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Associations of Early Sexual Initiation, Family Circumstances, and STD Incidence

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APPROVAL PAGE

Associations of Early Sexual Initiation, Family Circumstances, and STD Incidence

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ABSTRACT

BACKGROUND: According to the World Health Organization's (WHO) 2008 global estimate, approximately 498 million individuals worldwide become infected each year with a sexually transmitted disease (STD) or infection. Although adolescents only make up about a quarter of the sexually active population, approximately half of the newly reported STDs in the U.S each year are among individuals aged 15-24 years (The Henry J. Kaiser Family Foundation, 2014). The CDC reports that approximately 46.8% of U.S. high school students reported already having experienced their sexual debut. When adolescents engage in sexual behaviors earlier, it puts them at greater risk for other risky behaviors and ultimately STD incidence. Family circumstances are also considered to have an impact on an adolescent's likelihood to engage in earlier sexual behaviors.

METHODS: Data were obtained from the National Longitudinal Survey of Adolescent to Adult Health, Waves I and IV. Logistic regression was used to measure the strength of the relationship between early sexual debut and STD, and was also conducted to determine which family circumstances have the strongest associations with both early sexual debut and STD incidence. Statistical interaction was included to test for effect modification in the model. Gender was shown to be a significant predictor of STD incidence; therefore the model was tested for differential effects by gender.

RESULTS: Adolescents experiencing an early sexual debut (<15 years of age) were 2.22 times more likely to experience an STD than those with a late debut (≥ 15 years of age) (95% CI 1.88, 2.62). With respect to family circumstances and their relation to STD, the strongest association lay within adolescents' perception of fathers caring "none to very little" and STD incidence (OR=2.75, 95% CI: 1.60-4.70). The strongest associations of family circumstances with early sexual debut were adolescents whose mothers served jail time (OR=3.38, 95%CI: 2.37-4.82) and adolescents who felt like their mothers approved of their sex lives (OR=3.11, 95%CI: 2.09-4.64). Age of sexual debut was tested for statistical interaction in the model and was only significant among the variable for mother figure. Stratifying for gender, relationship to mother figure for males proved to have a statistically significant interaction with debut for both levels of mother figure (No mother p<.0001, Non-related female p=.0003), rendering age of sexual debut an effect modifier in the association between males relationship to their mother figure and STD incidence.

DISCUSSION:
Public health intervention programs that address adverse health consequences of early sexual debut among adolescents would be beneficial. Programs should consider familial structure among adolescents, particularly male adolescents, as a factor in modifying an adolescent's likelihood to engage in sexual risk behaviors and risk of subsequent STD.

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CHAPTER I
INTRODUCTION

1.1 Background

According to the World Health Organization's (WHO) 2008 global estimate, approximately 498 million individuals worldwide become infected each year with a sexually transmitted disease (STD) or infection (STI), with *Chlamydia trachomatis* (chlamydia), *Neisseria gonorrhoeae* (gonorrhea), *Treponmea pallidum* (syphilis), and *Trichomonas vaginalis* (Trichomoniasis) being the primary infectious agents (Mesenberg et al., 2014). Sexual health is a growing concern worldwide, as STDs greatly contribute to acute morbidity, infertility, and mortality (Mesenberg et al., 2014).

Concerns about the sexual health of adolescents in the United States are due to the increasingly high rate of teenagers becoming infected with STDs. Although adolescents only make up about a quarter of the sexually active population, approximately half of the newly reported STDs in the U.S each year are among individuals aged 15-24 years (The Henry J. Kaiser Family Foundation, 2014). The United States has seen an almost 50% decrease in teenage pregnancies since the peak in 1990, however the teenage birth rate in 2013 was still 27 births per 1000 females, falling from 62 births per 1000 females in 1991 (The Henry J. Kaiser Family Foundation, 2014). In 2013, a CDC survey among U.S. high school students reported that 46.8% of students had already experienced their sexual debut.

When adolescents experience early sexual initiation ("early debut"), they are more likely to engage in other risky behaviors, such as multiple sexual partners, lack of condom use, drug or alcohol use before sex, etc. These risky behaviors typically lead to high levels of STD incidence or pregnancies among adolescents. Family circumstances may also have a direct effect on this association. Youth coming from families of divorced parents, who have a parent in jail, have

weak social and familial support, and parents who do not provide any sort of emotional support or discipline can greatly be affected by these factors when it comes to their sexual decisions, including the age of their sexual initiation. This in turn affects their likelihood for other risky behaviors, including a higher likelihood to contract an STD and for teenage pregnancy.

1.2 Purpose of Study

The purpose of this study is to examine the relationship between family circumstances and age of sexual debut, to examine the relationship between family circumstances and STD incidence, to examine the relationship between age of sexual debut and STD incidence, and to evaluate if early sexual debut acts as an effect modifier in the relationship between family psychosocial circumstances and STD incidence. In this proposed research, the National Longitudinal Study of Adolescent to Adult Health Wave IV Survey Data will be analyzed in order to look for trends in associations between family circumstances and STD incidence. Other factors such as gender, race, sexual orientation, and educational attainment will also be evaluated. This research is important within the field of public health because this type of effect modification leading to STD incidence has not yet been evaluated.

1.3 Research Questions

1. What is the association between age of sexual debut and STD incidence?
2. What is the association between family psychosocial circumstances and STD incidence?
3. What is the association between family psychosocial circumstances and age of sexual debut?

4. Does age of sexual debut act as an effect modifier between the relationship of family psychosocial circumstances and STD incidence?

CHAPTER II

REVIEW OF THE LITERATURE

Sexually transmitted diseases and infections' incidence rates are disproportionally high among adolescents, and the literature suggests this phenomenon is due to their likelihood to engage in risky behaviors, when they may not be cognitively prepared for the situations they enter. Though youth only make up 25% of the sexually active population in the U.S., they are burdened with half of all new STD cases every year (Haydon et al., 2012). In this review of the literature, different family circumstances, risky sexual behaviors, and STD incidence among adolescents will be evaluated. For these purposes within the literature, the terms "youth'" and "adolescent" are used broadly, and often interchangeably. The WHO defines an "adolescent" as an individual between 10-19 years of age, and "youth" as individuals who are between 15-24 years of age. For the purposes of this review, we will primarily be looking at sexual risk taking behaviors among adolescents, primarily those who experience their sexual debut before 15 years of age, the different circumstances leading to their risky decision-making, and the outcomes of STD incidence as a result. Little research has been conducted to analyze the associations between adolescent sexuality and adult health (Haydon et al., 2012). Analyzing sexual risk behaviors among adolescents is important in order to provide interventions for prevention, and due to the large health, social, and financials costs and implications of STDs (Cheney et al., 2015).

2.1 Early sexual debut

Defining an "early" sexual debut, or initiation, can sometimes be difficult. It is safe to assume, based upon the literature, that the majority of investigators who have researched this

phenomenon define "early" sexual debut as less than 15 years of age at first coitus. Adolescents who have earlier sexual debuts are also put at higher risk for other factors that may contribute to their likelihood for STD incidence (Cheney et al., 2015). Beginning in the 1980's, the age of onset of sexual activity began to drastically decline among youth in the U.S., and with this transition came many other sexual risks and consequences that continue to burden adolescents today.

The link between early sexual debut and STD incidence is well established, along with the link between early sexual debut and many other types of adverse outcomes, including unplanned pregnancies, abortion, and other high-risk sexual behaviors (Boyle, 2003).

Haydon et al. (2012), who used the National Longitudinal Survey of Adolescent to Adult Health to analyze trends in sexual behaviors and their association with STD prevalence, employed latent class analysis to determine what types of individuals were most likely to experience lifetime STD diagnosis. They found that odds were greater for lifetime STD diagnosis among early sex initiators (22%). They also discovered that concurrent sexual relationships, another sexual risky behavior, was more likely among early initiators (20%). In accordance with these findings, sexual "postponers" reported the lowest rates of STD prevalence, at only 6% (Haydon et al., 2012).

In a study by Epstein et al. (2014), researchers used a test-and-replicate strategy among two different longitudinal studies, the Seattle Social Development Project (SSDP), and the Raising Healthy Children (RHC) survey, in order to analyze associations between age of sexual debut and STIs. Epstein et al. (2014) found that the association between early sexual debut and STD incidence was mediated by lifetime sex partners in the SSDP survey but only partially mediated in the RHC survey. Behavioral disinhibition was a predictor of early sex, early alcohol

use, lifetime number of partners, sex under the influence of drugs or alcohol, but itself had no effect on STD incidence. The researchers' conclusion was that early sexual debut is a primary mediator of STD incidence, and that it is a driving force that influences many other types of risk behaviors (Epstein et al., 2014)

O'Donnell et al. (2001) analyzed youth from the Reach for Health survey, following 1,287 adolescents from the seventh grade and mapping their sexual behavior until the participants were in the tenth grade. The participants were considered "urban minorities" and at baseline (seventh grade), 31% of males and 8% of females reported to have already experienced their sexual debut. By the end of the study (tenth grade), 66% of males and 52% of females reported to have made their debut.

Early sexual debut has a proven association with STD incidence, and it is possible that it also mediates the relationships between other factors and STDs. In addition to age of sexual debut, sexual concurrency, use of barrier protection and use of health services for STD treatment are other types of risk behaviors that can elucidate the link between adolescent STD incidence and social factors (Santelli et al., 2000).

2.2 Family psychosocial circumstances

Many recent studies have discovered links between negative family circumstances and adolescents participating in risky behaviors. "Negative" family circumstances can encompass many different scenarios, such as youth experiencing their parents going through a divorce, having new step-parents, living in a single-parent home, losing a parent to death, having a parent going to jail, or having parents who simply don't provide enough emotional support. Having negative family experiences or circumstances can be very difficult for adolescents, as family structure is vital in constructing a child's psychological outcomes, which will ultimately affect

their ability to resist poor decision-making. In the U.S. today, half of all adolescents will have parents who divorce (Donahue et al., 2010). It is important to understand the implications of the failing family structure on the adolescent, and the resulting increase in their likelihood for sexual risk behavior (Donahue et al., 2010). Within Donahue et al. (2010)'s research, univariate and multivariate models were built to analyze the association between parental relationship instability and sexual partnerships before the age of 16. These models showed that early (before the age of 5) onset family instability increased the odds of reported sexual partnerships (odds ratio [OR]=3.5), which then may be associated with other sexual risk behaviors (Donahue et al., 2010). Another study conducted by Klavs et al. (2006), which examined time trends in sexual debut, found that the primary risk factor for early sexual debut among young men was not living with both parents until the age of 15. In addition to these findings, Zimmer-Gembeck et al. (2007) found that the odds of early sexual debut increased when adolescents were living in single parent homes or in "blended" families, e.g. with step-parents.

Family socioeconomic status, as measured by a family's income and in some cases educational attainment, has been shown to be associated with many different health measures (Santelli et al., 2000). STD incidence in relation to SES has very rarely been analyzed, however increased risk of adolescent STD incidence and pregnancies is commonly attributed to poverty, which is more prevalent among racial and ethnic minority groups (Santelli et al., 2000).

In support of the research that shows associations of negative family circumstances and risky behaviors among adolescents, studies also show associations of positive family circumstances and youth abstaining from poor sexual decision-making. Parents' ability to talk to their children about sex can have a big influence on their behavior. Santelli et al. (2000) used the Youth Risk Behavior Survey to analyze the relationship of SES, familial structures, and ethnicity

to risky sexual behaviors among adolescents, which, as aforementioned, have a proven association with adolescent STD incidence. This study found that among both genders, adolescents were less likely to have ever had their sexual debut at the time of the study when participating individuals were provided with parental sex education, and/or if they were living in a 2-parent household. These associations were found to all be independently correlated with never having had sex (Santelli et al., 2000). Epstein et al. (2014) also found that strong familial structure and management was protective against early sexual debut. This idea of strong familial management carries over into Donahue et al.'s (2010) research, whom also concluded that adolescents whose parents had knowledge of their activities were less likely to participate in sexual activities.

In a meta-analysis by Zimmer-Gembeck et al. (2007), researchers found that in 10 out of 17 studies, an association of late age of first intercourse existed within youth living in "intact" families, defined as living in a home with 2 parents or married parents. Zimmer-Gembeck et al. (2007) also noted that educational attainment of parents had a small effect on adolescent risk behavior, delaying the age of sexual debut in 8 out of the 14 studies in which this variable was measured. Age of sexual debut also had an association with parental communication about disapproval of the adolescents' potential sexual behavior. This parental disapproval was found to be one of the only processes that were associated with delaying sexual debut among adolescents in this meta-analysis. (Zimmer-Gembeck et al., 2007)

Klavs et al. (2006) found that higher educational attainment and having sexual education provided by either their parents or their school was associated with later sexual debut among adolescent women, supporting the claims of Santelli et al. (2000). Donahue et al. (2010) also

concluded that adolescents whose parents had knowledge of their activities were less likely to participate in sexual activities.

2.3 Concurrent Sexual Risk Behaviors

As previously mentioned, adolescents who have earlier sexual debuts are also put at higher risk for other factors that may contribute to their likelihood for STD incidence, rendering this public health concern of high importance. Some of these other factors include: "unwanted intercourse", lower likelihood to use sexual protection or contraception, and higher numbers of lifetime sexual partners. (Cheney et al., 2015)

O' Donnell et al. (2001) also found that individuals who initiated sex earlier than their peers experienced increased likelihoods of many different types of other sexual risk behaviors. Some of these other risky behaviors included higher numbers of lifetime partners, teenage pregnancies, forcing of sexual activity, higher frequency of sexual acts, and higher likelihood to have had sex while drunk or taking drugs. (O'Donnell et al., 2001) In a survey conducted by the CDC, researchers investigated other types of risky behaviors, such as lack of condom use, and found that 40.9% of students reported to have not used a condom in their last sexual encounter (CDC, 2013). In a study analyzing the National Longitudinal Survey of Adolescent Health, conducted by Haydon et al. (2012), the researchers found that among early sex initiators (>16 years of age), the most prevalent outcome for these individuals was ever-STD diagnosis (23%), followed by sexual concurrency within the past year (13%), diagnosis of an STD within the past year (9%) and transactional sex within the last year (2%). These findings support the claim that early sexual initiators are more likely to participate in other sexual risk behaviors in their lifetime than later sex initiators. Klavs et al. (2006) discovered in their research that among both sexes, adolescents with an early sexual debut were more likely to participate in other risky sexual

behaviors such as lack of condom use, were more likely to be infected with bacterial STIs, and were more likely to experience teenage pregnancy.

Sexual concurrency refers to having more than one sex partner at a given point in time. In a Russian cross-sectional study conducted by Zhan et al. (2011), researchers concluded that partner concurrency (sexual concurrency among the individual and their partner) was associated with increased odds of having an STD.

2.4 Other Risk Behaviors Associated with Early Sexual Debut

Zhan et al. (2011) also found sexual concurrency to be significantly associated with age of sexual debut. Among individuals who had a sexual debut before 16 years of age, 30.5% of them had sexually concurrent partners, ($p=.003$), and high numbers of lifetime partners ($p<.0001$) (Zhan et al., 2011). In addition, Zhan et al.'s (2011) study also found significant associations of sexual partner concurrency among weekly drinkers ($p=0.003$). These findings are consistent with other studies, such as a study by Steinberg et al. (2011). Steinberg et al. (2011) measured different high-risk behaviors among incarcerated, adolescent females who had previously tested positive for an STD. The study employed 539 females between the ages of 12-18, and found many concomitant risky behaviors. Of the sample, 43.3% reported low condom or contraceptive use, 25% reported a previous STD, 26% reported a history of pregnancy, 23% reported a history of arrest for drugs or prostitution, 18% reported having a history of prostitution, and 50% reported using drugs or alcohol weekly (predominantly marijuana, alcohol, and methamphetamines). This study concluded that there is a relationship between drug use and other sexual risk behaviors among incarcerated female adolescents who were STD-positive (Steinberg et al, 2011).

Staras et al. (2011) used The Relationship of Alcohol, Youth, and Sexually Transmitted Disease Project to analyze relationships between substance use disorders (SUDs) and STDs. Their findings showed that STDs were more highly associated with youth who had an SUD (31.5%) than youth who did not have an SUD (24.4%). Study participants who had an SUD were also 1.8 times more likely than those without an SUD to have an STD (95% CI 1.2, 2.9) (Staras et al., 2011).

2.5 Peer pressure

Adolescents obtain a significant amount of the information that they have about sex from their peers. Many youth experiment sexually due to pressure from their peers, and at the same time are encouraged to participate in many other adult-like activities as well, such as drug and alcohol use. Peer pressure can also contribute to many youth having sexual experiences before they are ready (van de Bongardt, 2014).

In a qualitative study conducted by Li Pong Wong (2012), 34 focus groups were held in order to obtain adolescents' views on sexual attitudes and behaviors. Wong found many different factors that affected the individuals' sexual behavior, and peer pressure was a heavily influencing factor among some of the participants. Many of the participants, particularly those under the age of 16, revealed that most of their sexual decision making was unplanned, or spontaneous, while university undergraduate students reported peer pressure and social norms being a causal factor in their sexual decisions (Wong, 2012).

Zimmer-Gembeck et al. (2007) noted in a systematic review that in 6 out of the 8 studies which measured for friendships with "deviant" peers, the associations of these friendships and early sexual debut were significant. The strongest association of sexual behaviors, however, lay

with adolescents whose peer relationships had problem behaviors, such as drug use (Zimmer-Gembeck et al., 2008).

2.6 Race/ethnicity

Race and ethnicity are very important variables in understanding the epidemiologic relationship of sexual risk behaviors among adolescents and its consequences. Within the U.S., researchers have determined that African Americans and Hispanics are disproportionately associated with higher rates of STD incidence compared to Whites (Mojola et al., 2012). What causes these racial disparities in STD incidence is enigmatic. Although African American female youth have been found to be less likely to participate in many types of sexual risk behaviors, a study by Hipwell et al. (2011) found that African American female youth are more heavily burdened by STD incidence than their white counterparts. CDC STD surveillance tracked trends of some racial minority groups experiencing high burdens of STD incidence. In the U.S. in 2009, 71% of gonorrhea cases, 52% of syphilis cases, and 48% of chlamydia cases occurred among African Americans (CDC Fact Sheet, 2009). African Americans are also more likely to use condoms than Whites and Hispanics (Mojola et al., 2012). Santelli et al.'s (2000) analysis of the Youth Risk Behavior Survey found that individuals who claimed to be of white race were more likely to experience later sexual debut than individuals of other races. Therefore, it is possible that one explanation for this disparity in the cause of African American youth to be more heavily burdened by STDs than other races may be an effect of the rates of earlier sexual debut among individuals of their race (Dariotis et al., 2011). In addition, The 1997 Youth Risk Behavior Survey conducted by the CDC reports African American Males to be three times as likely as Hispanics and seven times as likely as whites to have had intercourse before the age of 15 (O' Donnell et al, 2001).

CHAPTER III

METHODS AND PROCEDURES

3.1 Data Source

Data were obtained primarily from the National Longitudinal Survey of Adolescent to Adult Health (hereinafter termed "Add Health") Wave IV (2008-2009), with additional variables obtained from the initial wave (Wave I) of the same survey. Family circumstance variables along with demographic variables were obtained from Wave I, whereas the age of sexual debut and STD incidence were measured in Wave IV.

ADD Health was conducted longitudinally in four waves in all 50 states of the U.S. The first wave of the survey was conducted in 1994-95 among adolescents from grades 7-12, and the same survey population has since been followed and surveyed into adulthood, with the final wave (Wave IV) taking place in 2008, when the sample was then 24-32 years old (52 survey respondents being 33-34 years old). Wave IV included 92.5% of the sample from Wave I, and of that sample 80.3% were interviewed. The data collection was carried out by Research Triangle Institute (RTI) under a sub-contract to the University of North Carolina at Chapel Hill.

3.2 Inclusion and Exclusion Criteria

Waves I and IV of the National Longitudinal Study of Adolescent to Adult Health were used for this analysis. This analysis was limited to respondents who participated in both Wave I and Wave IV.

The Add Health study design used a clustered sample in which the clusters were unequally sampled, and there were sample weights provided for 5,114 of the students. The use of sample weights generalized the sample to the entire U.S. population. For this analysis, the cross-sectional sample weight (GSWGT4_2) for respondents who participated in both the Wave I and

Wave IV in-home survey was used. The cross-sectional sample weight was used in lieu of the longitudinal sample weight because for the purposes of this analysis, we wish to investigate association rather than causation. Cluster2 was the cluster variable employed, while a strata variable was unavailable in the publicly available data set.

3.3 Variables

Sexually Transmitted Disease

Add Health analyzes many different types of STDs. The primary dependent variable was measured by the survey item, "Have you ever been told by doctor, nurse, or health professional that you had any of the following sexually transmitted diseases?" Respondents were instructed to select all the diseases that they have been told by a physician that they have had. Options included chlamydia, gonorrhea, trichomoniasis, syphilis, genital herpes, genital warts, hepatitis B, Human Papilloma Virus (HPV), Pelvic Inflammatory Disease (PID), cervicitis or mucopurulent cervicitis (MPC), urethritis, vaginitis, HIV infection or AIDS (this variable was excluded from the publicly available data set, and thus, excluded from this analysis), "any other STD", or "Have had no STD". Respondents who selected that they have had no STD were coded as "0"; and respondents who indicated that they had one of the specific STDs were coded as "1" for having ever had an STD.

Sexual Behavior / Sexual Debut

Early vs. late sexual debut was defined from responses to the item: "How old were you the first time you had sexual intercourse?" An age of 15 years of age or younger was coded as "1" for "Early Debut", and, and age of 16 years of age or older was coded as "2" for "Late Debut". Fifteen years of age was chosen as the cutoff based upon the literature (Epstein et al., 2014)

Family Circumstances

A focus of this study was how family circumstances might influence age of sexual debut and, therefore, STD incidence. Family circumstance variables were available with reference to both "fathers" and "mothers". Variables used included "Is your biological (mother/father) still alive?" "(Has/did) your biological (mother/father) ever (spent/spend) time in jail or prison?" "How many times (has/did) your biological (mother/father) (spent/spend) time in jail or prison?" was a continuous variable. "How old were you when your biological mother/father went to jail or prison (the first time)?" This was also a continuous variable, measured in years.

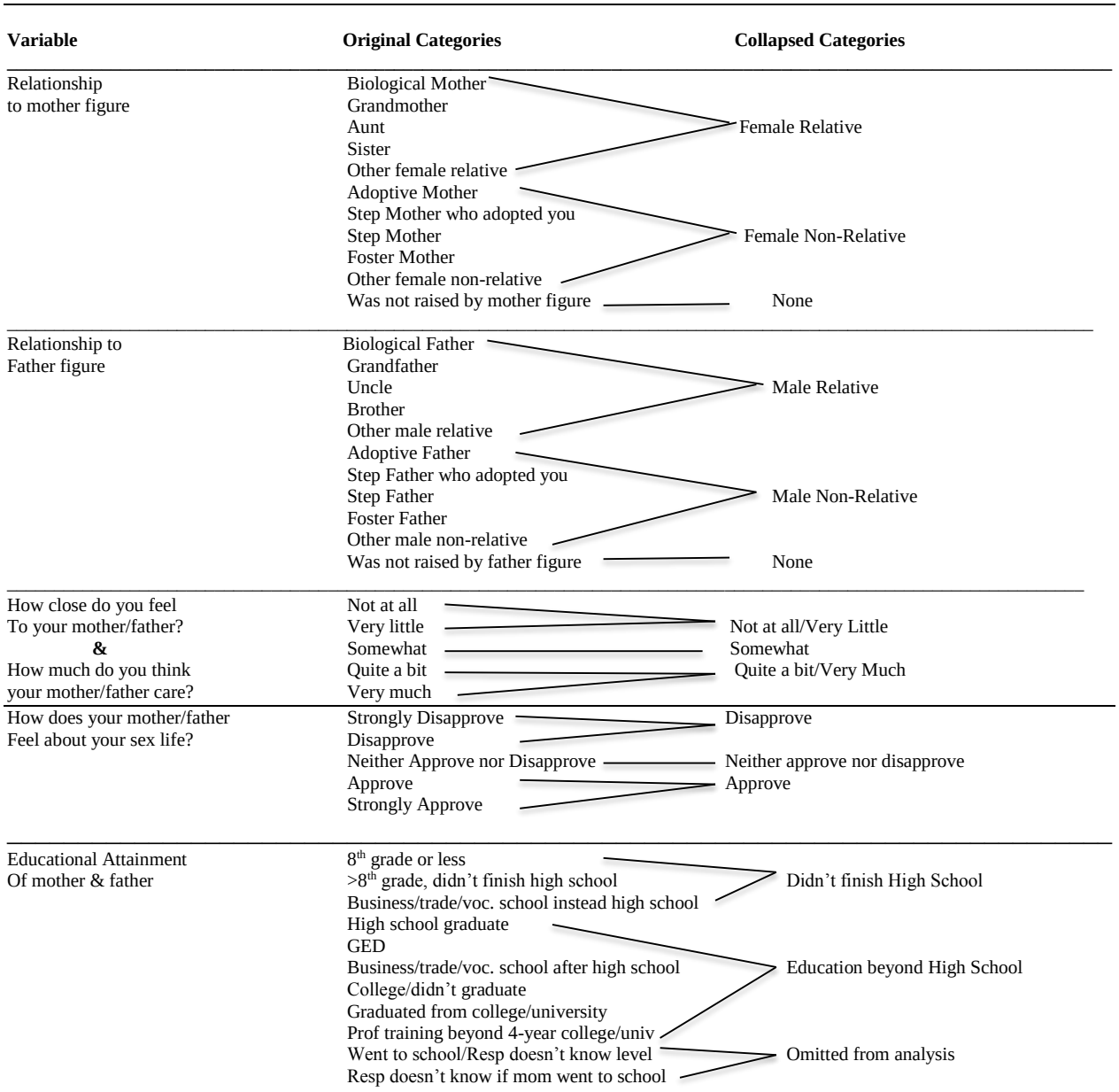
Relationship to mother/father figure was also measured. Response options included Biological Mother/Father, Adoptive Mother/Father, Step-mother/Step-father who adopted you, Step-Mother/Step-Father, Foster Mother/Foster father, other female/male non-relative, Grandmother/Grandfather, Aunt/Uncle, Sister/Brother, Other female/male relative, or Not raised by male/female figure. Step-mother/father who adopted you and step-mother/father were recoded as one variable, "Step-Mother"/"Step-Father"; "Foster Mother"/"Foster Father" and 'Other female/male non-relative' were recoded as one variable for "Non-Related Female/Male"; "Grandmother/Grandfather", "Aunt/Uncle", "Sister/Brother", and "Other female/male relative" were recoded as one variable, for "Female Relative"/"Male Relative", and Was not raised by a female/male figure was renamed "None".

"How close are you to your (mom/dad)?" and "How much does your (mother/father) care?" were both assessed on a Likert scale, with responses "Not at all", "Very little", "Somewhat", "Quite a bit", "Very much". "How does your (mom/dad) feel about your sex life?" was also assessed on a Likert scale, with respond options "Strongly approve", "Disapprove", "Neither disapprove nor approve", "Approve", and "Strongly approve". Education level of

mothers and fathers was also analyzed. Response options included “8th grade or less”, “>8th grade/didn’t graduate high school”, “Business/trade/voc. school instead high school”, “ High school graduate”, “GED”, “Business/trade/voc. school after high school”, “College/didn't graduate”, “Graduated from college/university”, “Prof training beyond 4-year college/university”. “Went to school/Respondent doesn’t know level” and “Respondent doesn’t know if mom went to school” were recoded as one variable, for “Child doesn’t know”.

These categories were used when assessing chi-square associations, however these variables were later condensed further for the purposes of creating fewer categories in the logistic regression analysis. The family circumstance dummy variables that were created are outlined in Figure 1.

Figure 1: Family Circumstance Dummy Variables for Logistic Regression



Respondent Characteristics

For age, respondents entered their birth year, and age was calculated by creating a new variable that calculated "2008 – birth year". 2008 was used because that was the year that

respondents filled out the Wave IV survey. However, after examination of the distribution of age, the variable turned out to have little variation (due to the survey sample design) and, therefore, was not included in the analysis.

For race, survey respondents had the option to choose more than one answer. For this reason, the variable for interviewer observed race was used. This race variable was chosen because there was not more than one selected answer and because it minimized missing data. For race, the different responses included White, Black/African American, American Indian/Native American, Asian/Pacific Islander, and other.

Another demographic variable assessed among the adolescents was educational attainment. Response options included 8th grade or less, some high school, high school graduate, some vocational/technical training, completed vocational/technical training, some college, completed college, some graduate school, completed a master's degree, some graduate training beyond a master's degree, completed a doctoral degree, some post baccalaureate professional education, or completed post baccalaureate professional education.

Sexual orientation was included as well. Responses included 100% Heterosexual, Mostly Heterosexual, Bisexual, Mostly Homosexual, 100% Homosexual, and Asexual.

3.4 Statistical Analysis

Chi-Square tests were initially used to determine associations of respondent characteristics with STD incidence and sexual debut (Table 1), and to determine associations between family circumstances and STD incidence and sexual debut (Table 2).

The hypotheses formed before performing the analysis are as follows:

1. Early sexual debut will be associated with higher likelihood of STD incidence.
2. Negative family circumstances are likely to affect an adolescent's likelihood to engage in risky behaviors, and thus their likelihood to contract an STD.
3. Negative family circumstances are also associated with higher likelihood for early sexual debut.
4. Age of sexual debut will act as an effect modifier in the relationship between family psychosocial circumstances and STD incidence.

Bivariate logistic regression was performed to assess the association between age of sexual debut and STD incidence. Family psychosocial circumstances were more complicated. In order to answer the second hypothesis as to whether or not family circumstances were associated with STD incidence, simple logistic regression was done for each family variable separately with STD incidence as the outcome dependent variable. Next, to test the hypothesis of family circumstances being associated with early sexual debut, simple logistic regression was conducted with the family variables with early sexual debut as the outcome. Next, statistical interaction (effect modification) was tested between the family variables, age of sexual debut, and STD incidence using logistic regression in order to answer the final hypothesis.

Finally, to evaluate whether the associations of family circumstances with early debut and STD might differ by respondent gender, analyses were repeated by estimating these same models stratified by gender.

All data management and statistical analyses were conducted using SAS version 9.3 (SAS Institute, Cary, NC).

CHAPTER IV
RESULTS

4.1 Descriptive Statistics

The sample size for the study population for which sample weights were provided is 5,114. Due to missing data, not all variable counts equal 5,114.

The demographic characteristics of the respondents are displayed in Table 1. The percentage of the study population with an early sexual debut (defined as 15 years of age or younger) was 36.8%. The STD incidence rate among the study population was 23.7%. African-Americans were found to be most likely to have experienced an early sexual debut (46.0%) and to have experienced an STD (43.3%) compared to other races. Females (37.9%) were slightly more likely to have experienced an early debut than males (35.7%) and were more likely to have experienced an STD (33.2%) than males (14.3%). Bisexual individuals (50.8%) were most likely to have experienced early debut compared to other sexual orientations, however "Mostly Heterosexual" individuals (40.4%) were more likely to have experienced an STD than other orientations.

Table 2 displays associations among family circumstances, early sexual debut, and STD incidence. One of the strongest associations here -is the mother/father jail time variables. Adolescents whose mothers served jail time were more likely to experience an early sexual debut (65.3%) than those whose mothers didn't (35.7%) and to have an STD (33.3%) than adolescents whose mothers didn't (23.3%). Adolescents whose fathers served jail time were also more likely to have an early debut (50.0%) than adolescents whose fathers didn't (33.8%) and to experience an STD (31.0%) than adolescents whose fathers didn't serve jail time (21.9%).

Table 1: Demographic Characteristics of Study Population by Exposure and Outcome

Participant Characteristics	Unweighted Frequencies (Total N)	Weighted Percent (Survey Population)	Early Debut Weighted %	Late Debut Weighted %	P-value	STD Weighted %	No STD Weighted %	P-Value
Age,years Median (IQR)	N = 4691	N/A	29 (27.0-30.0)	29 (28.0-31.0)	<.0001	29 (27.0-30.0)	29 (28.0-30.0)	<.0001
Sex					.1683			<.0001
Male	2298	50.35	35.68	64.32		14.33	85.67	
Female	2715	49.65	37.86	62.14		33.23	66.77	
Missing	101							
Race					<.0001			<.0001
White	3411	76.00	35.05	64.95		19.57	80.43	
African American	1182	16.03	45.97	54.03		43.30	56.70	
American Indian	50	1.02	26.80	73.20		34.27	65.73	
Asian/Pacific Islander	154	2.53	26.77	73.23		11.44	88.56	
Other	210	4.43	42.02	57.98		28.50	71.50	
Missing	107							
Sexual Orientation					0.0011			<.0001
Heterosexual	4289	86.37	35.55	64.45		21.59	7.69	
Mostly Heterosexual	506	9.56	45.40	54.60		40.43	59.57	
Bisexual	84	1.63	50.81	49.19		35.15	64.85	
Mostly Homosexual	40	0.82	35.38	64.62		27.29	72.71	
Homosexual	62	1.17	30.08	69.92		24.87	75.13	
Asexual	24	0.45	70.87	29.13		31.46	68.54	
Missing	109							
Educational Attainment					<.0001			.2128
8th grade or less	14	0.37	93.34	6.66		46.08	53.91	
Some High School	365	8.39	57.51	42.49		29.51	70.49	
High School Graduate	803	17.29	44.59	55.41		21.63	78.37	
Some Tech Training	177	3.60	45.97	54.03		22.94	77.06	
Completed Tech Training	320	6.34	39.52	60.48		24.34	75.66	
Some College	1684	33.28	39.03	60.97		25.56	74.44	
Bachelor's Degree	1004	19.22	24.19	75.81		21.60	78.40	
Some Graduate School	197	3.53	19.89	80.11		19.57	80.43	
Master's Degree	254	4.41	19.54	80.46		19.95	80.05	
Training beyond Master's	58	1.06	11.62	88.38		19.92	80.08	
PhD	29	0.58	11.14	88.86		23.41	76.59	
Some post-bac Ed.	36	0.60	30.83	69.17		21.10	78.89	
Completed post-bac Ed.	72	1.37	15.81	84.19		19.58	80.42	
Missing	101							

Table 2: Family Circumstances of Study Population by Exposure and Outcome

Family Circumstances Characteristics of Survey Respondents' Families	Unweighted Frequencies N=5114	Weighted Percents (Survey Population)	Early Debut Weighted %	Late Debut Weighted %	P-value (Exposure)	STD Weighted %	No STD Weighted %	P-Value (Outcome)
Mother Living					0.4809			0.2244
Yes	4418	95.23	36.66	63.34		23.85	76.15	
No	230	4.77	39.19	60.81		20.45	79.55	
Father Living					0.0026			0.6695
Yes	3977	88.60	35.43	64.57		23.23	76.77	
No	527	11.40	43.47	56.53		24.88	75.12	
Relationship to Mother					0.0677			0.0004
Biological Mother	4289	91.95	36.22	63.78		23.30	76.70	
Adoptive Mother	60	1.30	42.31	57.69		25.26	74.74	
Step-mother	65	1.26	29.45	70.55		10.60	89.40	
Non-Related Female	15	0.27	46.13	53.87		12.07	87.93	
Female Relative	236	4.72	46.61	53.39		34.85	65.15	
None	25	0.50	45.31	54.69		26.36	73.64	
Relationship to Father					<.0001			<.0001
Biological Father	3461	74.37	32.77	67.23		21.87	78.13	
Adoptive Father	88	2.06	38.74	61.26		24.52	75.48	
Step-Father	499	10.60	49.07	50.93		27.43	72.57	
Non-Related Male	34	0.61	54.78	45.22		16.91	83.09	
Male Relative	254	5.08	47.33	52.67		30.52	69.48	
None	353	7.28	50.59	49.41		32.69	67.31	
Jail Time								
Mother					<.0001			0.0099
Yes	164	3.50	65.26	34.74		33.89	66.11	
No	4485	96.50	35.71	64.29		23.25	76.75	
Father					<.0001			0.0001
Yes	678	15.02	49.95	50.05		30.97	69.03	
No	3748	84.98	33.82	66.18		21.94	78.06	
Educational Attainment of Mother					0.1731			0.8619
<8th grade	31	6.21	43.37	56.63		31.64	68.36	
Didn't Finish HS	71	16.10	56.18	43.82		25.68	74.31	
Trade School	5	.886	64.21	35.79		38.30	61.70	
High School	163	31.54	53.08	46.92		21.11	78.89	
GED	28	6.23	54.52	45.48		23.02	76.98	
Trade School after HS	30	5.18	63.08	36.92		37.41	62.59	
Some College	61	10.37	40.67	59.33		30.83	69.17	
College Grad	63	12.34	36.83	63.17		28.29	71.71	
Training beyond College	20	3.32	47.67	52.32		27.59	72.41	
Child Didn't Know	38	7.82	41.07	58.93		28.66	71.34	
Educational Attainment of Father					0.1311			.8204
<8th grade	71	4.61	44.64	55.36		29.91	70.09	
Didn't Finish HS	189	12.38	52.54	47.46		37.42	62.58	
Trade School	12	.952	75.39	24.61		33.98	66.02	
High School	556	35.62	49.84	50.16		27.58	72.42	
GED	41	2.62	40.99	59.01		32.46	67.54	
Trade School after HS	69	4.35	56.59	43.41		32.94	67.06	
Some College	127	8.00	41.87	58.13		31.68	68.32	
College Grad	234	14.79	40.37	59.63		26.58	73.42	
Training beyond College	76	4.33	33.48	66.52		27.90	72.10	
Child Didn't Know	181	12.34	47.25	52.75		29.72	70.28	

4.2 Unadjusted Odds Ratios

Age of Sexual Debut / STD Incidence

Once the chi-square associations of sexual debut and STD incidence with respondent characteristics and family circumstances were assessed, bivariate logistic regression analyses were performed to estimate the unadjusted odds ratios of early sexual debut and STD incidence. The results showed that those who experienced an early age of sexual debut were 2.22 times more likely to experience an STD than those who experienced a later debut (95% CI 1.88, 2.62).

With respect to father figures, adolescents who had no father figure were 59.3% more likely to have an STD than adolescents who were raised by a male relative (OR=1.59, 95%CI: 1.21-2.09, p <.01). Adolescents who were raised by a non-related male figure were 14.5% more likely to experience an STD than those who were raised by a male relative (OR=1.15, 95%CI: 0.91-1.44, p =0.43). With respect to mother figures, adolescents who had no mother figure were 3% more likely to have an STD than adolescents who were raised by a female relative (OR=1.03, 95%CI: 0.39-2.67, p = 0.70). Adolescents who were raised by a non-related female figure were 30% less likely to experience an STD than those who were raised by a female relative (OR=0.71, 95%CI: 0.41-1.22, p = 0.34).

With respect to perceived closeness to their fathers, Adolescents who claimed to feel little to none closeness towards their fathers were 93% more likely to have an STD than adolescents who felt quite or very close to their fathers (OR=1.93, 95%CI: 1.39-2.70, p = 0.01). Adolescents who claimed to feel somewhat close to their fathers were 49.5% more likely to experience an STD than those who felt quite or very close to their fathers (OR=1.50, 95%CI: 1.13-1.98, p=0.65). With respect to adolescents' perceived closeness to their mothers, adolescents who claimed to feel little to none closeness towards their mothers were 59.7% more likely to have an STD than adolescents who felt quite or very close to their mothers (OR=1.60, 95%CI: 1.07-2.38,

p=0.18). Adolescents who claimed to feel somewhat close to their mothers were 46.8% more likely to experience an STD than those who felt quite or very close to their mothers (OR=1.47, 95%CI: 1.14-1.89, p =0.33).

With respect to fathers serving jail time on adolescent behavior, adolescents whose fathers served jail time were 32.0% more likely to experience an STD than adolescents whose fathers did not serve jail time (OR=1.32,95% CI: 1.05-1.66, p=0.02). When measuring this same effect of mothers, adolescents whose mothers served jail time were 26.7% more likely to experience an STD than adolescents whose mothers did not serve jail time (OR=1.27, 95% CI: 0.88-1.83, p= 0.21).

With respect to adolescents' perceived feelings of their fathers on their sex lives, adolescents who felt that their fathers approved of their sex life were 34.9% more likely to experience an STD than those who felt that their fathers disapproved of their sex lives (OR=1.35, 95%CI: 0.90-2.03, p=0.15). Adolescents who felt that their fathers neither approved nor disapproved of their sex lives were 2.5% less likely to experience an STD than adolescents who felt that their fathers disapproved of their sex lives (OR=.98, 95% CI: 0.71- 1.34, p=0.34). When measuring this same association for mothers, adolescents who felt that their mothers approved of their sex life were 36.2% more likely to experience an STD than those who felt that their mothers disapproved of their sex lives (OR=1.36, 95%CI: 0.89-2.09, p =0.31). Adolescents who felt that their mothers neither approved nor disapproved of their sex lives were 18.8% more likely to experience an STD than adolescents who felt that their mothers disapproved of their sex lives (OR=1.19, 95% CI: 0.93-1.51, p =0.91).

With respect to educational level of fathers on adolescents likelihood for STDs, adolescents whose fathers didn't finish high school are 31.5% more likely to have an STD than

those adolescents whose fathers finished high school or had further education (OR=1.32, 95%CI:0.94-1.83, p=0.11). For mothers, adolescents whose mothers didn't finish high school are 5.7% more likely to have an STD than those adolescents whose mothers finished high school or had further education (OR=1.06, 95%CI: 0.63-1.77, p=0.83).

With respect to adolescent's perceptions on their father's level of caring, adolescents who felt that their fathers cared about them none or very little were 174.5% more likely to experience an STD than those adolescents who felt that their fathers cared quite a bit or very much (OR=2.75, 95%CI: 1.60-4.70, p=0.01). Adolescents who felt that their fathers cared about them somewhat were 64.3% more likely to experience an STD than those adolescents who felt that their fathers cared about them quite a bit or very much (OR=1.64, 95% CI: 1.10-2.46, p=0.97). With mothers, adolescents who felt that their mothers cared about them none or very little were 133% more likely to experience an STD than those adolescents who felt that their mothers cared quite a bit or very much (OR=2.33, 95%CI: 1.07-5.10, p=0.24). Adolescents who felt that their mothers cared about them somewhat were 116.4% more likely to experience an STD than those adolescents who felt that their mothers cared about them quite a bit or very much (OR=2.16, 95% CI: 1.36-3.43, p=0.20).

Many of the associations found here were not statistically significant. The associations that were found to be statistically significant here are fathers serving jail time and STD incidence (p=0.02), perception of fathers caring none to very little and STD incidence (p=0.01), adolescents raised by no father figure and STD incidence (p<.01), and adolescents who felt little to none closeness towards their fathers and STD incidence (p = 0.01).

Family Circumstances / Age of Sexual Debut

Bivariate logistic regression was next carried out to measure the association of each family circumstance with likelihood for early sexual debut among adolescents. Adolescents who felt that their mothers approved of their sex life were 211% more likely to have an early sexual debut than adolescents who felt that their parents disapproved of their sex life (OR=3.11, 95%CI: 2.09-4.64, p<.01). Adolescents who felt that their fathers approved of their sex lives were 152% more likely to have experienced an early sexual debut than adolescents who felt that their fathers disapproved of their sex life (OR=2.52, 95%CI: 1.71-3.73, p<.01). Adolescents whose fathers served jail time were 95% more likely to experience early sexual debut than those whose fathers didn't (OR= 1.95, 95%CI: 1.60-2.39, p<.0001). Adolescents whose mothers served jail time were 238% more likely to experience an early sexual debut than those whose mothers didn't (OR=3.38, 95%CI: 2.37-4.82, p<.0001) Adolescents who felt none to very little closeness to their fathers were 106% more likely to experience an early sexual debut than those who felt quite a bit or very much closeness to their fathers (OR=2.06, 95%CI: 1.48-2.87, p<.01). These results along with the rest of the logistic regression results can be found in Table 3.

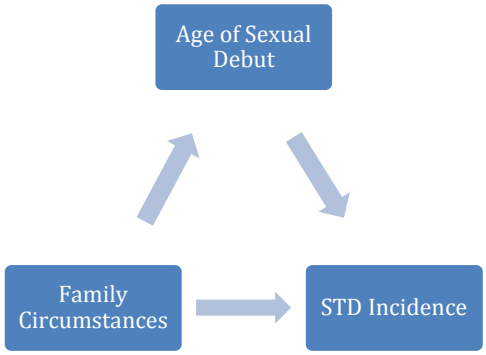
Table 3: Bivariate Analysis of Association of Independent Family Variables With Early Age of Sexual Debut

Family Variables	OR	95% CI	p-value
How much does Dad care?			
None/Very Little	1.81	1.024-3.196	0.4754
Somewhat	2.09	1.436-3.041	0.0790
Quite a Bit/Very Much	Referent		
How much does Mom care?			
None/Very Little	1.75	0.842-3.631	0.1828
Somewhat	1.06	0.609-1.851	0.5146
Quite a Bit/Very Much	Referent		
Education of Father			
Didn't Finish High School	1.25	0.941-1.659	0.1242
High School or Above	Referent		
Education of Mother			
Didn't finish high school	1.22	0.725-2.046	0.4565
High School or Above	Referent		
Mother's Feelings About Sex Life			
Approve	3.11	2.087-4.644	0.0002
Neither Approve nor Disapprove	2.03	1.667-2.463	0.3162
Disapprove	Referent		
Father's Feelings About Sex Life			
Approve	2.52	1.707-3.727	0.0009
Neither Approve nor Disapprove	1.69	1.327-2.139	0.6881
Disapprove	Referent		
Father Jail Time			
Yes	1.95	1.596-2.390	<.0001
No	Referent		
Mother Jail Time			
Yes	3.38	2.369-4.824	<.0001
No	Referent		
How close to Father ?			
None/Very Little	2.06	1.483-2.866	0.0045
Somewhat	1.67	1.317-2.126	0.2402
Quite a Bit/Very Much	Referent		
How close to Mother?			
None/Very Little	1.34	0.916-1.945	0.5613
Somewhat	1.41	1.076-1.837	0.2414
Quite a Bit/Very Much	Referent		
Relationship to Mother			
No Mother Figure	1.43	0.604-3.369	0.4316
Non-Related Female	1.01	0.705-1.446	0.5521
Female Relative	Referent		
Relationship to Father			
No Father Figure	2.01	1.521-2.668	0.0041
Non-Related Male	1.80	1.460-2.211	0.0394
Male Relative	Referent		

4.3 Interaction / Effect Modification

Next, age of sexual debut was tested for significance as a potential effect modifier on each of the family variables as a predictor of STD incidence. Over all family circumstances, few of the family variables had a statistically significant interaction with age of sexual debut in association to STD incidence. However, one variable was an exception. Age of sexual debut was a statistically significant effect modifier in the association of relationship to mother figure and STD incidence (χ^2 (2) = 8.15, p = 0.017).

Figure 2: Age of Sexual Debut as Possible Effect Modifier in the Relationship Between Family Circumstances and STD Incidence



Because of this statistical interaction, relationship to mother figure was the variable used and tested for significance in the multivariate logistic regression. Further results are discussed in Section 4.4.

4.4 Multivariate Logistic Regression

Relationship to mother figure was the focus of the multivariate logistic regression analysis, because it was the only variable which had statistically significant interaction with age of sexual debut in relation to STD incidence. The results showed that the odds of STD when comparing respondents who had an early age of sexual debut compared to respondents with a

late age of sexual debut, adjusted for mother figure effect modification, gender, race, sexual orientation, and educational attainment was .615. In the total sample, the modifying effect of relationship to mother on relationship of early debut and STD incidence was not statistically significant (Non-related female vs. female relative p=0.593, No mother figure vs. Female relative p =0.066). Because these results were not significant, the model was then stratified by gender, which showed to have a large effect on the model. Results of the gender stratification are discussed in section 4.5.

Next, STD and early sexual debut were put into a multivariate logistic regression model, to obtain an adjusted odds ratio, controlling for gender, race, sexual orientation, and educational attainment. In this model, the odds of STD given an early sexual debut are 2.15 (95%CI: 1.81, 2.55).

4.5 Stratification by gender

When reviewing the multivariate model, gender was shown to have a very strong association (χ^2 212.3, p<.0001) between early sexual debut and STD incidence, indicating that gender was a possible confounder in the relationship. Because of this, the model was next stratified by gender. For males, relationship to mother figure showed to have a statistically significant interaction with debut for both levels of mother figure (No mother p<.01, Non-related female p<.01). For females, relationship to mother figure had no statistical interaction with debut (No mother p=0.20, Non-related female p=0.60). Therefore, among adolescent males, age of sexual debut acts an effect modifier in the association between relationship to mother figure and STD incidence. Next, because of the strength of gender in the multivariate model, this analysis was next stratified by gender to see if the effects of the other strongly associated family variables relating to mothers and fathers differed between males or females. In order to test this, bivariate

logistic regression was used to test for only the family variables shown to have a significant association with STD incidence and sexual debut, and the corresponding variable for the other parent. Demographic factors were not controlled for in this model. Findings are shown in Table 4.

Table 4: Stratification of Family Circumstances and STD incidence by Gender

	Males			Females		
Variables	**Unadjusted OR**	**95% CI**	**p-value**	**Unadjusted OR**	**95% CI**	**p-value**
Age of Sexual Debut						
Early	2.398	1.812, 3.174	.0001	2.199	1.795, 2.694	.0001
Late	Referent			Referent		
Relationship to Mother						
Non-Related Female	0.877	0.359, 2.139	0.9115	0.567	0.320, 1.005	0.1773
None	0.894	0.147 5.426	0.9618	1.111	0.290, 4.255	0.5822
Female Relative	Referent			Referent		
Relationship to Father						
Non-Related Male	1.069	0.741, 1.540	0.2868	1.105	0.828 1.474	0.4075
None	1.755	1.036, 2.973	0.0436	1.602	1.113, 2.306	0.0278
Male Relative	Referent			Referent		
How much does your mother care?						
None/Very Little	1.337	0.351, 5.094	0.8098	2.983	1.175, 7.573	0.1281
Somewhat	1.249	0.417, 3.735	0.9082	2.115	1.313, 3.407	0.5168
Quite a bit/Very much	Referent			Referent		
How much does your father care?						
None/Very Little	1.032	0.266, 4.002	0.5844	3.441	1.730, 6.846	0.0039
Somewhat	2.182	1.013, 4.701	0.0760	1.300	0.759, 2.227	0.2849
Quite a bit/Very much	Referent			Referent		
Father Serve Jail Time?						
Yes	1.476	1.078, 2.021	0.0153	1.252	0.924, 1.697	0.1464
No	Referent			Referent		
Mother Serve Jail Time?						
Yes	1.954	1.018, 3.750	0.0440	0.952	0.607, 1.492	0.8292
No	Referent			Referent		

Many of the gender specific associations with family variables and STD incidence do show an association (OR>1.0), however; few associations are found to be statistically significant. While not statistically significant for males, females who felt that their fathers cared about them none to very little compared to females who felt that their fathers cared about them very much were 3.44 times more likely to have an STD (95%CI: 1.73-6.85, p<.01). The association of fathers/mothers serving jail time and STD incidence was not statistically significant for females,

however males whose fathers served jail time were 47.6% more likely to have an STD (OR=1.48, 95%CI: 1.08-2.02, p=0.02), and males whose mothers served jail time were 95.4% more likely to have an STD (OR=1.95, 95%CI: 1.02-3.75, p=0.04). Having no father figure compared to being raised by a male relative was significant for both males (OR=1.76, 95%CI: 1.04-2.97, p=0.04) and females (OR=1.60, 95%CI: 1.11-2.31, p=0.03).

CHAPTER V
DISCUSSION AND CONCLUSION

5.1 Discussion of Research Questions

The first research question asked addressed included whether or not early sexual debut would be associated with higher likelihood of STD incidence. This association was proven, as consistent with the literature. The next research question included negative family circumstances affecting an adolescent's likelihood for STD incidence. This association was proven, with the strongest associations lying within fathers serving jail time, perception of fathers caring none to very little, adolescents raised by no father figure, and adolescents who felt little to none closeness towards their fathers. These results were also expected, because as the literature suggests, many family circumstances are associated with poor and risky decision making among youth. The third research question dealt with family circumstances being related to early age of sexual debut. This association was also proven. The variables with the strongest associations were adolescents who felt that their mothers and/or fathers approved of their sex life, adolescents whose mothers and/or fathers served jail time, and adolescents who felt none to very little closeness to their fathers. Adolescents being at an increased likelihood for early sexual debut when they felt their parents approved of their sex life can be considered controversial. This phenomenon is likely due to the adolescent having fewer inhibitions about sex, and not being worried about any type of repercussions if their parents openly approve of them having a sex life at a young age. The term "sex life" however, can have multiple meanings. Some respondents may have intended that their parents approve of their lack of sexual activity, and some may have intended that their parents approve of them being sexually active. These results suggest the latter. The next research question involved age of sexual debut as an effect modifier between the relationship of family circumstances and STD incidence. When testing all of the different family

circumstance variables, only one variable (relationship to mother figure) was shown to have statistical interaction with age of debut and STD incidence. This association was also only true among adolescent males. This was unexpected, because the literature suggests that many different types of family psychosocial circumstances are associated with both age of sexual debut and STD incidence. Many of the family variables were associated with both STDs and age of debut, however, only one showed a statistically significant interaction.

5.2 Study Strengths and Limitations

There are several strengths and limitations to this research. First of all, the Add Health survey design was strong. The survey design used sampling weights, which generalized a small population to the target population. There are many benefits to this type of data collection. For one, the weights compensate for not collecting data from the entire population. They also adjust for differential selection probabilities, adjust for differential nonresponse and attrition, and reduce potential bias associated with nonresponse (West, *Sampling Weights and Variance Estimation*).

However, while the nature of the research has many positive attributes, there are still limitations to be considered. For one, there was not a strata variable available for use within the public use data set. According to the investigators, not including a strata variable in the analysis "only minimally affects the standard error" (Chen & Chantala, 2014). This is a serious limitation to the analysis of the data because not only did the investigator not define his interpretation of what a "minimal effect" is, we also do not know if this minimal difference in the standard error renders the results more conservative or more liberal than they should be. Another limitation of interest is that the researcher is taking for granted that students responded truthfully. When adolescents are being asked to report on variables such as sexual behavior, drug and alcohol use,

etc., there can be some apprehension to answer truthfully due to fear of disciplinary action. However, this possibility of response bias only causes an underestimation of the effect of the associations, because it is highly unlikely that students would report that they did participate in sexual activity or drug and alcohol use when they actually did not. In addition, the variable measures of STD incidence were a self-reported lifetime history of STD diagnosis, which is susceptible to response bias due to the social stigma of sexually transmitted disease. Other possible types of bias within this data include selection bias, misclassification bias, and survey non-response bias. In addition, although this data was collected longitudinally, the study design used for this analysis was cross-sectional in nature. Therefore, the directionality of the associations between the selected independent variables and the dependent variable cannot be established.

5.3 Implications of Findings

There are many implications of the findings in this research. African Americans are shown to have the highest rates of early sexual debut, which has a proven association with STD incidence. These findings are consistent with the literature. Many different types of family circumstances have been shown in the literature to be associated with poor decision making in adolescents. Because of this, some specific subgroups that should be targeted by prevention efforts include minorities, and also children who have weak familial structures.

In addition, the Theory of Planned Behavior can go to explain some of the associations found in this study. We can conclude that certain family circumstances lead to an earlier debut, and subsequently STD, but further explanation of the causal mechanisms behind this phenomenon is necessary. The Theory of Planned Behavior attempts to explain the behaviors over which an individual has the possibility to exert self-control. In this theory, intentions drive

the behavior of individuals. Norms (both social and subjective) can heavily influence an adolescent and their decision-making process. An individual's likelihood to engage in certain behaviors can be affected by their perception of whether or not their peers or people of importance (in this scenario, likely a parent) approve or disapprove of their behavior. The question as to whether the adolescent has the ability to exert behavioral control over their actions due to these norms could certainly be a factor in some of the associations found in this research.

5.4 Recommendations for Future Research

One recommendation for future research would include considering estimation of a mediation model of relationships among family circumstances, early sexual debut and STD incidence. Another suggestion for future research would be to include questions relating to other sexual risk behaviors in the analysis. Other variables that could be of interest include the age of initiation of other types of sexual behaviors, birth control use/adherence, number of partners, and sexual concurrency. Sexual concurrency is highly associated with risky decision-making and with STD incidence (Maughan-Brown, 2012) and could go to explain some of the associations that were presented in this research.

5.5 Conclusion

The results of this study indicated that not only is sexual debut associated with STD incidence, but family circumstances are also associated with STD incidence and early sexual debut. Adolescents' interactions with the mother figure variable appears to be a particular important factor in affecting adolescent behaviors associated with early sexual debut. Public health intervention programs that address adverse health consequences of early sexual debut among adolescents would be beneficial. Programs should consider familial structure among

adolescents, particularly male adolescents, as a factor in modifying an adolescent's likelihood to engage in sexual risk behaviors and risk of subsequent STD.

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