sex the second time is very low or close to 0 since they already have the infection.

Column 2 includes all variables in the regression model. The partner respect perception variable has a significant effect in decreasing the chances of contracting an STD. Females who feel that a partner would lose respect for them because of sex decreases the chance of contracting an STD in Wave II by 6 percentage points. Adolescents' perceptions of sex change according to how their peers feel, therefore if females feel that it is not a respectable act among their peers, they are less likely to engage in it (Prinstein et al., 2003). Likewise, females who felt that having sex would make them more attractive increase the likelihood of STDs by 8 percentage points. Teens often make risky decisions based heavily on how their peers think (Trenholm et al., 2008).

Column 3 includes the chance variable still controlling for the background variables, which has no significant impact on the STD outcomes just as in the male STD regression. Column 4 includes only knowledge variable questions controlling for the various background variables. Unlike the male regression model, none of the knowledge questions is significant. Since the question in the male regression model

that was significant pertained to male contraceptives, it could be that males would have more knowledge on this subject. Column 5 includes only perception variables controlling for background variables. Females who believed that a partner would lose respect for them because of sex decreases the chance of contracting an STD in Wave II by 6 percentage points. Also, females who believed that having sex would make them more attractive increase the likelihood of STDs by 8 percentage points. Again, for this regression model the indexed knowledge and perception variables were not included in the regression because not all the individual knowledge and perception questions can be applied to sex in general or STDs.

In summary, father's educational background only has a significant effect on female STD outcomes. Unlike the male regression model, the sexual activity variable has a significant effect, and two of the perception variables have a significant effect. Knowledge questions did not have a significant effect and so although females have knowledge in these particular areas, it does not affect their chances of contracting an STD.

CHAPTER SIX

CONCLUSIONS

A. Summary of Findings

Using cross-sectional data from the 1994-96 National Survey of Adolescent Health (Add Health), this study investigates whether teens' knowledge and perceptions on sex, contraceptives, STDs, and pregnancy have an effect on lowering the teen pregnancy and STD rates in the United States. In contrast to previous studies in the literature, this study looks at both perception and knowledge questions in addition to background variables and creates indexed knowledge and perception variables. The basis for the econometric model is from Gruber's economic model of youth and risky behavior (2000). Correlation among knowledge variables and previous sexual activity and among perception variables is displayed through a separate regression analysis as well as correlation matrices.

This study finds that both mother and father's educational background affect the pregnancy and STD rates. Both mothers and fathers who completed a high school education increase the chances of pregnancy and STDs. Smoking among male respondents has a significant effect in increasing the chances of STDs. Previous sexual activity also increases the chances of pregnancy and STDs. Only some individual knowledge and perception questions increase the likelihood of pregnancy and STDs.

B. Limitations

Although teens are provided with knowledge on sex, STDs, and pregnancy, there are endogenous variables in the model, which is not fully captured by the independent variables. The endogeneity could be something related to a personality type variable. The personality variable is hard to measure and would require more detailed survey questions in order to collect appropriate data. As mentioned in the previous chapter, using an instrumental variable would decrease the endogeneity effect. An example of an instrumental variable would be information on the school's sex education program, including length, starting age, and content covered. Information on school sex education programs is included in the school administrator data, which is not readily available as it is restricted data.

Another thing to consider is that the data set used in this study is very outdated. Future studies should look into more current data so that the effects of more recent sex education initiatives and teen attitudes can be studied.

C. Policy Implications

Sex education programs that are geared towards teaching facts about sex, STDs, pregnancy, and contraception are proven to be ineffective. A more practical program involving open discussion with other peers on the topic and demonstrating correct contraceptive usage would be beneficial. Specifically, sponsoring teens to travel across the United States talking to other teens at high schools about these issues would capture teenager's attention on the topic. Lastly, a program focused on life after pregnancy or emergency contraception plans such as Plan B should be

developed. This would give closure for teens to know what would happen in the case of an accidental pregnancy or if they follow through with the pregnancy.

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Table 1. Descriptive statistics for Add Health data set pregnancy and STD regressions.

VARIABLES	W2pregnancy		W2STD (male)		W2STD (female)	
	Mean	Std. Error	Mean	Std. Error	Mean	Std. Error
DEPENDENT VARIABLE						
W2STD	N/A	N/A	0.031	0.005	0.055	0.007
W2pregnant	0.063	0.008	N/A	N/A	N/A	N/A
INDEPENDENT VARIABLES						
Race/Ethnicity Variables						
Hispanic	0.120	0.011	0.123	0.010	0.123	0.010
White	0.672	0.015	0.661	0.014	0.661	0.015
Black	0.133	0.010	0.141	0.010	0.142	0.010
Other	0.074	0.008	0.075	0.008	0.074	0.008
Age Variables	16.444	0.031	16.586	0.034	16.451	0.030
Age15	0.172	0.012	0.167	0.012	0.170	0.012
Age16	0.375	0.016	0.321	0.014	0.375	0.016
Age17	0.306	0.015	0.314	0.014	0.307	0.015
Age18	0.129	0.010	0.156	0.011	0.129	0.010
Age19	0.017	0.004	0.042	0.006	0.018	0.004
Income Variables						
Income1 (\$0-30,000)	0.231	0.015	0.308	0.014	0.297	0.015
Income2 (\$30-60,000)	0.283	0.015	0.312	0.014	0.281	0.014
Income3 (\$60-90,000)	0.134	0.012	0.101	0.009	0.129	0.011
Income4 (\$90-120,000)	0.044	0.006	0.043	0.007	0.043	0.006
Income5 (>\$120,000)	0.247	0.014	0.235	0.013	0.249	0.014
Missingincome	0.219	0.013	0.209	0.127	0.222	0.013
Mother's Education Variables						
Mothersomehighschool	0.026	0.005	0.025	0.005	0.029	0.005
Motherhighschool	0.032	0.006	0.050	0.006	0.033	0.006
Mothersomecollege	0.014	0.004	0.012	0.003	0.013	0.004
Mothercollege	0.015	0.004	0.022	0.004	0.015	0.004
Father's Education Variables						
Fathersomehighschool	0.069	0.008	0.042	0.006	0.067	0.008
Fatherhighschool	0.124	0.011	0.118	0.010	0.119	0.010
Fathersomecollege	0.032	0.006	0.018	0.004	0.031	0.006
Fathercollege	0.060	0.007	0.060	0.007	0.058	0.008
Oldersis	0.198	0.013	0.156	0.112	0.198	0.013
Olderbro	0.216	0.013	0.209	0.013	0.213	0.013
Religion Variables						
Protestant	0.563	0.016	0.545	0.016	0.563	0.016
Catholic	0.263	0.015	0.255	0.014	0.261	0.014
Jew	0.012	0.003	0.104	0.003	0.011	0.003
Islam	0.002	0.002	0.005	0.003	0.002	0.002
Otherrelig	0.160	0.012	1	0	1	0
Alcohol	0.606	0.016	0.646	0.015	0.605	0.016
Smoke	0.222	0.014	0.254	0.014	0.219	0.014
Drugs	0.295	0.015	0.369	0.015	0.293	0.015
Teenmom	0.209	0.013	0.279	0.014	0.223	0.013
Sex	0.360	0.016	0.456	0.015	0.365	0.015
Knowledge Variables						
Correctly answered sperm die	0.573	0.016	0.511	0.015	0.577	0.016
Correctly answered ejaculation pull	0.645	0.016	0.756	0.014	0.643	0.015
Correctly answered	0.276	0.015	0.221	0.013	0.277	0.014

ovulation						
Correctly answered condom fit	0.483	0.016	0.548	0.015	0.492	0.016
Correctly answered vaseline	0.634	0.016	0.617	0.015	0.636	0.015
Correctly answered pregnant time	0.405	0.016	0.429	0.015	0.404	0.016
Correctly answered pull out	0.800	0.013	0.730	0.014	0.797	0.013
Correctly answered condom roll	0.856	0.011	0.822	0.012	0.856	0.011
Correctly answered pregnant period	0.588	0.016	0.535	0.015	0.590	0.016
Knowledge: indexed variable	5.262	0.061	5.171	0.055	5.273	0.060
Knowledge Index Variations						
Know1: variation significant (3)	1.644	0.031	N/A	N/A	N/A	N/A
Know2: variation insignificant (6)	3.618	0.043	N/A	N/A	N/A	N/A
Sexknow1: sex variation significant (4)	2.557	0.034	N/A	N/A	N/A	N/A
Sexknow2: sex variation significant (5)	2.704	0.041	N/A	N/A	N/A	N/A
Perception Variables						
Life worse after pregnant	0.878	0.010	0.870	0.010	0.880	0.010
Protection is a hassle	0.156	0.012	0.208	0.013	0.154	0.012
Friend respects you for having sex respect	0.390	0.006	0.189	0.012	0.039	0.006
Partner loses respect for you after sex	0.244	0.014	0.122	0.010	0.244	0.014
Sex makes you feel guilty	0.497	0.016	0.265	0.013	0.495	0.016
Sex is physical pleasure	0.266	0.014	0.587	0.015	0.263	0.014
Sex makes you more attractive	0.063	0.008	0.136	0.011	0.063	0.008
Pregnancy is embarrassing	0.707	0.015	0.605	0.015	0.706	0.015
Pregnancy means quitting school	0.212	0.014	0.230	0.013	0.209	0.014
Pregnant means getting married (even if it's the wrong person)	0.334	0.015	0.415	0.015	0.338	0.015
Pregnancy makes you grow up fast	0.818	0.012	0.694	0.014	0.815	0.012
Responsible Perception: indexed variable	7.167	0.058	6.082	0.058	7.169	0.057
HichanceSTD	N/A	N/A	0.050	0.007	0.042	0.008
Hichancepregnancy	0.377	0.016	N/A	N/A	N/A	N/A
Birthcontrolplan:	0.806	0.013	0.820	0.012	0.803	0.013
Would the respondent be prepared for sexual intercourse with birth control						
Number of observations	1,153		1,325		1,241	

Note: All means are reported according to the survey weight from Add Health Wave I
N/A= Not Applicable

Table 2. Marginal effects for the probit regressions that use background, knowledge, perception, and chance variables to study Wave II pregnancy outcomes								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Race/Ethnicity Variables								
Hispanic	0.02 (0.025)	0.02 (0.024)	0.03 (0.025)	0.03 (0.025)	0.02 (0.024)	0.02 (0.026)	0.03 (0.025)	0.02 (0.025)
Black	0.04* (0.019)	0.03 (0.019)	0.04** (0.019)	0.04* (0.019)	0.03 (0.019)	0.03 (0.019)	0.04* (0.019)	0.03* (0.019)
Other	0.02 (0.026)	0.01 (0.026)	0.02 (0.026)	0.02 (0.026)	0.01 (0.026)	0.02 (0.026)	0.02 (0.026)	0.02 (0.026)
Age Variables								
Age15	-0.12*** (0.039)	-0.13*** (0.038)	-0.12*** (0.037)	-0.12*** (0.039)	-0.12*** (0.040)	-0.11*** (0.040)	-0.12*** (0.038)	-0.12*** (0.038)
Age16	-0.13*** (0.036)	-0.13*** (0.035)	-0.13*** (0.034)	-0.13*** (0.036)	-0.13*** (0.037)	-0.12*** (0.037)	-0.13*** (0.035)	-0.13*** (0.036)
Age17	-0.12*** (0.035)	-0.12*** (0.035)	-0.12*** (0.034)	-0.12*** (0.035)	-0.12*** (0.036)	-0.11*** (0.036)	-0.12*** (0.035)	-0.12*** (0.035)
Age18	-0.13*** (0.039)	-0.13*** (0.037)	-0.13*** (0.037)	-0.14*** (0.038)	-0.13*** (0.040)	-0.13*** (0.040)	-0.14*** (0.038)	-0.13*** (0.038)
Income Variables								
Income1 (\$0-30,000)	-0.01 (0.020)	-0.02 (0.019)	-0.02 (0.019)	-0.01 (0.020)	-0.02 (0.019)	-0.02 (0.020)	-0.02 (0.019)	-0.01 (0.020)
Income2 (\$30-60,000)	-0.02 (0.020)	-0.02 (0.019)	-0.02 (0.020)	-0.02 (0.020)	-0.01 (0.019)	-0.02 (0.020)	-0.02 (0.020)	-0.02 (0.020)
Income3 (\$60-90,000)	-0.05 (0.028)	-0.05* (0.029)	-0.05* (0.029)	-0.05* (0.029)	-0.05 (0.028)	-0.05 (0.028)	-0.05* (0.029)	-0.05* (0.028)
Income4 (\$90-120,000)	0.02 (0.032)	0.03 (0.033)	0.03 (0.033)	0.02 (0.032)	0.03 (0.032)	0.03 (0.032)	0.02 (0.032)	0.02 (0.032)
Mother's Education Variables								
Mothersomehighschool	-0.01 (0.046)	-0.01 (0.041)	-0.02 (0.045)	-0.01 (0.046)	0.00 (0.042)	-0.01 (0.045)	-0.02 (0.046)	-0.02 (0.046)
Motherhighschool	0.06* (0.037)	0.06* (0.034)	0.06* (0.035)	0.06* (0.037)	0.06* (0.036)	0.06 (0.037)	0.06* (0.036)	0.06* (0.037)
Mothersomecollege	0.03 (0.052)	0.02 (0.053)	0.03 (0.052)	0.03 (0.052)	0.03 (0.052)	0.04 (0.055)	0.03 (0.051)	0.03 (0.052)
Father's Education Level								
Fathersomehighschool	0.05 (0.031)	0.05* (0.026)	0.05 (0.029)	0.05 (0.031)	0.05* (0.028)	0.05 (0.030)	0.05 (0.030)	0.05 (0.031)
Fatherhighschool	0.04** (0.019)	0.05** (0.019)	0.05** (0.019)	0.04** (0.019)	0.04** (0.019)	0.04** (0.019)	0.04** (0.019)	0.04** (0.019)
Fathersomecollege	0.06 (0.036)	0.04 (0.034)	0.05 (0.036)	0.05 (0.037)	0.05 (0.036)	0.05 (0.036)	0.05 (0.036)	0.05 (0.036)
Fathercollege	-0.02 (0.035)	-0.02 (0.035)	-0.02 (0.036)	-0.02 (0.035)	-0.01 (0.034)	-0.02 (0.035)	-0.02 (0.036)	-0.02 (0.035)
Oldersis	0.02 (0.018)	0.01 (0.017)	0.02 (0.018)	0.02 (0.018)	0.01 (0.017)	0.01 (0.018)	0.01 (0.018)	0.01 (0.018)
Olderbro	-0.02 (0.019)	-0.02 (0.018)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)
Religion Variables								
Protestant	0.02 (0.022)	0.02 (0.021)	0.02 (0.022)	0.02 (0.022)	0.02 (0.021)	0.03 (0.021)	0.02 (0.022)	0.02 (0.022)
Catholic	0.03 (0.026)	0.03 (0.025)	0.03 (0.026)	0.03 (0.026)	0.03 (0.025)	0.03 (0.025)	0.03 (0.026)	0.03 (0.026)
Alcohol	0.00 (0.017)	0.01 (0.016)	0.00 (0.017)	0.00 (0.017)	0.01 (0.016)	0.00 (0.017)	0.00 (0.017)	-0.00 (0.017)
Smoke	0.02 (0.021)	0.01 (0.020)	0.02 (0.020)	0.02 (0.021)	0.01 (0.020)	0.02 (0.021)	0.02 (0.021)	0.02 (0.021)
Drugs	0.02 (0.019)	0.01 (0.018)	0.02 (0.019)	0.02 (0.019)	0.01 (0.018)	0.02 (0.018)	0.02 (0.019)	0.02 (0.019)

Teenmom	-0.00 (0.023)	-0.00 (0.021)	-0.00 (0.022)	-0.00 (0.023)	-0.00 (0.022)	-0.01 (0.023)	-0.00 (0.023)	-0.00 (0.023)
Sex	0.05*** (0.018)	0.04** (0.017)	0.05*** (0.017)	0.05*** (0.018)	0.05*** (0.018)	0.05** (0.018)	0.05*** (0.018)	0.05*** (0.018)
Knowledge Variables								
Correct answer for sperm die		0.01 (0.015)	0.01 (0.015)					
Correct answer for ejaculation		0.03* (0.017)	0.03* (0.017)					
Correct answer for ovulation		-0.01 (0.015)	-0.01 (0.016)					
Correct answer for condom fit		0.03* (0.015)	0.02 (0.015)					
Correct answer for vaseline		-0.02 (0.015)	-0.02 (0.016)					
Correct answer for pregnant time		-0.01 (0.015)	-0.00 (0.016)					
Correct answer for pull out		0.01 (0.018)	-0.00 (0.019)					
Correct answer for condom roll		-0.01 (0.024)	-0.02 (0.024)					
Correct answer for pregnant period		0.03* (0.017)	0.03* (0.016)					
Perception Variables								
Life would be worse if dealing with pregnancy		0.02 (0.021)			0.02 (0.022)			
Protection is a hassle		0.02 (0.018)			0.02 (0.018)			
Friend respects you for having sex respect		0.01 (0.031)			0.01 (0.031)			
Partner loses respect for you after sex		-0.01 (0.019)			-0.01 (0.020)			
Sex makes you feel guilty		-0.02 (0.016)			-0.02 (0.017)			
Sex is physical pleasure		-0.01 (0.016)			0.00 (0.016)			
Sex makes you more attractive		0.05* (0.029)			0.05 (0.030)			
Pregnancy is embarrassing		-0.00 (0.017)			0.00 (0.017)			
Pregnancy means quitting school		0.01 (0.020)			0.01 (0.020)			
Pregnant means getting married (even if it's the wrong person)		-0.03 (0.018)			-0.03 (0.018)			

Pregnancy makes you grow up fast	-0.02 (0.017)	-0.02 (0.018)						
Chance Variables								
Hichancepregnancy	-0.00 (0.015)	-0.00 (0.015)						
birthcontrolplan	-0.03* (0.019)	-0.03 (0.019)						
Would the respondent be prepared for sexual intercourse with birth control								
Knowledge: indexed variable		0.00 (0.004)						
Responsible Perception: indexed variable						-0.01** (0.005)		
Know1							0.01 (0.009)	
Know2							-0.00 (0.006)	
Sexknow1								0.01 (0.008)
Sexknow2								-0.00 (0.006)
Number of Observations	1,153	1,153	1,153	1,153	1,153	1,153	1,153	1,153

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 3. Marginal effects for the probit regressions that use background, perception, and chance variables to study individual knowledge questions

VARIABLES	(1) spendie	(2) ejacpull	(3) ovulate	(4) condomfit	(5) vaseline	(6) pregnanttime	(7) pullout	(8) condomroll	(9) pregnantperiod
Race/Ethnicity Variables									
Hispanic	0.06 (0.053)	0.04 (0.053)	0.05 (0.048)	0.02 (0.054)	0.05 (0.053)	-0.06 (0.054)	-0.06 (0.039)	-0.02 (0.035)	-0.04 (0.051)
Black	0.05 (0.047)	0.08* (0.045)	-0.01 (0.044)	0.07 (0.046)	0.08* (0.048)	0.04 (0.048)	-0.09** (0.036)	-0.06* (0.032)	-0.07 (0.045)
Other	-0.01 (0.056)	0.09 (0.058)	-0.09 (0.057)	0.05 (0.055)	-0.09* (0.054)	0.05 (0.058)	-0.02 (0.046)	-0.09** (0.034)	-0.10* (0.060)
Age Variables									
Age15	-0.01 (0.114)	-0.17 (0.136)	0.08 (0.126)	0.16 (0.107)	-0.07 (0.108)	0.03 (0.113)	-0.07 (0.082)	0.00 (0.068)	0.08 (0.113)
Age16	0.07 (0.111)	-0.18 (0.135)	0.10 (0.121)	0.19* (0.104)	0.05 (0.106)	0.03 (0.110)	-0.09 (0.080)	0.04 (0.066)	0.15 (0.110)
Age17	0.01 (0.111)	-0.23* (0.135)	0.03 (0.122)	0.20* (0.104)	0.02 (0.106)	0.02 (0.110)	-0.04 (0.081)	0.03 (0.067)	0.16 (0.110)
Age18	0.09 (0.116)	-0.22 (0.140)	0.11 (0.124)	0.18* (0.109)	0.04 (0.110)	0.08 (0.115)	-0.05 (0.086)	0.03 (0.069)	0.14 (0.114)
Income Variables									
Income1 (\$0-30,000)	-0.05 (0.043)	0.03 (0.041)	-0.07* (0.039)	0.03 (0.043)	0.05 (0.042)	-0.04 (0.043)	-0.06* (0.033)	0.02 (0.028)	0.01 (0.041)
Income2 (\$30-60,000)	0.02 (0.042)	0.04 (0.040)	0.00 (0.038)	0.05 (0.041)	0.07* (0.041)	-0.02 (0.043)	-0.02 (0.033)	0.00 (0.027)	0.04 (0.040)
Income3 (\$60-90,000)	0.02 (0.056)	0.10** (0.052)	-0.05 (0.053)	-0.04 (0.055)	0.04 (0.055)	-0.05 (0.057)	0.05 (0.044)	0.02 (0.035)	0.03 (0.052)
Income4 (\$90-120,000)	-0.08 (0.080)	0.05 (0.076)	-0.00 (0.073)	0.15** (0.075)	0.19** (0.076)	-0.10 (0.080)	0.06 (0.064)	0.01 (0.051)	-0.02 (0.077)
Mother's Education Variables									
Mothersomehighschool	0.42*** (0.114)	-0.04 (0.113)	0.01 (0.102)	0.24*** (0.095)	-0.03 (0.103)	-0.16 (0.109)	0.03 (0.100)	0.11 (0.078)	-0.05 (0.109)
Motherhighschool	-0.05 (0.099)	0.15 (0.102)	-0.03 (0.097)	-0.05 (0.101)	0.11 (0.092)	-0.08 (0.101)	-0.06 (0.075)	0.02 (0.070)	0.07 (0.094)
Mothersomecollege	0.03 (0.141)	0.11 (0.137)	-0.11 (0.142)	-0.04 (0.132)	-0.02 (0.130)	-0.17 (0.149)		-0.03 (0.073)	0.13 (0.134)
Mothercollege	0.06 (0.133)	-0.03 (0.133)	0.01 (0.131)	0.09 (0.138)	0.03 (0.130)	0.18 (0.136)	0.16 (0.118)	0.01 (0.095)	0.13 (0.130)
Father's Education Variables									
Fathersomehighschool	0.05	-0.04	0.07	0.07	-0.10	-0.04	-0.02	-0.05	-0.07

	(0.065)	(0.061)	(0.058)	(0.062)	(0.062)	(0.066)	(0.052)	(0.041)	(0.061)
Fatherhighschool	0.02	0.02	0.08*	0.04	0.01	0.00	-0.00	0.04	-0.07
	(0.049)	(0.048)	(0.044)	(0.047)	(0.049)	(0.051)	(0.037)	(0.035)	(0.047)
Fathersomecollege	0.11	-0.01	0.07	0.15	0.06	0.04	0.11	0.06	0.07
	(0.090)	(0.087)	(0.088)	(0.091)	(0.093)	(0.099)	(0.079)	(0.079)	(0.095)
Fathercollege	0.01	0.04	-0.04	0.16***	0.07	-0.00	0.06	0.09*	0.18***
	(0.066)	(0.061)	(0.059)	(0.059)	(0.065)	(0.064)	(0.050)	(0.048)	(0.066)
Oldersis	0.04	-0.02	-0.03	-0.00	-0.07*	0.00	-0.00	-0.01	-0.00
	(0.040)	(0.038)	(0.038)	(0.040)	(0.038)	(0.040)	(0.030)	(0.024)	(0.039)
Olderbro	0.01	-0.05	-0.04	-0.03	-0.10***	0.04	-0.00	-0.00	-0.06*
	(0.039)	(0.037)	(0.035)	(0.038)	(0.037)	(0.039)	(0.029)	(0.024)	(0.037)
Religion Variables									
Protestant	-0.02	0.07	-0.09**	-0.02	0.07	0.02	-0.04	-0.01	0.02
	(0.046)	(0.044)	(0.041)	(0.046)	(0.045)	(0.048)	(0.036)	(0.029)	(0.044)
Catholic	-0.05	0.04	-0.10**	-0.05	0.12**	0.02	-0.02	-0.01	0.05
	(0.052)	(0.050)	(0.046)	(0.051)	(0.050)	(0.054)	(0.039)	(0.034)	(0.049)
Jew	0.15	0.22	0.02	0.11	0.09	0.15	-0.08	-0.06	0.18
	(0.135)	(0.137)	(0.122)	(0.139)	(0.120)	(0.146)	(0.115)	(0.106)	(0.167)
Islam		-0.05		0.08	-0.04			-0.16	
		(0.312)		(0.304)	(0.299)			(0.138)	
Alcohol	0.02	0.04	0.04	-0.02	0.02	-0.06	0.05**	0.00	-0.09***
	(0.035)	(0.034)	(0.032)	(0.037)	(0.036)	(0.037)	(0.027)	(0.023)	(0.034)
Smoke	0.03	0.08*	0.06	-0.01	0.03	0.04	0.02	-0.00	0.03
	(0.046)	(0.044)	(0.042)	(0.043)	(0.044)	(0.047)	(0.036)	(0.029)	(0.043)
Drugs	0.03	0.01	-0.02	0.12***	0.08*	0.07*	-0.01	0.03	0.06
	(0.043)	(0.041)	(0.039)	(0.040)	(0.042)	(0.043)	(0.034)	(0.027)	(0.039)
Teenmom	-0.01	-0.00	-0.02	-0.02	-0.06	0.02	0.03	-0.01	-0.10**
	(0.050)	(0.048)	(0.045)	(0.049)	(0.048)	(0.051)	(0.039)	(0.033)	(0.048)
Sex	0.09**	0.15***	-0.00	0.10***	0.06	0.02	0.04	0.10***	0.06
	(0.039)	(0.037)	(0.036)	(0.037)	(0.038)	(0.040)	(0.030)	(0.028)	(0.037)
Perception Variables									
Life would be worse if dealing with pregnancy	0.06	0.06	-0.03	0.02	0.01	0.10*	0.00	0.00	-0.01
	(0.049)	(0.047)	(0.047)	(0.049)	(0.050)	(0.052)	(0.039)	(0.033)	(0.048)
Protection is a hassle	-0.00	0.07	-0.02	-0.06	-0.03	-0.00	-0.06*	-0.01	-0.13***
	(0.045)	(0.043)	(0.043)	(0.043)	(0.041)	(0.046)	(0.033)	(0.027)	(0.043)
Friend respects you for having sex respect	-0.17**	0.02	0.11	-0.08	0.01	0.05	0.02	-0.08**	-0.14*
	(0.078)	(0.078)	(0.073)	(0.078)	(0.073)	(0.080)	(0.063)	(0.041)	(0.077)
Partner loses respect for you after sex	-0.09**	-0.01	-0.09**	-0.08**	-0.06	-0.05	-0.06**	-0.06***	-0.05

	(0.040)	(0.038)	(0.036)	(0.039)	(0.038)	(0.041)	(0.030)	(0.023)	(0.038)
Sex makes you feel guilty	0.04	-0.02	-0.02	-0.02	-0.01	-0.01	0.04	0.02	-0.03
	(0.037)	(0.035)	(0.033)	(0.036)	(0.035)	(0.038)	(0.028)	(0.023)	(0.035)
Sex is physical pleasure	0.05	-0.01	0.01	0.07**	-0.03	-0.05	0.13***	0.05*	0.10***
	(0.038)	(0.036)	(0.034)	(0.037)	(0.037)	(0.038)	(0.031)	(0.026)	(0.036)
Sex makes you more attractive	-0.09	0.03	-0.01	-0.17***	-0.18***	-0.03	-0.09*	-0.09**	-0.08
	(0.062)	(0.063)	(0.061)	(0.062)	(0.062)	(0.068)	(0.052)	(0.039)	(0.061)
Pregnancy is embarrassing	-0.04	0.01	0.04	0.00	0.06	0.02	0.04	0.01	0.11***
	(0.040)	(0.039)	(0.036)	(0.039)	(0.039)	(0.041)	(0.029)	(0.026)	(0.039)
Pregnancy means quitting school	-0.06	0.04	0.03	-0.09**	0.02	0.02	-0.04	-0.07***	-0.05
	(0.042)	(0.039)	(0.039)	(0.039)	(0.039)	(0.043)	(0.031)	(0.024)	(0.040)
Pregnant means getting married (even if it's the wrong person)	-0.01	-0.02	-0.05	-0.04	-0.01	-0.05	0.01	-0.04*	-0.04
	(0.035)	(0.034)	(0.032)	(0.034)	(0.034)	(0.036)	(0.028)	(0.022)	(0.033)
Pregnancy makes you grow up fast	0.04	-0.04	-0.03	0.05	-0.02	0.01	0.05	0.07**	0.07*
	(0.043)	(0.041)	(0.039)	(0.042)	(0.042)	(0.044)	(0.031)	(0.027)	(0.041)
Chance Variables									
Hichancepregnancy	0.06*	0.00	0.00	-0.01	0.00	0.05	-0.03	0.04*	0.01
	(0.032)	(0.031)	(0.030)	(0.031)	(0.031)	(0.033)	(0.025)	(0.021)	(0.031)
Birthcontrolplan	-0.01	0.11***	-0.04	0.08**	-0.05	-0.11***	0.07**	0.04*	0.04
	(0.041)	(0.039)	(0.037)	(0.040)	(0.040)	(0.041)	(0.029)	(0.025)	(0.039)
Would the respondent be prepared for sexual intercourse with birth control									
Number of observations	1,186	1,188	1,186	1,188	1,188	1,186	1,170	1,188	1,186

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 4. Marginal effects for the probit regressions that use background, knowledge, perception, and chance variables to study Wave II STD outcomes for males

Variables	(1)	(2)	(3)	(4)	(5)
Race/Ethnicity Variables					
Hispanic	0.03** (0.013)	0.03** (0.013)	0.03** (0.013)	0.03** (0.013)	0.03** (0.013)
Black	0.02* (0.013)	0.03* (0.013)	0.02* (0.013)	0.02* (0.013)	0.02* (0.013)
Other	0.02 (0.017)	0.03 (0.016)	0.02 (0.017)	0.02 (0.017)	0.03 (0.016)
Age Variables					
Age15	-0.02 (0.026)	-0.02 (0.026)	-0.02 (0.026)	-0.02 (0.026)	-0.02 (0.026)
Age16	-0.01 (0.023)	-0.01 (0.022)	-0.01 (0.022)	-0.01 (0.023)	-0.01 (0.022)
Age17	0.01 (0.021)	0.01 (0.021)	0.01 (0.021)	0.01 (0.021)	0.01 (0.021)
Age18	0.01 (0.022)	0.01 (0.022)	0.01 (0.022)	0.01 (0.022)	0.01 (0.022)
Income Variables					
Income1 (\$0-30,000)	-0.00 (0.011)	-0.00 (0.011)	-0.00 (0.011)	-0.00 (0.011)	-0.00 (0.011)
Income2 (\$30-60,000)	-0.03** (0.014)	-0.03** (0.013)	-0.03** (0.014)	-0.03** (0.014)	-0.03** (0.014)
Income3 (\$60-90,000)	-0.03 (0.018)	-0.02 (0.018)	-0.03 (0.018)	-0.02 (0.018)	-0.03 (0.018)
Income4 (\$90-120,000)	-0.02 (0.023)	-0.01 (0.023)	-0.02 (0.022)	-0.02 (0.023)	-0.02 (0.023)
Mother's Education Variables					
Mothersomehighschool	0.02 (0.022)	0.02 (0.021)	0.02 (0.021)	0.02 (0.022)	0.02 (0.021)
Motherhighschool	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.01 (0.019)
Father's Education Variables					
Fathersomehighschool	-0.03 (0.025)	-0.03 (0.025)	-0.03 (0.025)	-0.03 (0.025)	-0.03 (0.025)
Fatherhighschool	0.01 (0.012)	0.02 (0.012)	0.01 (0.012)	0.02 (0.012)	0.01 (0.012)
Fathercollege	-0.00 (0.018)	-0.01 (0.017)	-0.00 (0.018)	-0.01 (0.018)	-0.00 (0.018)
Oldersis	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)
Olderbro	-0.04** (0.016)	-0.04** (0.016)	-0.04** (0.016)	-0.04** (0.016)	-0.04** (0.016)
Religion Variables					
Protestant	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)	-0.00 (0.012)
Catholic	0.01 (0.014)	0.01 (0.013)	0.01 (0.014)	0.01 (0.014)	0.01 (0.014)
Jew	0.02 (0.031)	0.03 (0.031)	0.02 (0.031)	0.02 (0.031)	0.03 (0.031)
Islam	0.05 (0.041)	0.06 (0.041)	0.05 (0.041)	0.06 (0.041)	0.06 (0.041)
Alcohol	0.01 (0.011)	0.01 (0.011)	0.01 (0.011)	0.01 (0.011)	0.01 (0.011)
Smoke	0.02* (0.010)	0.02** (0.010)	0.02** (0.010)	0.02** (0.010)	0.02** (0.010)
Drugs	0.01 (0.009)	0.01 (0.009)	0.01 (0.009)	0.01 (0.009)	0.01 (0.009)
Teenmom	0.02* (0.011)	0.02* (0.011)	0.02* (0.011)	0.02* (0.011)	0.02* (0.011)

Sex	0.01 (0.010)	0.01 (0.010)	0.01 (0.010)	0.01 (0.009)	0.01 (0.010)
Knowledge Variables					
Correct answer for condom fit		0.01 (0.009)		0.01 (0.009)	
Correct answer for vaseline		0.00 (0.009)		0.00 (0.009)	
Correct answer condom roll		-0.02* (0.011)		-0.02* (0.012)	
Perception Variables					
Friend respects you for having sex respect		-0.00 (0.011)			-0.00 (0.011)
Partner loses respect for you after sex		-0.01 (0.016)			-0.00 (0.016)
Sex makes you feel guilty		-0.00 (0.012)			0.00 (0.012)
Sex is physical pleasure		-0.01 (0.009)			-0.01 (0.009)
Sex makes you more attractive		0.01 (0.011)			0.01 (0.011)
Chance Variables					
HichanceSTD		-0.01 (0.017)	-0.01 (0.017)		
Number of observations	1,325	1,325	1,325	1,325	1,325

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

Table 5. Marginal effects for the probit regressions that use background, knowledge, perception, and chance variables to study Wave II STD outcomes for females

Variables	(1)	(2)	(3)	(4)	(5)
Race/Ethnicity Variables					
Hispanic	0.01 (0.022)	0.02 (0.020)	0.01 (0.022)	0.01 (0.022)	0.02 (0.021)
Black	0.03* (0.019)	0.03 (0.019)	0.03* (0.019)	0.03* (0.019)	0.03 (0.019)
Other	0.04** (0.021)	0.04** (0.019)	0.04** (0.020)	0.04** (0.021)	0.04** (0.020)
Age Variables					
Age15	-0.00 (0.057)	0.00 (0.059)	-0.00 (0.058)	-0.01 (0.057)	0.00 (0.059)
Age16	0.04 (0.054)	0.04 (0.056)	0.04 (0.056)	0.03 (0.054)	0.04 (0.056)
Age17	-0.00 (0.054)	0.00 (0.056)	-0.00 (0.055)	-0.01 (0.054)	0.01 (0.057)
Age18	0.03 (0.054)	0.04 (0.057)	0.03 (0.055)	0.03 (0.054)	0.04 (0.057)
Income Variables					
Income1 (\$0-30,000)	0.01 (0.017)	0.00 (0.017)	0.01 (0.017)	0.01 (0.017)	0.01 (0.017)
Income2 (\$30-60,000)	-0.02 (0.019)	-0.02 (0.018)	-0.02 (0.019)	-0.02 (0.019)	-0.02 (0.018)
Income3 (\$60-90,000)	-0.04 (0.028)	-0.04 (0.028)	-0.04 (0.028)	-0.04 (0.027)	-0.05 (0.028)
Income4 (\$90-120,000)	-0.05 (0.046)	-0.05 (0.042)	-0.05 (0.046)	-0.05 (0.045)	-0.04 (0.043)
Mother's Education Variables					
Mothersomehighschool	-0.02 (0.038)	-0.01 (0.036)	-0.02 (0.038)	-0.02 (0.039)	-0.01 (0.036)
Motherhighschool	-0.04 (0.047)	-0.04 (0.044)	-0.04 (0.048)	-0.04 (0.047)	-0.04 (0.044)
Father's Education Variables					
Fathersomehighschool	0.03 (0.026)	0.02 (0.024)	0.03 (0.026)	0.02 (0.025)	0.02 (0.025)
Fatherhighschool	0.03* (0.018)	0.04** (0.018)	0.03* (0.018)	0.03* (0.018)	0.04** (0.018)
Fathercollege	-0.00 (0.025)	0.00 (0.025)	-0.00 (0.025)	-0.00 (0.025)	0.01 (0.025)
Oldersis	0.01 (0.017)	0.01 (0.017)	0.01 (0.017)	0.01 (0.017)	0.01 (0.017)
Olderbro	-0.02 (0.019)	-0.03 (0.019)	-0.02 (0.019)	-0.02 (0.019)	-0.03 (0.019)
Religion Variables					
Protestant	-0.01 (0.018)	-0.01 (0.018)	-0.00 (0.019)	-0.01 (0.018)	-0.01 (0.018)
Catholic	0.02 (0.021)	0.01 (0.021)	0.02 (0.021)	0.02 (0.021)	0.01 (0.021)
Alcohol	0.01 (0.016)	0.01 (0.015)	0.01 (0.016)	0.01 (0.016)	0.01 (0.015)
Smoke	0.03 (0.018)	0.02 (0.016)	0.03 (0.018)	0.03 (0.018)	0.02 (0.017)
Drugs	0.02 (0.016)	0.02 (0.015)	0.02 (0.016)	0.01 (0.016)	0.02 (0.016)
Teenmom	0.02 (0.018)	0.02 (0.018)	0.02 (0.018)	0.02 (0.018)	0.02 (0.017)
Sex	0.06***	0.07***	0.06***	0.06***	0.07***

	(0.017)	(0.017)	(0.017)	(0.017)	(0.017)
Knowledge Variables					
Correct answer for condom fit		0.02 (0.013)		0.02 (0.014)	
Correct answer for vaseline		0.00 (0.014)		-0.00 (0.014)	
Correct answer condom roll		-0.01 (0.019)		-0.01 (0.022)	
Perception Variables					
Friend respects you for having sex respect		0.01 (0.028)			0.01 (0.027)
Partner loses respect for you after sex		-0.06*** (0.020)			-0.06*** (0.020)
Sex makes you feel guilty		0.01 (0.015)			0.01 (0.015)
Sex is physical pleasure		-0.02 (0.015)			-0.02 (0.015)
Sex makes you more attractive		0.08*** (0.024)			0.08*** (0.024)
Chance Variables					
HichanceSTD		0.01 (0.028)	0.01 (0.028)		
Number of observations	1,223	1,223	1,223	1,223	1,223

*Statistically significant at the 0.10 level.

**Statistically significant at the 0.05 level.

***Statistically significant at the 0.01 level.

APPENDIX

Table A1. Correlation matrix of individual knowledge variables

	Spermdiecorr	Ejacpullcorr	Ovulatecorr	Condomfitcorr	Vaselinecorr	Pregnantperiodcorr	Pulloutcorr	Condomrollcorr	Pregnantperiodcorr
Spermdiecorr	1.00								
Ejacpullcorr	0.0138 (0.6350)	1.00							
Ovulatecorr	0.0868 (0.0028)	-0.0230 (0.4289)	1.00						
Condomfitcorr	0.1118 (0.0001)	0.0363 (0.2113)	0.1148 (0.0001)	1.00					
Vaselinecorr	0.1207 (0.0000)	0.1061 (0.0002)	0.0685 (0.0181)	0.2042 (0.0000)	1.00				
Pregnantperiodcorr	0.1180 (0.0000)	0.0126 (0.6643)	0.1078 (0.0002)	0.0632 (0.0294)	0.1075 (0.0002)	1.00			
Pulloutcorr	.0770 (0.0080)	0.0545 (0.0606)	0.0340 (0.2414)	0.1403 (0.0000)	0.0983 (0.0007)	-0.0110 (0.7040)	1.00		
Condomrollcorr	0.1896 (0.0000)	0.0788 (0.0066)	0.0705 (0.0151)	0.2269 (0.0000)	0.2424 (0.0000)	0.0861 (0.0030)	0.1696 (0.0000)	1.00	
Pregnantperiodcorr	0.0676 (0.0198)	-0.0254 (0.3823)	0.0888 (0.0022)	0.1933 (0.0000)	0.1715 (0.0000)	0.1776 (0.0000)	0.0824 (0.0045)	0.1705 (0.0000)	1.00

Note: p-values are in parentheses

Table A2. Correlation matrix of individual perception variables

	Lifeworse	Hassle	Friendrespect	Partnerrespect	Guilty	Pleasure	Attractive	Embarrassing	Quitschool	Marriage	Growup
Lifeworse	1.00										
Hassle	-0.0264 (0.3634)	1.00									
Friendrespect	-0.0437 (0.1326)	0.0564 (0.0521)	1.00								
Partnerrespect	0.0940 (0.0012)	0.0486 (0.0938)	0.0919 (0.0015)	1.00							
Guilty	0.1331 (0.0000)	0.0218 (0.4534)	0.0225 (0.4376)	0.3809 (0.0000)	1.00						
Pleasure	-0.0168 (0.5619)	-0.0129 (0.6564)	0.0714 (0.0139)	-0.0430 (0.1389)	-0.0874 (0.0026)	1.00					
Attractive	-0.0562 (0.0529)	0.0659 (0.0230)	0.1771 (0.0000)	0.0476 (0.1013)	0.0309 (0.2868)	0.2095 (0.0000)	1.00				
Embarrassing	0.3386 (0.0000)	-0.0917 (0.0016)	-0.0477 (0.1006)	0.1617 (0.0000)	0.3046 (0.0000)	0.0038 (0.8966)	0.0038 (0.8970)	1.00			
Quitschool	0.0770 (0.0079)	0.0002 (0.9952)	0.0438 (0.1311)	0.1465 (0.0000)	0.1757 (0.0000)	0.0601 (0.0382)	0.0328 (0.2590)	0.1784 (0.0000)	1.00		
Marriage	0.0853 (0.0032)	0.0038 (0.8963)	0.0291 (0.3158)	0.1884 (0.0000)	0.1918 (0.0000)	0.0081 (0.7812)	0.0567 (0.0509)	0.2074 (0.0000)	0.2248 (0.0000)	1.00	
Growup	0.1410 (0.0000)	-0.0958 (0.0009)	-0.0458 (0.1149)	0.1294 (0.0000)	0.2048 (0.0000)	0.0675 (0.0200)	-0.0212 (0.4657)	0.2649 (0.0000)	0.1342 (0.0000)	0.2129 (0.0000)	1.00

Note: p-values are in parentheses

