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RISKY BUSINESS: Sexual health behaviors, butt stuff,
and whether people will talk about it

A dissertation submitted in partial satisfaction of the
Requirements for the degree of Doctor of Philosophy
In Epidemiology

by

Drew Anne Westmoreland

2018

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ABSTRACT OF THE DISSERTATION

RISKY BUSINESS: Sexual health behaviors, butt stuff,
and whether people will talk about it

by

Drew Anne Westmoreland

Doctor of Philosophy in Epidemiology

University of California, Los Angeles

Professor Marjan Javanbakht, Chair

STDs present a preventable and continuing public health issue. Certain behaviors can increase the risk of STDs among young people. Additionally, much of the data used depends on potentially unreliable self-reported information. This dissertation (1) examined life-time risk factors and trajectories for STDs, (2) illuminated sexual health behaviors associated with HAI, and (3) investigated the validity of using a popular SDS in a young, urban population.

The first study investigated the longitudinal effects of broader, individual, and partnership factors on number of sex partners and concurrent sexual relationships. Broader influences such as lesser degrees of parental support and being a native English speaker or having higher levels of acculturation suggest increases in both number of sexual partners and the occurrence of concurrent sexual relationships. We also found that substance use, including alcohol use, was associated with higher numbers of sexual partners and likelihood of concurrent sexual

relationships. Finally, we found that the trajectories of sexual partners were not only explained by time, but by demographic characteristics.

The second study used individual- and partner-level analyses to assess the association of demographic and behavioral characteristics with HAI. Demographic factors, such as identifying as Black/African American, or behaviors, such as alcohol consumption and having a sexual partner who was recently incarcerated, were associated with more reporting of HAI. Additionally, HAI was more likely to occur in main, longer, and more committed partnerships, as well as relationships where IPV was present.

The third study evaluated the validity of using an older, popular SDS in a young, urban population. Factor analyses identified 15 questions from the MC-SDS that worked well in our population and differ from other short form versions. Of these 15 items, 20% were determined to be harder to answer based on underlying SD and about half were better able to differentiate between question scores for average SD. Finally, older age groups provided more socially desirable answers.

The findings from this dissertation help highlight characteristics and behaviors that can be incorporated into sexual health interventions to reduce STDs, and to improve how we collect and analyze data related to reported sexual health behaviors.

The dissertation of Drew Anne Westmoreland is approved.

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2018

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DEDICATION

For my dad, my stalwart cheerleader.

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LIST OF ABBREVIATIONS

Add Health	The National Longitudinal Study of Adolescent to Adult Health
AI	Anal Intercourse
AIDS	Acquired Immunodeficiency Syndrome
AOR.....	Adjusted Odds Ratio
CDC.....	Center for Disease Control and Prevention
CI.....	Confidence Interval
Est	Estimate
Freq.	Frequency
HAI.....	Heterosexual Anal Intercourse
HSV	Herpes Simplex Virus
HIV.....	Human Immunodeficiency Virus
HPV	Human Papillomavirus Virus
IPV	Intimate Partner Violence
IRB.....	Institutional Review Board
IRT.....	Item Response Theory
LL.....	Lower Limit
MC-SDS.....	Marlowe and Crowne Social Desirability Scale
Max.....	Maximum
Med.....	Median
Min.....	Minimum
MSM	Men who have sex with Men
No.	Number
NSFG.....	National Survey of Family Growth
NSSHB	National Survey of Sexual Health and Behavior
OR	Odds Ratio
PID.....	Pelvic Inflammatory Disease
SD.....	Social Desirability
SE.....	Standard Error
Std. Dev.	Standard Deviation
SDS	Social Desirability Scale
SES	Socioeconomic Status
SHaYP	UCLA Sexual Health among Young People Study
STD	Sexually Transmitted Disease
UCLA	University of California, Los Angeles
UL	Upper Limit
US.....	United States
YRBS.....	Youth Risk Behavior Survey

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CHAPTER 1: Introduction

1.1 STDs in Adolescents and Young People in the US:

Sexually transmitted diseases (STDs) present an important, preventable, and continuing public health problem due to the many immediate and long-term health issues that STDs cause. Sexual encounters can have unintended outcomes including acquiring sexually transmitted diseases (STDs) that require life-long disease management. For women, untreated STDs can lead to chronic pelvic pain and infertility representing further life-long consequences in addition to disease management (1). Additionally, STDs—most notably Chlamydia, Gonorrhea, Hepatitis B, human immunodeficiency virus (HIV), human papillomavirus (HPV), herpes simplex-2 virus (HSV-2), Syphilis, and Trichomonosis—constitute approximately 16 billion dollars of total medical costs based on the cost of treatments and treatment histories (1, 2). These total direct costs fail to include other potentially related medical costs such as routine cervical care and adverse pregnancy treatments resulting from STD infections (2). Adolescents and young people, in particular, are at risk for potentially life-long health consequences.

Young people ages 15-24 continue to bear a disparate burden of STDs constituting one of the highest risk groups for STDs in the United States (US) (3, 4). Previous Centers for Disease Control and Prevention (CDC) estimates suggest that 50% of new STD cases are young people between the ages of 15-24 (5). In 2016, the rates of Chlamydia slightly increased from 2015 and were highest among 15-24 year olds. Within this age range, 20-24 year olds had a higher rate (2643.8 cases) compared to 15-19 year olds (1929.2 cases) per 100,000 persons. Increased rates of Gonorrhea in 2016 (from 2015) showed a similar pattern. Females 20-24 years old had a higher reported incidence rate (595.5 cases) compared to 15-29 year olds (482.1 cases) per 100,000. However, among males, the highest incidence age group for 2015 was 20-24 year olds (616.8 cases per 100,000 males) followed by 25-29 year olds (545.1 cases per 100,000 males). Notably,

there have been increasing concerns that diseases once able to be cured will soon develop drug resistance as seen more recently with Gonorrhea (6). In 2015, Ceftriaxone plus azithromycin was the only drug treatment regimen recommended by the CDC for Gonorrhea. This recommendation was accompanied by additional calls to continue to eliminate the use of less effective antibiotics from treatment (7). Rates of Primary and Secondary Syphilis increased in 2016 and remained highest among young adults—particularly young, Black/African American men who have sex with men (MSM)—with higher rates reported for (first) 25-29 and (second) 20-24 year olds (5). Young people, in general, are at higher risk for contracting STDs for a complex interaction of biological, behavioral, and cultural reasons (8). The continued high rates of STDs among young persons, and the growing concern of drug resistant diseases, underscore the need for further research to inform successful interventions to reduce negative sexual outcomes.

1.2 Sexual Behaviors of Young People:

Vaginal Intercourse. According to survey information collected by the National Survey of Family Growth (NSFG), the average age of first intercourse among women aged 15-44 remained around 17 years of age between 2002 and 2015. Similar findings were reported for men aged 15-44 with the average age of first intercourse being approximately 17 years of age during the same timeframe (9). The National Survey of Sexual Health and Behavior (NSSHB) provides similar, yet more specific, estimates for narrower age ranges. Approximately 10% of males 14-15 years old, 30% of males 16-17 years old, and, finally, 63% of males 18-19 years old reported ever having had vaginal intercourse (10). A slightly larger proportion of adolescent females ages 14-15 years old (12%) and 16-17 years old (32%) reported ever engaging in vaginal intercourse. However, by the ages of 18-19, only 54% of young women reported engaging in vaginal sex potentially indicating a slower accumulation of persons newly engaging in the sex act (10). Still, these estimates indicate that by age 19 a majority of both adolescent males and females having had had vaginal intercourse.

Oral Sex. When considering the prevalence of oral sex, survey results from the NSFG (2011-2015) report that 83% of men and 81% of women aged 15-44 reported ever having oral sex, while 51% of men and 46% of women aged 15-19 reported in ever engaging in oral sex. Most of these estimates indicate a slight increase from previously reported estimates between 2006-2010 (9). Other surveys that look more closely at adolescent and young people's behaviors reveal that approximately 13% of 14-15 year old males and about one-third of males 16-17 years old report receiving oral sex in the past year from a female sex partner (10). Among adolescent females, 10% of girls 14-15 years old and 24% of girls 16-17 years old reported receiving oral sex in the past year. Additionally, 12% of girls 14-15 years old and 22% of 16-17 years old reported giving oral sex to a male sex partner in the past year (10). These proportions are not mutually inclusive nor exclusive, but rather serve to indicate the popularity of oral sex in the general population and, more specifically, in young people.

Anal intercourse. A sex act of particular interest to the current study is heterosexual anal intercourse. Unprotected anal intercourse presents unique opportunities for sexual health interventions, and recent survey and study data indicate that relatively large proportions of individuals are engaging in anal intercourse. While national survey prevalence estimates (2011-2015) of ever having anal intercourse for ages 15-44 have been 33% for women and 38% for men (9), some studies have reported estimates as high as 41% of participants reported ever engaging in anal intercourse (11, 12). Studies specifically targeting adolescents and young people have reported anal intercourse prevalence estimates of 11% and 16% in various study populations (13, 14). The NSSHB reports that approximately 5% of males 16-19 years old and 11% of males 20-24 years old reported having insertive anal intercourse (10). Additionally, the survey reports that 4% or less of 14-17 year old adolescent girls reported anal intercourse while 18% of 18-19 year olds reported having anal intercourse (10). Not only do these estimates indicate that larger proportions of adults are having anal intercourse, but surveillance estimates indicate that adolescents and young adults are also engaging in anal intercourse.

Anal intercourse presents a unique challenge to improving sexual health as many studies report anal intercourse as a higher risk sexual act. A published systematic review of the literature revealed that, when compared to vaginal intercourse, anal sex had an increased risk for male-to-female transmission of HIV-1 in heterosexual relations (15). A meta-analysis reporting transmission rates of HIV-1 among heterosexuals found receptive anal intercourse as a higher risk sexual activity for contracting HIV compared to receptive vaginal intercourse (16). While most research has focused on HIV transmission, some studies provide evidence of increased risk for a wider variety of STDs compared to vaginal intercourse. Engaging in heterosexual anal intercourse has been positively associated with viral STDs in Hispanic and Black men (17). In a study of high-risk women from the National HIV Behavioral Surveillance study (18), women who only reported having unprotected vaginal intercourse had half the risk of an STD compared to women who had both unprotected vaginal intercourse and anal intercourse (AOR=0.39; 95% CI = 0.23, 0.67) (12). Chlamydia and Gonorrhea infections have both been associated with self-reported engagement in heterosexual anal intercourse (19). Given the potential for increased risk for HIV and STDs when having unprotected anal intercourse, more research is needed to understand how and why adolescents and young people might choose to have unprotected anal intercourse to better inform potential prevention interventions.

In total, the behavioral surveillance data and current literature provide compelling evidence that despite initial abstinence-only education support and intervention attempts to delay sexual debut adolescents are having sex. Not only are adolescents and young people having sex, there is evidence of an expanding sexual repertoire among young people, including anal intercourse. Continued research into what motivates people to engage in sex and associated sexual behaviors may lead to more successful sexual health interventions.

1.3 Sexual risk behaviors:

The goal of this dissertation is to help identify areas of sexual behavior to better inform interventions that can be used effectively to reduce the STD burden among adolescents and young people. To do that, the specific aims of this dissertation seek to continue to explore and explain the effects of individual behaviors, relationship characteristics, and the complex interaction of both on the sexual health of young people. Several risk behaviors have been previously associated with higher risk for STDs including the total number of (20, 21) and timing of sex partners which are the focus of this dissertation (21-24).

Multiple and concurrent sex partners. Lifetime number of sexual partnerships is a known predictor of STD risk (20). Research has shown that approximately one-third of sexually active adolescents reported having had multiple sex partners increasing their risk of acquiring STDs by three-fold (25-27). Evidence suggests that adolescents as young as 15 have more than one sexual partner (25). The odds of multiple partners in a year increases through the early twenties then levels off (28). Longitudinal data collected from middle school and high school aged adolescents indicated that a majority (59%) of participants had engaged in casual sex (29). While a majority of middle school and high school adolescents did report engaging in casual sex, female participants reported less casual sex compared to their male peers (29). Engaging in and the frequency of engaging in casual sex is an important contributor to total number of sex partners. While adolescents are engaging in casual sex which can contribute to higher numbers of lifetime sexual partners, one study reported that adolescents were more likely to have casual sex with someone they once were in a romantic relationship with and to have casual sex with the same person repeatedly reducing the potential total number of sexual partners (30).

Not only are adolescents having sex with multiple partners, but these partnerships may be occurring concurrently (25). Among adolescents who were in mutually acknowledged relationships, the proportion of adolescents who also reported having sex with other partners was 25% (31). Other studies of broader age ranges report lower proportions of partner concurrency: 12% for sexually active men 15 to 44 and 12% among women 15 to 44 (32-34). Not only are

adolescents and young adults having sex with multiple partners, but these partnerships may be occurring concurrently (25).

Risk profiles and risk factors over the life course. There are several important considerations for sexual health that begin in adolescence and can impact sexual health over the lifespan. Earlier sexual debut among adolescents has been associated with an increased number of total sexual partners (35). National survey estimates suggest that the average number of total sex partners for men 25-44 years old was approximately 6 and the average number for women of the same age was approximately 4¹ (9). While previous research has indicated that the number of sexual partners may level off in the late twenties perhaps due to marriage or monogamous partnerships, Census reports indicate that a rising proportion of adults are deciding to never marry (35% of men and 30% of women in 2016) (36, 37). Additionally, the median age at first marriage has been continuously increasing since the late 1970s to approximately 29 among men and approximately 27 among women in 2016 (38). These changes in attitudes toward marriage—and delaying marriage—may present opportunities for increased numbers of sexual partners. Other opportunities for increasing the number of sexual partners include changes in later life partnerships. Marriages and monogamous relationships may change in later life due to partner death, choice, divorce, or serious illness all of which can lead to the accumulation of additional (increased number of) sex partners. Research indicates that a substantial proportion of older adults (50+) last had sex with a non-relationship partner (39). Concurrency has also been linked to specific developmental periods including younger ages when people are dating without potentially being in long-term partnerships, transitional periods such as the beginnings and endings of relationships (i.e. dating, break-ups and/or divorce), as well as people choosing to be in consensual non-monogamous relationships (40).

¹ Number of sex partners is rounded up to the nearest person for approximation.

The potential of increasing number of sexual partnerships through different life stages highlights the importance of establishing sexual health behaviors that mitigate risk of acquiring STDs not just to reduce the disease burden in adolescence but also for adult populations. In addition to highlighting reporting last sex with a non-relationship partner, research also indicates that older adults (50+) were less likely to use condoms or to get tested for STDs in the last year (39). While general condom use is associated with a reduction of STDs, correct and consistent condom use has been shown to provide the best protection against STDs (1, 4, 41-50). A systematic review conducted using 45 studies evaluating condom effectiveness in preventing STDs indicated that a majority of these studies found that condoms reduced STD infections (43). Specifically, correct and consistent condom use has been shown to reduce bacterial vaginosis (49), Chlamydia, Gonorrhea, and Trichomoniasis (48, 51). However, despite substantially reducing the risk for contracting an STD, condom use is low. National survey estimates suggest a little less than one-third of men and a little less than a quarter of women aged 15-44 reported using condoms (every time) during intercourse in the 4 weeks prior to their interview (2011-2015) (52). While there are many factors that can contribute to changes in condom use (e.g. marital status, use of hormonal contraceptives), these low prevalence estimates in combination with the knowledge of changing relationship and marital norms may indicate the need to re-evaluate sexual health messaging to establish sexual health behaviors as a pattern of healthy decision making that can be perpetuated throughout later development phases.

Some other factors that may influence the number of sexual partnerships and having concurrent sexual relationships include parental SES and education status (53), familial relationships (54, 55), and religion (56), as well as individual factors such as age, gender, race/ethnicity, cultural influences, relationship status, alcohol and substance use (32, 57-61).

Additional Factors Associated with Anal Intercourse. Previous studies have indicated several factors and sexual behaviors that are associated with anal intercourse such as condom use, partnership factors, and other high risk behaviors. Condom use during anal sex is uncommon

(17), and a majority of teens do not report using condoms during anal sex (62). However, for people who used condoms during anal sex, recent protected anal sex was positively associated (OR 2.77; 95% CI 1.17, 6.56) with subsequent condom use during anal sex (63). Condom use during anal sex was related to the use of condoms during vaginal sex (12, 64). One study found people 5.8 times more likely to have protected anal sex if they engaged in protected vaginal sex that same day (63). Among women, adolescents had the highest reports of condom use during most recent anal sex, although that proportion was only 25% (17). This higher proportion could be due to adolescents providing researchers with socially desirable and expected answers for condom use.

One consideration for whether adolescents and young people use condoms is their main motivation: pregnancy prevention vs. disease prevention. Results from the National Longitudinal Survey of Youth (NLSY) indicate that young people in longer relationships (>6 months) had lower percentages of condom use compared to their peers in shorter relationships (<6 months). Additionally, a higher percentage of young people in longer relationships reported using hormonal contraception compared to those in shorter relationships (65). These results suggest that there may be a greater concern about pregnancy prevention than STD prevention in young people leading to a heavier reliance on hormonal contraceptives especially in longer, more intimate, and/or more committed relationships (65). This, in return, could lead to a lower use of condoms as they consider themselves “protected” from what they are most worried about (i.e. pregnancy prevention). Other studies have also supported the importance of relationship (or lack of romantic relationship) context suggesting that adolescents and young people are more likely to use condoms when having casual sex than in main relationships (62, 65). This is especially important when understanding motivations in having heterosexual anal intercourse since a major factor associated with having heterosexual anal intercourse is relationship status. People who reported being married or cohabitating with someone were more likely to report engaging in anal intercourse (17). Some studies reported that anal sex occurred more frequently in main

relationships than in casual sex relationships (62, 66). However, there are other studies that report anal sex being more commonly associated with transactional sex and/or one-time sex partners (12, 19, 67). This discrepancy between relationship types might be due to differing study populations illustrating that anal intercourse occurs within the two “extremes” of relationship status (monogamously committed and not committed). More research into this area is needed to fully understand when people are choosing to engage in anal intercourse and other STD risk factors that may be coinciding with the occurrence of anal sex.

Qualitative research into heterosexual anal intercourse has helped to illuminate some potential reasons persons identifying as heterosexual choose to engage in anal intercourse. These reasons differ by age and gender. Among women, reasons for having anal sex include increased intimacy with sex partner, curiosity, sexual pleasure, a sense of power in their relationship, and to please a sexual partner; anal intercourse can also be viewed as a marker in a relationship’s progression (66, 68). These reasons would appear to support research that indicates women prefer having anal intercourse within the context of committed or serious relationships. The main reason women reported not wanting to having anal sex was the expectation of pain (66, 68). Reasons for having anal intercourse during adolescence included considering anal sex an effective form of contraception and having anal sex during vaginal bleeding (menstrual cycle) (62, 63). These additional relationship considerations for whether people engage in anal intercourse provide added information to understanding why people choose to engage in certain sex acts and illuminate opportunities for bettering sexual education to address potential risks such as lower condom use.

Finally, in high STD risk populations, engaging in anal intercourse has been associated with higher risk behaviors such as transactional sex, drug/substance use, and engaging in sexual relations while under the influence of drugs or other substances (12, 17, 19, 63, 67, 69, 70).

1.4 Social Desirability:

This research and much of the existing research depends on survey data using a majority of self-reported sexual health information. A major concern with using survey data for evaluating sensitive topics, such as sexual health, is the reliability and accuracy of the information being collected. Social desirability is a bias that can occur when participants answer certain questions in a way that satisfies their perception of the “right” or “acceptable” answer according to perceived social norms rather than answering truthfully. This particular bias can be especially harmful in behavioral research (71, 72). To measure the potential influence that social desirability has on study participants’ questionnaire responses, Marlowe and Crowne developed a 33-item social desirability scale in the 1960s that was validated in white, male undergraduates at The University of Kentucky (73). This scale was designed based on “cultural approval” as a motivational factor and aimed to distinguish social desirability from psychopathological personality traits previously thought to influence survey participant responses (73-75). Based on this scale, “[a] low need for social approval implies a degree of independence of cultural definitions of acceptable behavior.” (74)

Since its inception, the Marlowe and Crowne Social Desirability Scale (MC-SDS) has become one of the most popular measures of social desirability and been converted into many different versions of short-form scales (75). Studies have used the MC-SDS to determine the association of social desirability with survey results for physical activity recall (76), dietary intake (77), and condom use (78). In a review of self-report studies using the MC-SDS, Van de Mortel found that very few studies used a scale to assess social desirability, and, of those that assessed social desirability (79). Among those studies using a social desirability scale, about half found that social desirability did influence their outcomes, but very few then used statistical methods to try to account for this bias in their research (79). However, despite its wide usage (80, 81) and numerous validation studies (78, 81-85), the usefulness of the full MC-SDS for measuring social desirability in young populations is questionable due to the relevance of certain questions (i.e. voting and driving a car). Additionally, there is conflicting evidence of the ability of the scale to

distinguish between self-report and validated measures (80) and its usefulness in estimating under-reporting for certain behaviors (81, 83). This research will contribute to the literature on the MC-SDS by validating the usefulness of the full MC-SDS in a young, urban population to measure social desirability, as well as determining the associations of those scores with potentially stigmatized sexual health behaviors.

1.5 Specific Aims:

This dissertation examines long-term behavioral risk factors for STDs, as well as to better illuminate adolescent and young adult sexual behaviors and attitudes toward heterosexual anal intercourse. Additionally, this research will seek to explore the usefulness of the full MC-SDS in young people seeking sexual health care at STD clinics. To accomplish these aims, I will conduct secondary data analysis using The National Longitudinal Study of Adolescent to Adult Health (Add Health), a longitudinal study of a nationally representative sample of adolescents in grades 7-12 in the US during the 1994-95 school year. The Add Health cohort has been followed into young adulthood through four in-home interviews, the most recent in 2008 when the sample was aged 24-32. Additionally, I will use data collected as part of a UCLA study on young adult oral and pharyngeal Gonorrhea conducted in Los Angeles STD clinics. Using these two datasets, this dissertation aims:

1. To determine how sexual partnership behaviors developed during adolescence change with time and are influenced by other demographic and behavioral risk behaviors into young adulthood using data from the National Longitudinal Study of Adolescent to Adult Health dataset.

2. To describe individual and partnership characteristics of ever and recent heterosexual anal intercourse for young people ages 15-29 attending public STD clinics in Los Angeles County using partner-level data.

3. To determine the validity of using the Crowne and Marlowe (1960s) Social Desirability Scale among young people 15-29 attending public STD clinics in Los Angeles County.

CHAPTER 2: Sex partners ADD up: Factors associated with total number and timing of sexual partners from adolescence to young adulthood

2.1 Abstract:

Background. Higher numbers of lifetime sexual partners and concurrent sexual relationships are known to increase STD risk. The aim of this study was to determine how broader and individual demographic characteristics, behavioral factors, and partnership factors from adolescence change with time and influence later sexual risk behaviors into young adulthood.

Methods. Using data from all four Waves of The National Longitudinal Study of Adolescent to Adult Health (1995-2008), this study used crude and adjusted repeated Poisson models to assess the average effects of the covariates over time. Longitudinal, hierarchical, mixed effects, repeated measures models were used to determine average effects of individual- and partnership-specific characteristics with concurrent partnerships across time. Finally, individual growth models were used to better illuminate the role of demographic factors in explaining individual differences in cumulative number of sex partners across all four waves

Results. The median number of accumulated sex partners by Wave 4 was 7 (IQR=3-15), and concurrency ranged from 29%-41% with the highest proportion of concurrency occurring at Wave 3. Broader influences such as lesser degrees of parental support and being a native English speaker or having higher lever levels of acculturation suggest increases in both number of sexual partners and the occurrence of concurrent sexual relationships. We also found that substance use, including alcohol use, was associated with higher numbers of cumulative sexual partners and the likelihood of concurrent sexual relationships. Finally, we found that the trajectories of sexual partners over time were not only explained by time, but by age, gender, race/ethnicity, and sexual attraction.

Conclusion. Our study contributes to the literature on sexual risk behaviors by establishing longitudinal associations of broader, individual-level, and partnership-level factors associated with increased cumulative sexual partners and sexual relationship concurrency. These findings help to illustrate the importance of targeted STD prevention interventions for adolescents and the potential for their effects to last into adulthood.

2.2 Introduction:

Sexually transmitted diseases (STDs) present an important, preventable, and continuing public health problem due to the many immediate and long-term health issues caused by STDs. Adolescents and young adults continue to bear the burden of STDs in the population, and, in 2016, disease rates increased from previous 2015 estimates for Chlamydia, Gonorrhea, and Syphilis (5). There are many factors that can influence STD risk and acquisition including the number and timing of sexual partnerships.

Lifetime number of sexual partnerships is a known predictor of STD risk (20, 21) as is having concurrent, or overlapping, sexual partnerships (21-24). Research has shown that approximately one-third of sexually active adolescents reported having had multiple sex partners increasing their risk of STDs by three-fold (25-27). Evidence suggests that even adolescents as young as 15 have had more than one sexual partner (25). National survey estimates suggest that the average number of sex partners for men 25-44 years old was approximately 7 and the average number for women of the same age was approximately 5² (86). The odds of having more cumulative sex partners in a year increases through the early twenties then levels off (28) which could be due to entering a new developmental period marked by more stable adult relationships. While previous research has indicated that the number of sexual partners may level off in the late

² Number of sex partners is rounded up to the nearest person for approximation.

twenties perhaps due to marriage or monogamous partnerships, Census reports indicate that a rising proportion of adults are deciding to never marry (35% of men and 30% of women in 2016) (36, 37). Additionally, the median age at first marriage increased in 2016 to age 29 among men and age 27 among women (38). These changes in attitudes toward marriage—and delaying marriage—may present opportunities for increased numbers of sexual partners.

Not only are adolescents and young adults having sex with multiple partners, but these partnerships may be occurring concurrently (25). Among adolescents who were in mutually acknowledged relationships, the proportion of young people who also reported having sex with other partners during the same time period was 25% (31). Other studies report lower proportions of partner concurrency; Averages of 12% have been reported for sexually active men 15 to 44 and 12% among sexually active women 15 to 44 in the past year (32-34). Concurrency has been linked to specific developmental periods including younger ages when people are dating without potentially being in long-term partnerships, transitional periods such as the beginnings and endings of relationships (i.e. dating, break-ups and/or divorce), as well as people choosing to be in consensual non-monogamous relationships (40). Some of the factors that have been shown to influence the number and concurrency of sexual relationships include broader, socio-cultural developmental factors such as familial relationships (54, 55), and religion (56), as well as individual factors such as age, gender, race/ethnicity, parental SES and education status (53), relationship status, alcohol and substance use (32-34, 57-61).

The time between middle school and high school ages through the late 20s represents formative developmental periods. Drawing on past developmental psychology literature, Arnett (2000) helped to further expand on aspects of these developmental stages by delineating the time between 18 and late twenties as emerging adulthood (87-89). In this theoretical model, Arnett posits that beginning around 18 years of age young people are living in a transitional period full of instability as they begin to move out of their parents homes to continue their education or finding new jobs, as well as meeting new people and forming new social relationships. It is this instability

that helps to foster a period of change and exploration not just in regard to their educational and occupational status but also in their own identity and relationships (87-89). Romantic relationships in particular experience a great deal of growth and development from middle school and high school ages. Most young people usually wait to incorporate sexual activity into relationships around the time that Arnett suggests emerging adulthood begins (87-91). It is this emerging adulthood period that offers relative freedom in exploration of sex and love without added pressures of looming adult responsibility or marriage that may be more pointed in the late twenties as emerging adulthood transitions into young adulthood (87-89). With regards to how this relates directly to sexual risk behavior, this period of exploration in sex and love can lead to an accumulation of more sex partners, and the highly transitive nature of dating may contribute to more overlapping and concurrent relationships. It can also have implications for risk behaviors, such as substance use (88), that are known associates of sexual risk behavior. Therefore, it is important to try to understand many different aspects of development (i.e. cultural influences, the role of parents, important of religion, and behaviors) that change over this particular developmental period, and whether or not they have lasting impacts on sexual behavior. Perhaps a better understanding of the dynamic changes in these influences can better inform not only culturally and developmentally appropriate prevention messaging, but also better inform the timing of interventions.

Using individual and partnership data from the National Longitudinal Study of Adolescent to Adult Health dataset, this study seeks to determine how broader (e.g. cultural influences, religious influences, and familial influences) and individual demographic (e.g. race/ethnicity, gender) and behavioral factors (e.g. transactional sex, alcohol and substance use) from adolescence change with time and influence later sexual risk behaviors into young adulthood. Specifically, we hypothesize that broader influences highlighting the importance of religiosity, having more perceived parental support, and less acculturation to American/Western culture will reduce the overall number of sexual partners and likelihood of concurrency. Additionally, we

hypothesize that participating in certain behaviors—such as engaging in transactional sex, binge drinking, and substance use—will increase, on average, the number of total sexual partners and the likelihood of having overlapping sexual partnerships.

2.3 Methods:

Study population. The National Longitudinal Study of Adolescent to Adult Health (Add Health)—formerly known as the National Longitudinal Study of Adolescent Health—a school-based, nationally representative, longitudinal study that began data collection in 1994 that was used to address the study aims. More detailed information on the Add Health study design has been published elsewhere (92, 93). Briefly, Add Health is a nationally representative sample of young people that began with an in-school survey of approximately 90,000 middle school and high school students in 1994. Home-based interviews have been collected for a little over 20,000 of the students in beginning in 1995. The current, complete Add Health in-home interview data available for analysis spans 14 years—Wave 1 (beginning 1995) through Wave 4 (final data collection 2008) with Wave 5 data collection currently underway. (Figure 2.1). The surveys collected a plethora of information most notably of demographic characteristics, familial dynamics, cultural influences, and sexual health behaviors. Add Health was approved by The University of North Carolina Institutional Review Board (IRB). Informed consent was obtained from all participants for all Add Health data collection per federal regulations (94). Access to Add Health data was granted to the current investigators under contract with The University of North Carolina. IRB approval was obtained from The University of California, Los Angeles to acquire access to the data.

Outcome measures. This study leverages information from the in-home interviews for all available Waves described in Figure 2.1. There are two outcomes of interest for the current study, number of sex partners and concurrent, or overlapping, sexual partnerships. The number of sex partners was collected at each Wave in various forms. For example, Waves 1 and 2 inquired

“With how many people, in total, including romantic relationship partners, have you ever had a sexual relationship?” while Wave 4 inquired about the total number of sexual partners for males and females separately. Given the varying phrasing, total number of sex partners was constructed for Wave 2 by summing the number of sexual partners given at participants’ Wave 1 interview and the number of sex partners since month of last interview (MOLI) provided at Wave 2 interviews. Wave 3 total sex partners was constructed by adding additional vaginal sex partners (only partners assessed) at Wave 3 with previous estimates from Wave 2. Finally, the number of sex partners accumulated by Wave 4 data collection was calculated by summing the total male and female sex partners reported during Wave 4 interviews.

The second outcome of interest was partner concurrency. As part of the in-home interviews, a sample of respondents were asked detailed questions about “romantic” and “non-romantic” sexual relationships. For Waves 1, 2, and 3, this information included the months and years during which sexual relationships occurred. These dates were used to calculate overlapping sexual relationships for each partnership reported by respondents. In Wave 4, concurrent partners was assessed directly by asking, “During the time you and [first name] [have had/had] a sexual relationship, [have/did] you ever [had/have] any other sexual partners?” Using the specific sexual relationship dates and subsequent questions, a binary (yes/no) variable was created for each partner.

Covariates. Drawing on socio-ecological models of health influences (95), a conceptual model of socio-cultural, individual- and partner-level factors thought to influence concurrency across adolescent to young adult developmental periods is presented in Figure 2.2 and include age, race/ethnicity, gender of persons to whom respondents are sexually attracted, alcohol consumption, drug/substance use, family support, and religiosity. Detailed information on how each of the variables were constructed is presented in Table 2.1.

Statistical analyses. Descriptive statistics were calculated for all continuous (medians, ranges) and categorical (frequencies, percentages) demographic, behavioral, and sexual risk

behavior characteristics. Variables included in analyses were based on the existing literature. Regression analyses were used to assess the association between covariates of interest and the two outcomes of interest (i.e., concurrency and number of sexual partners). Specifically, repeated Poisson models were used to assess each covariate's association with cumulative number of sexual partners. Adjusted longitudinal, repeated Poisson regression models were used to determine associations of individual factors with total number of sexual partners at each Wave and across time. Bivariate, hierarchical cross-sectional and longitudinal logistic regressions were used to investigate the associations between partner concurrency and other covariates at the individual- and partner-level. Multivariable, longitudinal, hierarchical, mixed effects, repeated measures models were used to determine average effects of individual- and partnership-specific characteristics with concurrent partnerships across time. For number of sex partners and partner concurrency, demographic characteristics were assessed for potential changes in association magnitude and direction due to time. Adjusted log-changes in counts and adjusted odds ratios (AORs) as well as 95% confidence intervals (CIs) were reported for each test of association as appropriate. Finally, individual growth models were used to better illuminate the role of demographic factors in explaining individual differences in cumulative number of sex partners across all four waves (96). All analyses were conducted using SAS version 9.4 (97).

2.5 Results:

Descriptive overview of study participants. Crucial developmental periods (adolescence, emerging adulthood, and young adulthood) are covered by Add Health Waves 1 through 4 and the descriptive statistics for each Wave of data collection are presented in Table 2. Waves 1 and 2 have very similar characteristic and behavioral distributions owing to their relatively close data collection periods. The mean age of participants at Wave 1 was 16 (SD=1.7), Wave 2 was 16 (SD=1.6), Wave 3 was 22 (SD=1.8), and Wave 4 was 29 (SD=1.8). About 50% of the sample is female, and about 53% report identifying as white. There were slightly higher percentages of

women (53%, 54%) and whites (55%, 58%) in the later Waves (3 and 4). Across all Waves of data collection, a majority reported being US citizens and speaking English at home with family or friends. As expected, marital status increased across the Waves with very few reporting being married at Wave 1 (0.4%) and 44% reporting being currently married by Wave 4.

Sexual Risk behaviors. Slightly more than 25% respondents reported binge drinking (5+ drinks at a time in the past 12 months) at Waves 1 and 2, while half reported either binge drinking in the past 12 months for Waves 3 and 4. Marijuana use in the past 30 days increased from Wave 1 (14%) to 24% in Wave 3, but decreased slightly in the following Wave 4 responses (18%). Other substance use including (methamphetamines, cocaine, other stimulants, non-prescribed prescription drugs) was fairly uncommon during all Waves, with the highest proportion of respondents reporting current substance (past 30 days) use during Wave 4 (7%). Only about 2% of all participants reported being diagnosed (past 12 months) with an STD in Waves 1 or 2, increasing to 6% by Wave 4.

Partnership characteristics. The median number of total sex partners for Wave 1 was 0 (IQR=0-0), increasing to 7 by Wave 4 (IQR=3-15) (Table 2.2). The median age of partners reported at Wave 1 was 17 (IQR=16-19), at Wave 2 was 18 (IQR=16-19), at Wave 3 was 23 (IQR=21-25), and at Wave 4 was 29 (IQR=26-32) (Table 2.3). Age discordance (|5| years age difference with partner) between partners increased from Wave 1 (6%) to almost 20% in Wave 4. Of all the Waves, the largest proportion of same-sex partnerships was 2.5% in Wave 4. Only about 20% of all partnerships reported for any Wave were with people of a different racial or ethnic group than the respondent. Finally, of the reported partnerships, the proportions of directly assessed or overlapping date estimated concurrency was 39% at Wave 1, 29% at Wave 2, 41% at Wave 3, and 29% at Wave 4.

Broader developmental influences associated with number of sex partners and partnership concurrency. Beginning with a discussion of broader influences and then narrowing to specific individual- and partner-level factors in final, adjusted models, we found that the

language a respondent spoke at home with friends and family and family support was associated with cumulative number of sex partners over time (Table 2.4). Young study participants who reported speaking Spanish (AOR: 0.7; 95% CI 0.6, 0.8) and other languages (AOR: 0.8; 95% CI 0.7, 0.9) at home with friends and family had lower cumulative sex partners compared to participants who reported speaking English. Similarly, participants who reported speaking Spanish (AOR: 0.9; 95% CI: 0.7, 1.0) and other languages (AOR: 0.7; 95% CI: 0.6, 0.9) at home with family and friends were less likely to have concurrent sexual partnerships. We also found that family support had influences on the cumulative number of sex partners and concurrent partnerships over time. Compared to respondents who reported being close to both of their parents, those who were close to only one parent (AOR: 1.1; 95% CI: 1.1, 1.2) or somewhat close to one parent (AOR: 1.1; 95% CI: 1.0, 1.3) had about 10% more sexual partners. Participants who reported being close to at least one parent (AOR: 1.2; 95% CI: 1.1, 1.2) or somewhat close to one parent (AOR: 1.1; 95% CI: 1.0, 1.2) were more likely to have had concurrent sexual relationships compared to participants who were close to both parents.

Demographic and behavioral factors. There were many individual demographic and behavioral factors associated with both cumulative number of sex partners and having concurrent sexual relationships. Increasing age was associated with an increased number of sexual partners. Women had lower numbers of sexual partners (AOR=0.6; 95% CI 0.6, 0.6), but were slightly more likely to report concurrent partners (AOR: 1.1; 95% CI: 1.1, 1.2) compared to men which could be construction of the currency variable. Black/African Americans were 1.6 times (95% CI: 1.5, 1.8) as likely to have a higher number of sexual partners and 1.6 times (95% CI: 1.5, 1.7) as likely to have concurrent partnerships compared to non-Hispanic white participants. Participants who reported being romantically or sexually attracted to both men and women were 1.4 times (95% CI: 1.2, 1.5) as likely to have more sexual partners and 1.5 times (95% CI: 1.3, 1.6) as likely to have concurrent partnerships as participants who reported being interested in the opposite sex only. Additionally, respondents who reported being sexually attracted to the same-sex had, over

all four data collection times, more sexual partners (AOR: 1.7, 95% CI: 1.3, 2.1) compared to participants who were sexually attracted to the opposite sex. Participants who were in racially/ethnically discordant relationships were 1.1 times as likely to have had a concurrent sexual partnership compared to those who had sexual partnerships within their own race/ethnic group (95% CI: 1.0, 1.2).

Beyond demographic characteristics, individual behaviors associated with the cumulative number of sexual partners and partner concurrency were alcohol and substance use. Binge drinkers had higher numbers of total sex partners (AOR: 1.3; 95% CI: 1.2, 1.4) and were 1.6 times (95% CI: 1.5, 1.7) as likely to have had concurrent partnerships compared to those who never drank or had not had alcohol in the past 12 months. Even persons who reported no binge drinking in the past 12 months but reported ever binge drinking, were more likely to have concurrent partnerships compared to people who had not had alcohol in the past 12 months (AOR: 1.6; 95% CI: 1.4, 1.7). Having used marijuana in the past 30 days was associated with more cumulative sexual partners (AOR: 1.3; 95% CI: 1.2, 1.4) and a higher likelihood of having concurrent partnerships (AOR: 1.2; 95% CI: 1.1, 1.3). Finally, using any other drugs in the past 30 days was associated with both increased sexual partners (AOR: 1.4; 95% CI: 1.3, 1.6) and having had concurrent sexual partnerships (AOR: 1.3; 95% CI: 1.2, 1.4). Non-recent drug users (>30 days) were also found to have higher numbers of sexual partners compared to never drug users (AOR: 1.4; 95% CI: 1.3, 1.5).

Individual growth models. When only looking at the trajectory of cumulative sex partners over all four Waves (unadjusted individual growth model), individual differences explained 17% of the total variance found in the mean number of sex partners over time with the majority of variance being explained by time itself (Table 5). Of this individual variance, 5% of the differences in cumulative number of sexual partners could be explained by gender alone. Race/ethnicity and gender combined accounted for 13% of the individual variance in the cumulative number of sexual partners, and the addition of marital status explained an additional 2% of the individual differences

in sexual partners over time. Sexual attraction was also found to significantly influence the trajectories of sexual partners over time, but also introduced additional variability into the model. Figures 2.3-2.6 help to illustrate the change in median predicted cumulative sex partners and fitted trends over time for differences in gender, race/ethnicity, marital status, and sexual attraction. Men have a slightly steeper slope compared to females. From the graphs of the median predicted number of sexual partners at each wave according to racial/ethnic grouping, we can see that there are slight differences in the trajectories of cumulative sex partners by racial/ethnic group with Black/African Americans having noticeably higher values at Waves 3 and 4. Non-married individuals had a much steeper trajectory compared to married participants. Although the married trend does not fit a linear relationship as well, there are still wide differences between predicted numbers of sexual partners at Waves 3 and 4. Finally, young people who reported any same-sex sexual attraction had much higher trajectories of total sex partners with a noticeable sharp increase between Waves 2 and 3 that continues to increase through Wave 4, albeit at a shallower slope.

2.5 Discussion:

The major contribution of this paper is a longitudinal extension of previously established broader/socio-cultural, individual, and partnership factor associations with number of sexual partners and partner concurrency. Broader influences such as lesser degrees of parental support and being a native English speaker or having higher levels of acculturation suggest increases in both number of sexual partners and the occurrence of concurrent sexual relationships. Similarly, we found that past or recent substance use, including alcohol use, was associated with higher numbers of cumulative sexual partners and the likelihood of concurrent sexual relationships. Additionally, we found that the trajectories of sexual partners over time were not only explained by time, but by demographic characteristics and had a noticeable change in trajectory pattern for sexual attraction.

One of the major foci of this study was to determine if broader developmental factors that may have particular influence in adolescence still had influence on sexual partnership behaviors in later years. We used two measures of cultural influences to approximate differences of growing up in immigrant or multicultural families—US citizenship status and the primary language spoken with family and friends. Only language spoken with family and friends was associated with both outcomes with Spanish and other languages contributing to lower overall sexual partners, and less concurrent sexual partnerships. Previous research has suggested that cultural practices of first- or second-generation young people can be protective against health risk behaviors (98). While generationality was not directly assessed in this study, non-acculturation to English indicates a particular strength to cultural norms that may not adhere to more permissive American sexual health behavior norms especially since our findings do suggest that having a primary language other than English reduces the number of sexual partners and lessens the likelihood of having concurrent partnerships across time.

Beyond potential cultural influences, familial support, as measured by parental closeness, was also found to be associated with both number of sexual partners and concurrency. Our results suggest that persons who are close to one or are somewhat close to one parent have increased sexual partners and are more likely to have concurrent partnerships than participants close to both parents. A published review of the literature, indicates that that parental closeness and parental relationship status (i.e. dual-parent households or single-parent homes) does reduce overall sexual partners and other sexual risk behavior in adolescents (55). Our results support these past findings and further demonstrate that parental relationships influence sexual behaviors beyond adolescence and immediate influence—i.e. when a child is still potentially living at home with their parents—to influence into young adulthood.

This study also establishes longitudinal effects of individual demographic and behavioral characteristics on the cumulative number of sexual partners and overlapping sexual relationships through different developmental periods establishing average effects for these factors over time.

In our study, women respondents were less likely to have increased cumulative sex partners, but slightly more likely to report having concurrent sexual relationships. While the latter result was surprising, it is consistent with previous cross-sectional findings from Add health on partner concurrency (25), but could also be a product of the available date information (month and year) used to determine overlapping sexual relationships. Of the individual behaviors investigated in this study, substance use—binge drinking, marijuana use, and other drug use—was associated with both increased sexual partners and higher likelihood of concurrent sexual relationships. The increased average effect over time suggests that not only is recent substance use (past 12 months for alcohol and past 30 days for marijuana and drug use) associated with more sexual partners and concurrent relationships over time, but also past alcohol and substance use. These findings are particularly relevant for STD interventions and prevention messaging targeting adolescents indicating that incorporating safe alcohol and drug use messages could have lasting effects on sexual health behaviors into adulthood.

Finally, this furthers literature by not only investigating averaging effects of individual characteristics on cumulative sex partners and concurrency over time, but also investigating the trajectories of those outcomes and characteristics over time. Our results suggest that among demographic factors gender, race/ethnicity, marital status and sexual attraction, race/ethnicity helps to explain more of the individual variation in number of sexual partners than gender or marital status. Results from the adjusted individual growth models with sexual attraction indicate a significant impact of sexual attraction on the trajectory of sexual partners over time despite the added variance introduced into the model—which was likely due to the small proportion of reported same-sex attraction. Not only persons identifying as having any attraction to the same sex have a greater trajectory for increased sexual partners, but they have a disparate increase between Waves 2 and 3 (upper teens to mid-twenties). This increase in sexual partners stays high at Wave 4, but increases to a lesser degree. This may suggest that for young people who identify as having same-sex attractions emerging adulthood plays a very significant role in sexual

identity exploration and development. The findings related to race/ethnicity and sexual attraction both serve to highlight the importance in targeted public health messages that address sexual health concerns and issues that are relevant to different groups and communities. Additionally, it highlights the importance of appropriately and continuously timing sexual health interventions during emerging adulthood development, especially for young people with same-sex attractions.

Despite the unique contributions of this longitudinal study, the results should be interpreted in light of some limitations. Importantly, this study uses previously collected longitudinal data. Specifically relevant to the current study, there are limitations to the availability of questions across all data collection periods and the ability to measure different constructs and influences of these factors. However, this study uses constructs and measures that could be most reliably computed across all four Waves and was able to include most of the constructs considered important from *a priori* knowledge. Additionally, due to the nature of longitudinal data collection and loss to follow-up, this study does rely on available survey responses and complete data analysis, therefore results may reflect the unique characteristics of the Add Health study population and may not be generalizable to all populations. Despite some attrition, response rates were relatively high across all 4 Waves ($\geq 76\%$ response rate) (93). Finally, Add Health data is collected via serial surveys and interviews mostly relying on self-reported information. While sensitive information, such as sexual behaviors, was collected via direct entry by the respondent, there still may be the potential for respondents to provide socially desirable answers since interviewers were present (93). Due to the nature of data collection and the sensitive topics used in this study (i.e. sexual health behaviors) some health behaviors may be under or over (younger ages) reported. A last limitation owing to data collection is due to differential response rates over time (92, 99). Despite these limitations, this study does add to the limited literature on averaging effect on sexual behaviors over time.

2.6 Conclusions:

In conclusion, our study contributes to the literature on sexual risk behaviors by establishing longitudinal associations of broader, individual-level, and partnership-level factors associated with increased cumulative sexual partners and sexual relationship concurrency. Notably, there are broader influences such as family support and cultural influences that affect sexual behaviors into young adulthood in addition to individual demographic characteristics—gender, race/ethnicity—and behaviors—alcohol and substance use. These findings highlight several important considerations for sexual health interventions beginning with the continued importance of culturally and racially tailored intervention messaging. Additionally, the broader influences of family and culture indicate that normative values have lasting impacts on behaviors beyond adolescence, therefore indicating that adolescence is a formative time and potentially the best opportunity to influence lasting behavior change.

2.7 Tables and Figures:

Table 2.1 Description of how each variable was constructed for analysis, Add Health (1995-2008).

Construct	Wave	Assessed Directly	Description of construction
Outcomes of interest			
Cumulative number of sex partners	1	Yes	Reported number of people respondents reported having a sexual relationship with
	2,3	No	Constructed variable based on number of people reported in previous Wave and sexual partners reported at current Wave since month of last interview
	4	No	Constructed variable based on total male and female sex partners
Partner concurrency	1,2	No	Concurrency constructed from beginning and recent sex dates for 1-6 romantic and non-romantic partners
	3	Yes	Constructed from overlapping sex dates and from direct assessment question
	4	Yes	Respondents directly report their concurrency
Covariates of interest			
Continuous variables			
Age	1,2,3,4	Yes	Age was calculated for each wave using recommended formulas from Add Health
Age of partner	1,2,3,4	Yes	Reported for partners by respondents in the questionnaire
Categorical variables			
<i>Individual characteristics</i>			
Gender	1,2,3,4	Yes	Reported by each participant at each wave
Race/Ethnicity	1,3	Yes	Constructed from self-reported Hispanic/Latinx and racial identities
	2,4	No	Racial/Ethnic information copied from previous wave
Have health insurance	1	Yes	Health insurance information reported by parents for adolescents in Wave 1
	2	No	Health insurance status copied from previously reported data in Wave 1
	3,4		
Marital status	1,2,4	Yes	Participants reported their current marital status
	3	Yes	Constructed from partner-specific reported current marriages

Sexual attraction	1,2,3,4		Participants reported the gender to whom they were sexually attracted
<i>Individual behaviors</i>			
Transactional sex	1,2,3,4	Yes	Respondents reported if they had been paid or paid for sex
Binge drinking	1,2,3,4	Yes	Respondents reported how often they drank more than 5 drinks in the past 12 months
Marijuana use	1,2,3,4	Yes	Respondents reported on marijuana use in the past 30 days
Other drug use	1,2,3,4	Yes	Constructed based on reported drug (methamphetamine, cocaine, inhalants, other stimulants, non-prescribed prescription drugs) use in the past 30 days
STDs	1,2,3,4	Yes	Cumulative STD measure constructed from self-reported data on Chlamydia, Genital Herpes, Genital Warts, Gonorrhea, HIV/AIDS, Syphilis, Trichomoniasis, or Vaginitis (past 12 months).
<i>Broader influences</i>			
US Citizen	1,3,4	Yes	Reported by each participant
	2	No	Information regarding citizenship status used from Wave 1
Language spoken at home, with family or friends	1,2,3,4	Yes	Language spoken reported at each Wave by respondent
Family support	1,2,3,4	Yes	Constructed from reported closeness to mother (or mother figure) and father (or father figure)
Importance of religion	1,2,3,4	Yes	Constructed from directly reported religion and importance of religion questions
<i>Partner characteristics</i>			
Age discordance	1,2,3,4	No	Constructed from calculated respondent's age and reported as of partner based on >5 year difference
Gender discordance	1,2,3,4	No	Constructed from reported respondent and partner genders
Race/Ethnicity discordance	1,2,3,4	No	Constructed from reported respondent and partner race/ethnicity

Table 2.2 Overview of the Add Health study population and cross-sectional associations of characteristics with number of vaginal sex partners, Add Health (n=20,766) 1995-2008.

	Wave 1							Wave 3			Wave 4				
	Mean/ Med	(SD)	Range or IQR		Mean/ Med	(SD)	Range or IQR		Mean/ Med	(SD)	Range or IQR		Mean/ Med	(SD)	Range or IQR
Age	15.7/16	(1.7)	11--21	***	16.2/16	(1.6)	11--23	***	22/22	(1.8)	18--28	*	28.5/29	(1.8)	24--34
Number of sex partners	1.4/0	(5.4)	0-0		1.8/0	(6.7)	0-1		5.8/3	(11.7)	1-6		13.3/7	(26.0)	3-15
	Freq.	(%)			Freq.	(%)			Freq.	(%)			Freq.	(%)	
<i>Individual characteristics</i>															
<i>Biological sex</i>															
Male	10,255	(49.5)	Ref		7,181	(48.7)	Ref		7,160	(47.1)	Ref		6,676	(46.4)	Ref
Female	10,480	(50.5)	***		7,556	(51.3)	***		8,030	(52.9)	***		7,715	(53.6)	***
<i>Race/Ethnicity</i>															
Hispanic /Latinx	3,523	(17.1)			2,487	(16.9)	*		2,475	(16.3)			1,830	(15.6)	*
White	11,032	(53.4)	Ref		7,994	(54.4)	Ref		8,344	(54.9)	Ref		6,738	(57.5)	Ref
Black/African American	4,475	(21.7)	***		3,097	(21.1)	***		3,216	(21.2)	***		2,338	(20.0)	***
Other	1,637	(7.9)	**		1,106	(7.5)	*		1,152	(7.6)	**		815	(7.0)	***
<i>Have health insurance</i>															
No	2,217	(12.7)	*		1,575	(12.3)			3,527	(23.4)	***		2,925	(20.4)	***
Yes	15,275	(87.3)	Ref		11,244	(87.7)	Ref		11,570	(76.6)	Ref		11,446	(79.7)	Ref
<i>Marital status</i>															
No	20,656	(99.6)	Ref		14,605	(99.2)	Ref		12,589	(83.0)	Ref		7,313	(55.7)	Ref
Yes	79	(0.4)			123	(0.8)			2,583	(17.0)	***		5,822	(44.3)	***
<i>Sexual attraction</i>															
Opposite sex	16,761	(92.8)	Ref		11,023	(94.2)	Ref		13,229	(90.4)	Ref		13,137	(92.7)	Ref
Same sex	247	(1.4)	**		179	(1.5)			128	(0.9)			292	(2.1)	***
Both	1,045	(5.8)	***		499	(4.3)	***		1,274	(8.7)	***		750	(5.3)	***
<i>Individual behaviors</i>															
<i>Transactional sex</i>															
Never	20,269	(98.7)	Ref		14,129	(97.2)	Ref		14,370	(95.2)	Ref		12,112	(97.9)	Ref
Ever	278	(1.4)	***		401	(2.8)	***		729	(4.8)	***		261	(2.1)	***
<i>Binge drank in the last 12 months</i>															
Never drinkers/No alcohol since MOLI	10,848	(53.1)	Ref		7,710	(54.7)	Ref		3,468	(24.4)	Ref		2,884	(21.7)	Ref
Yes, binge drank	5,418	(26.5)	***		4,054	(28.8)	***		7,072	(49.7)	***		6,742	(50.8)	***
Never binge drank	4,170	(20.4)	***		2,328	(16.5)	*		3,696	(26.0)			3,655	(27.5)	

Marijuana use in the last 30 days												
Never	14,600	(71.9)	Ref	10,818	(75.2)	Ref	10,279	(67.7)	Ref	6,625	(52.2)	Ref
Not in past 30 days	2,786	(13.7)	***	1,261	(8.8)	***	1,393	(9.2)	***	3,824	(30.1)	***
Yes	2,930	(14.4)	***	2,308	(16.0)	***	3,511	(23.1)	***	2,251	(17.7)	***
Other drug use in past 30 days												
Never	17,944	(88.0)	Ref	13,466	(92.5)	Ref	13,121	(88.0)	Ref	9,827	(77.2)	Ref
Not in past 30 days	1,734	(8.5)	***	567	(3.9)	***	1,047	(7.0)	***	2,068	(16.2)	***
Yes	722	(3.5)	***	533	(3.7)	***	747	(5.0)	***	840	(6.6)	***
STDs†												
No	7,757	(37.9)	Ref	6,207	(42.4)	Ref	12,340	(81.7)	Ref	12,665	(88.0)	Ref
Yes	499	(2.4)	***	332	(2.3)	*	818	(5.4)	***	893	(6.2)	***
Never had sex	12,225	(59.7)	N/A	8,107	(55.4)	N/A	1,951	(12.9)	N/A	833	(5.8)	N/A
<i>Broader influences</i>												
US Citizen												
No	1,654	(8.0)	**	1,072	(7.3)	**	1,069	(7.0)	***	912	(6.3)	***
Yes	19,061	(92.0)	Ref	13,652	(92.7)	Ref	14,119	(93.0)	Ref	13,478	(93.7)	Ref
Language spoken at home, with family or friends												
English	18,358	(88.6)	Ref	13,240	(89.9)	Ref	13,493	(89.1)	Ref	13,485	(93.7)	Ref
Spanish	1,650	(8.0)	**	1,043	(7.1)	***	917	(6.1)	***	711	(4.9)	***
Other	719	(3.5)	***	453	(3.1)	***	734	(4.9)	**	195	(1.4)	***
Family support												
Close to both parents	10,201	(56.1)	Ref	6,708	(54.8)	Ref	8,892	(70.0)	Ref	7,697	(63.4)	Ref
Close to at least one parent	6,457	(35.5)	***	4,199	(34.3)	***	2,643	(20.8)	*	3,229	(26.6)	***
Somewhat close to both parents	471	(2.6)	***	505	(4.1)	*	449	(3.5)		448	(3.7)	
Somewhat close to at least one parent	892	(4.9)	***	734	(6.0)	***	617	(4.9)		643	(5.3)	***
Close to neither parent	156	(0.9)	*	106	(0.9)	*	95	(0.8)		119	(1.0)	
Importance of religion												
Not religious	2,526	(12.4)	***	1,893	(13.1)	***	2,817	(18.7)		2,624	(18.3)	***
Not/Fairly (un)important	1,901	(9.4)	***	1,532	(10.6)	***	4,684	(31.1)		4,069	(28.3)	*
Important/Fairly important	15,891	(78.2)	Ref	11,051	(76.3)	Ref	7,585	(50.3)	Ref	7,668	(53.4)	Ref

a) STDs for wave 1 data collection were assessed for ever having been diagnosed with an STD by a doctor or nurse, while other waves assessed STDs in the past 12 months.

b) Health insurance status at wave 1 was determined using parent-reported data.

c) Race/ethnicity, citizen status, and health insurance status were not assessed at wave 2. For these variables, values reported at wave 1 were used since the time between interviews was only 12 months and demographic characteristics most likely did not change.

d) Race/ethnicity was not assessed during wave 4 data collection. Values for wave 4 were computed using previously reported wave 3 estimates.

*** \leq 0.0001

** \leq 0.01

* \leq 0.05

Table 2.3 Overview of the Add Health study population who reported on sexual partners and cross-sectional associations of characteristics with partner concurrency, Add Health 1995-2008.

	Wave 1			Wave 2			Wave 3			Wave 4			
	Mean/ Med	(SD)	IQR	Mean/ Med	(SD)	IQR	Mean/ Med	(SD)	IQR	Mean/ Med	(SD)	IQR	
Age	16.6/17	(1.4)	16-18	17.0/17	(1.4)	16-18	22.0/22	(1.7)	21-23	**	28.5/29	(1.8)	27-30
Partner age	17.8/17	(3.3)	16-19	18.4/18	(3.9)	16-19	23.5/23	(4.3)	21-25	***	29.4/29	(5.0)	26-32
	Freq.	(%)		Freq.	(%)		Freq.	(%)			Freq.	(%)	
<i>Individual characteristics</i>													
Biological sex													
Male	4,991	(49.7)		3,100	(45.3)		13,413	(44.4)			6,550	(45.8)	
Female	5,052	(50.3)	***	3,749	(54.7)	**	16,768	(55.6)	***		7,745	(54.2)	*
Race/Ethnicity													
Hispanic /Latinx	1,699	(17.0)		1,158	(16.9)		4,171	(13.8)			1,824	(15.6)	
White	5,112	(51.0)		3,613	(52.8)		18,445	(61.1)			6,774	(57.8)	**
Black/African American	2,721	(27.1)	***	1,717	(25.1)	***	5,770	(19.1)	***		2,344	(20.0)	***
Other	491	(4.9)		354	(5.2)		1,793	(5.9)	*		786	(6.7)	
Have health insurance													
No	1,125	(13.9)		829	(14.2)		7,034	(23.4)	*		2,907	(20.4)	***
Yes	6,971	(86.1)		5,020	(85.8)		22,973	(76.6)			11,370	(79.6)	
Marital status													
No	9,981	(99.4)		6,740	(98.5)		25,522	(84.6)			7,380	(55.1)	
Yes	62	(0.6)	**	104	(1.5)	*	4,641	(15.4)	***		6,014	(44.9)	***
Sexual attraction													
Opposite sex	8,659	(90.7)		5,510	(92.8)		26,135	(87.6)			13,122	(92.8)	
Same sex	175	(1.8)	**	63	(1.1)		226	(0.8)			275	(2.0)	***
Both	717	(7.5)	*	363	(6.1)	***	3,485	(11.7)	***		740	(5.2)	***
STDs†													
No	8,846	(88.1)		6,304	(92.1)		26,825	(89.1)			12,766	(89.3)	
Yes	729	(7.3)	***	385	(5.6)	***	2,506	(8.3)	***		894	(6.3)	***
Never had sex	467	(4.7)		157	(2.3)		782	(2.6)			635	(4.4)	
<i>Individual behaviors</i>													
Transactional sex													
Never	9,619	(95.8)		6,542	(96.3)		28,418	(94.3)			12,339	(98.0)	
Ever	419	(4.2)	***	250	(3.7)	***	1,731	(5.7)	***		252	(2.0)	***
Binge drank in the last 12 months													

Never drinkers	2,607	(26.1)		2,215	(33.4)		4,138	(14.5)		2,793	(21.2)	
Yes, binge drank	5,188	(52.0)	***	3,264	(49.2)	***	17,290	(60.4)	***	6,779	(51.4)	***
Never binge drank	2,184	(21.9)		1,158	(17.5)		7,188	(25.1)	***	3,629	(27.5)	*
Been drunk in the last 12 months												
Never drinkers	2,607	(26.1)		2,215	(33.3)		4,138	(14.5)		2,793	(21.2)	
Yes, drunk	5,568	(55.8)	***	3,484	(52.4)	***	18,281	(63.8)	**	6,915	(52.4)	***
Never drunk	1,807	(18.1)		950	(14.3)		6,218	(21.7)	***	3,498	(26.5)	
Marijuana use in the last 30 days												
Never	4,244	(43.1)		3,631	(54.8)		17,689	(58.6)		6,478	(51.4)	
Not in past 30 days	2,423	(24.6)	***	923	(14.0)	**	3,782	(12.5)	***	3,848	(30.5)	***
Yes	3,177	(32.3)	***	2,066	(31.2)	***	8,703	(28.8)	***	2,283	(18.1)	***
Other drug use in past 30 days												
Never	7,603	(76.7)		5,770	(85.4)		24,576	(82.6)		9,697	(76.7)	
Not in past 30 days	1,592	(16.1)	***	522	(7.7)	***	3,204	(10.8)	***	2,096	(16.6)	***
Yes	720	(7.3)	***	468	(6.9)	***	1,980	(6.7)	***	858	(6.8)	***
<i>Broader influences</i>												
US Citizen												
No	481	(4.8)	**	343	(5.0)		1,515	(5.0)	***	888	(6.2)	**
Yes	9,556	(95.2)		6,503	(95.0)		28,665	(95.0)		13,406	(93.8)	
Language spoken at home, with family or friends												
English	9,249	(92.1)		6,372	(93.0)		27,910	(92.6)		13,420	(93.9)	
Spanish	681	(6.8)		390	(5.7)		1,321	(4.4)	***	692	(4.8)	**
Other	113	(1.1)	**	87	(1.3)	*	896	(3.0)	***	183	(1.3)	**
Family support												
Close to both parents	3,462	(41.9)		2,297	(42.7)		16,878	(68.0)		7,644	(63.4)	
Close to at least one parent	3,750	(45.4)	*	2,287	(42.5)		5,565	(22.4)	***	3,201	(26.6)	***
Somewhat close to both parents	305	(3.7)	*	258	(4.8)	**	875	(3.5)		446	(3.7)	
Somewhat close to at least one parent	658	(8.0)		473	(8.8)		1,313	(5.3)	***	649	(5.4)	***
Close to neither parent	81	(1.0)		67	(1.2)	*	179	(0.7)	**	115	(1.0)	
Importance of religion												
Not religious	1,564	(15.7)		1,083	(16.0)		6,063	(20.2)		2,598	(18.2)	**
Not/Fairly (un)important	1,174	(11.8)	*	907	(13.4)		10,206	(34.0)		4,056	(28.4)	
Important/Fairly important	7,197	(72.4)		4,777	(70.6)		13,791	(45.9)		7,621	(53.4)	
<i>Partner characteristics</i>												
Discordant partner age												
None	2,316	(93.8)		966	(91.5)		27,106	(89.9)		11,413	(80.2)	

5 years age difference from partner	154 (6.2)	90 (8.5)	3,045 (10.1) *	2,826 (19.9)
Gender of partners				
Male	5,063 (50.4)	3,749 (54.7)	16,780 (55.6)	8,111 (53.4)
Female	4,990 (49.6) ***	3,100 (45.3) **	13,407 (44.4) ***	7,079 (46.6)
Discordant partner gender				
No	67 (0.7)	0 (0.0)	638 (2.1)	350 (2.5)
Yes	9,973 (99.3) **	6,848 (100.0)	29,543 (97.9) **	13,940 (97.6) ***
Race/Ethnicity of partners				
Hispanic /Latinx	1,689 (16.8) *	1,122 (16.4)	3,894 (13.1)	2,426 (16.0) **
White	4,985 (49.7)	3,534 (51.7)	17,296 (58.2)	8,391 (55.3)
Black/African American	2,746 (27.4) ***	1,754 (25.6) ***	5,954 (20.0) ***	3,116 (20.5) ***
Other	621 (6.2)	430 (6.3)	2,578 (8.7)	1,247 (8.2)
Discordant partner race/ethnicity				
No	7,938 (79.3)	5,480 (80.2)	23,175 (78.0)	9,302 (79.4)
Yes	2,071 (20.7)	1,352 (19.8)	6,539 (22.0) ***	2,415 (20.6) ***
Concurrency/Overlapping partners				
No	6,043 (61.5)	4,754 (70.7)	17,852 (59.1)	10,652 (71.3)
Yes	3,792 (38.6)	1,967 (29.3)	12,335 (40.9)	4,293 (28.7)

a) STDs for wave 1 data collection were assessed for ever having been diagnosed with an STD by a doctor or nurse, while other waves assessed STDs in the past 12 months.

b) Health insurance status at wave 1 was determined using parent-reported data.

c) Race/ethnicity, citizen status, and health insurance status were not assessed at wave 2. For these variables, values reported at wave 1 were used since the time between interviews was only 12 months and demographic characteristics most likely did not change.

d) Race/ethnicity was not assessed during wave 4 data collection. Values for wave 4 were computed using previously reported wave 3 estimates.

e) Partner age, gender, race/ethnicity, and concurrency are all based on the total number of partnerships reported per wave

***≤0.0001

**≤0.01

*≤0.05

Table 2.4 Adjusted regression results from individual-level associations with cumulative number of sex partners, as well as individual- and partner-level associations with concurrent sexual partnerships, Add Health 1995-2008.

	Individual associations with cumulative sex partners <i>effective sample n=36,130</i>					Individual and partner associations with concurrent partners <i>effective sample n=30,423</i>				
	95% CI				p-value	95% CI				p-value
	β	AOR	LL	UL		β	AOR	LL	UL	
<i>Individual factors</i>										
Age	0.04		(0.02	, 0.06)	<.0001	0.01		(0.0	, 0.0)	0.3012
Biological sex										
Male				Ref					Ref	
Female		0.6	(0.6	, 0.7)	<.0001		1.1	(1.1	, 1.2)	<.0001
Race/Ethnicity										
Hispanic /Latinx		1.0	(0.9	, 1.2)	0.4123		1.1	(1.0	, 1.2)	0.0389
White				Ref					Ref	
Black/African American		1.6	(1.5	, 1.8)	<.0001		1.6	(1.5	, 1.7)	<.0001
Other		0.8	(0.7	, 0.9)	0.0013		1.0	(0.9	, 1.1)	0.4456
Marital status										
No				Ref					Ref	
Yes		0.8	(0.7	, 0.8)	<.0001		0.9	(0.8	, 0.9)	<.0001
Sexual attraction										
Opposite sex				Ref					Ref	
Same sex		1.7	(1.3	, 2.1)	<.0001		1.1	(0.8	, 1.4)	0.5162
Both		1.4	(1.2	, 1.5)	<.0001		1.5	(1.3	, 1.6)	<.0001
<i>Individual behaviors</i>										
Transactional sex										
Never				Ref					Ref	
Ever		1.4	(1.2	, 1.6)	<.0001		1.5	(1.3	, 1.7)	<.0001
Binge drank in the last 12 months										
Never drinkers				Ref					Ref	
Yes, binge drank		1.3	(1.2	, 1.4)	<.0001		1.2	(1.1	, 1.3)	<.0001
Never binge drank		1.0	(0.9	, 1.1)	0.4591		1.6	(1.4	, 1.7)	<.0001
Marijuana use in the last 30 days										
Never				Ref					Ref	
Not in past 30 days		1.3	(1.2	, 1.4)	<.0001		1.3	(1.2	, 1.4)	<.0001
Yes		1.3	(1.2	, 1.4)	<.0001		1.2	(1.1	, 1.3)	<.0001
Other drug use in past 30 days										
Never				Ref					Ref	
Not in past 30 days		1.4	(1.3	, 1.5)	<.0001		1.0	(0.9	, 1.1)	0.5253
Yes		1.4	(1.3	, 1.6)	<.0001		1.3	(1.2	, 1.4)	<.0001
<i>Broader influences</i>										
Language spoken at home, with family or friends										
English				Ref					Ref	
Spanish		0.7	(0.6	, 0.9)	0.0006		0.9	(0.7	, 1.0)	0.0293
Other		0.8	(0.7	, 1.0)	0.0178		0.7	(0.6	, 0.9)	0.0003
Family support										
Close to both parents				Ref					Ref	
Close to at least one parent		1.1	(1.1	, 1.2)	0.0007		1.2	(1.1	, 1.2)	<.0001
Somewhat close to both parents		1.1	(1.0	, 1.3)	0.1471		0.9	(0.8	, 1.1)	0.2766
Somewhat close to at least one parent		1.1	(1.0	, 1.3)	0.0420		1.1	(1.0	, 1.3)	0.0205

Close to neither parent	1.1	(0.9 , 1.4)	0.3336	1.1	(0.8 , 1.4)	0.6966
<i>Partner characteristics</i>						
Discordant partner age						
None					Ref	
5 years age difference from partner	1.0	(0.9 , 1.1)				0.6361
Discordant partner gender						
No					Ref	
Yes	1.2	(1.0 , 1.4)				0.1358
Discordant partner race/ethnicity						
No					Ref	
Yes	1.1	(1.0 , 1.2)				0.0043

Table 2.5 Results from individual growth models for cumulative number of sexual partners, Add Health 1995-2008.

	Unconditional Linear Model			Gender			Race/Ethnicity			Marital Status			Gender of Sex Partners		
	Est.	(SE)		Est.	(SE)		Est.	(SE)		Est.	(SE)		Est.	(SE)	
Random Variance															
Intercept	35.06	(0.96)	***	33.35	(0.95)	***	30.41	(0.85)	***	29.68	(0.83)	***	32.47	(0.98)	***
Wave	171.11	(1.17)	***	171.11	(1.17)	***	153.76	(1.07)	***	148.35	(1.04)	***	162.02	(1.22)	***
Residual	1.00	(0.00)		1.00	(0.00)		1.02	(0.00)		1.03	(0.00)		1.03	(0.00)	
Fixed Effects															
Intercept	1.38	(0.10)	***	2.71	(0.12)	***	2.40	(0.13)	***	2.38	(0.13)	***	2.39	(0.14)	***
Wave-2	0.26	(0.14)		0.28	(0.14)		0.28	(0.14)	*	0.31	(0.13)	*	0.38	(0.16)	*
Wave-3	4.31	(0.15)	***	4.37	(0.15)	***	4.35	(0.14)	***	5.10	(0.14)	***	4.97	(0.16)	***
Wave-4	12.16	(0.15)	***	12.20	(0.15)	***	12.22	(0.15)	***	13.96	(0.17)	***	13.87	(0.18)	***
Gender				-2.63	(0.13)	***	-2.49	(0.13)	***	-2.30	(0.13)	***	-2.56	(0.14)	***
Race/Ethnicity-Black/African American							1.84	(0.17)	***	1.60	(0.16)	***	1.78	(0.18)	***
Race/Ethnicity-Hispanic							-0.20	(0.18)		-0.23	(0.18)		-0.30	(0.20)	
Race/Ethnicity-Other							-1.54	(0.25)	***	-1.54	(0.25)	***	-1.73	(0.27)	***
Marital Status-Yes										-3.87	(0.19)	***	-3.78	(0.20)	***
Gender of sex partners-Both													2.37	(0.26)	***
Gender of sex partners-Same													4.22	(0.54)	***
Goodness of fit															
Parameters	5			7			11			13			15		

Likelihood (-2LL)	506309.9	505931.4	477506.60	467758.8	425693.2
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***≤0.0001
**≤0.01
*≤0.05

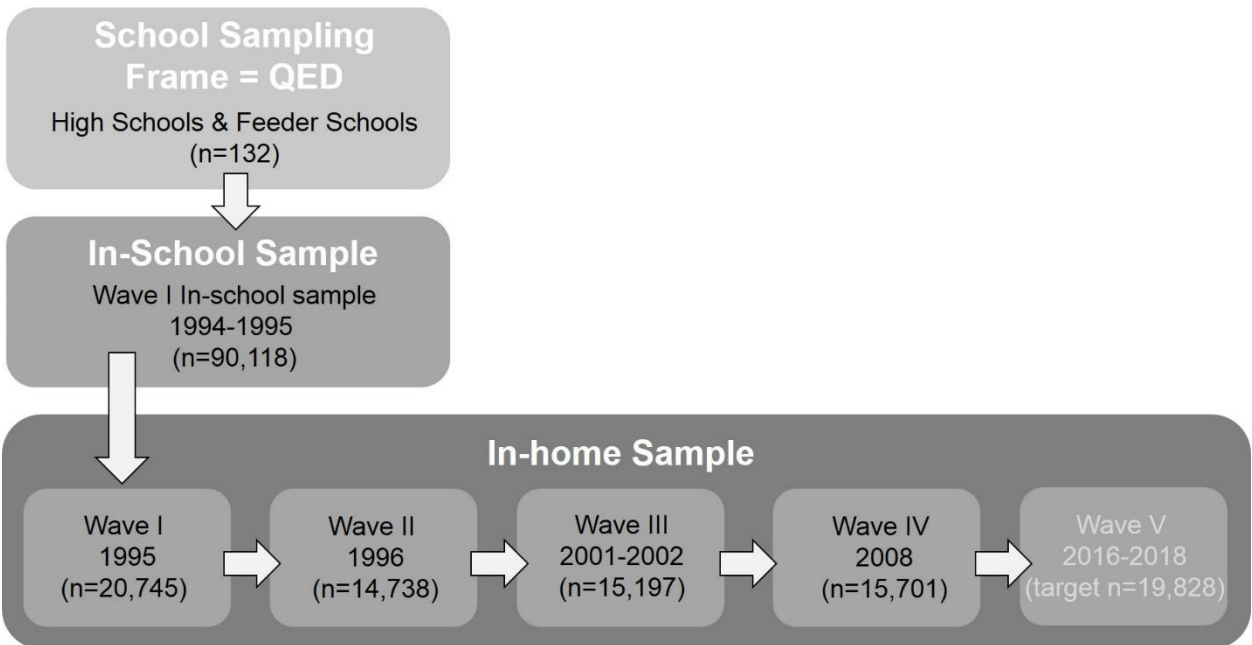


Figure 2.1 Flow diagram of longitudinal data collection for The National Longitudinal Study of Adolescent to Adults Health, 1995-2008.

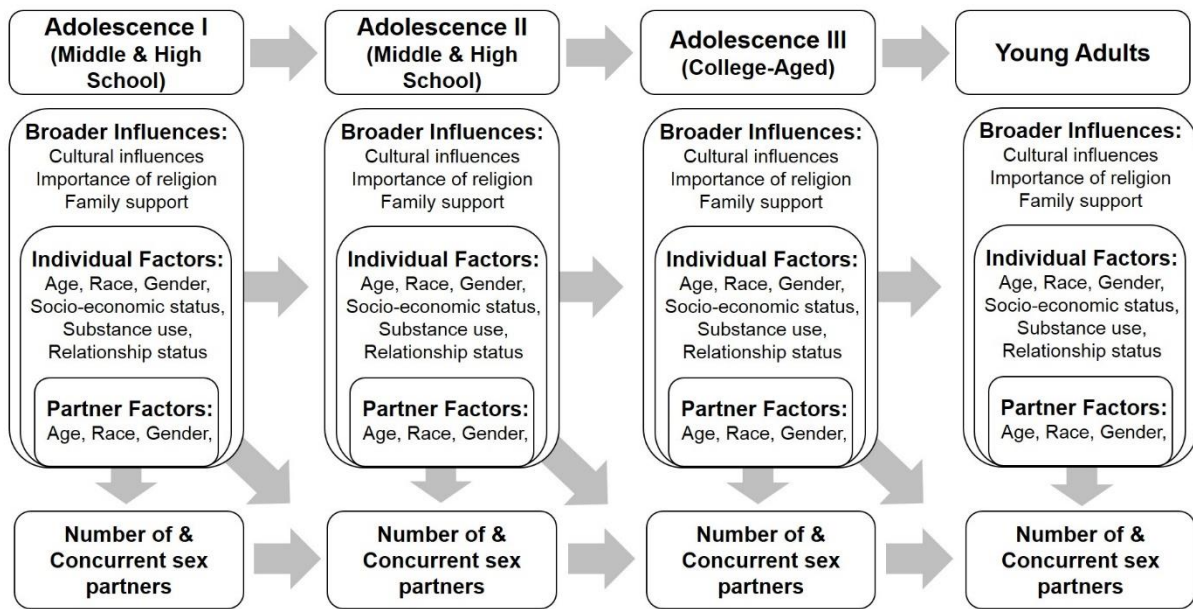


Figure 2.2 Conceptual model of broader, individual, and partnership influences on number of sexual partners and concurrency over time, Add Health 1995-2008.

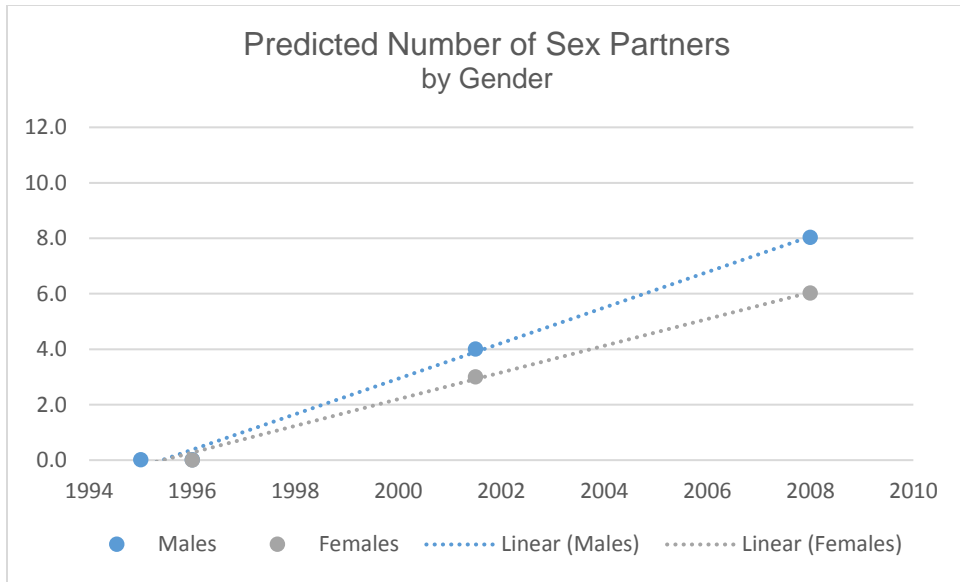


Figure 2.3 Individual growth trajectories of predicted number of cumulative sexual partners by gender, Add Health 1994-2008.

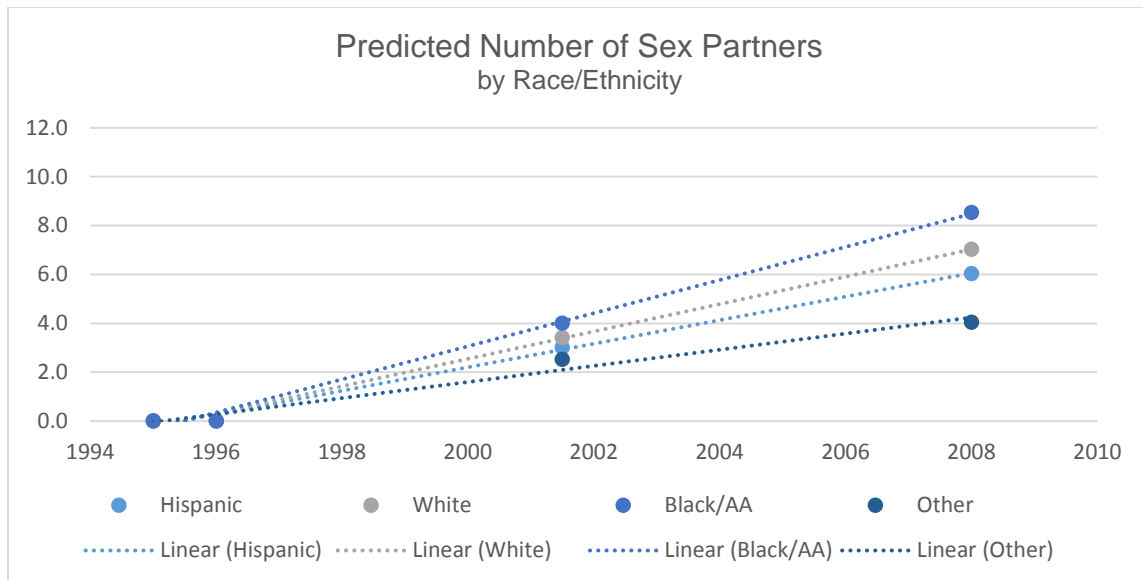


Figure 2.4 Individual growth trajectories of predicted number of cumulative sexual partners by race/ethnicity, Add Health 1994-2008.

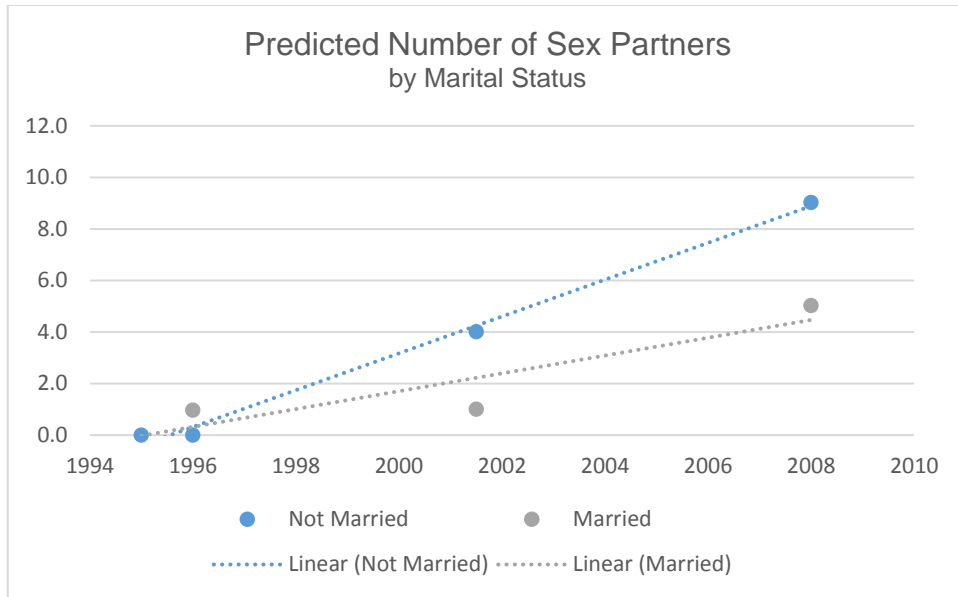


Figure 2.5 Individual growth trajectories of predicted number of cumulative sexual partners by gender, Add Health 1994-2008.

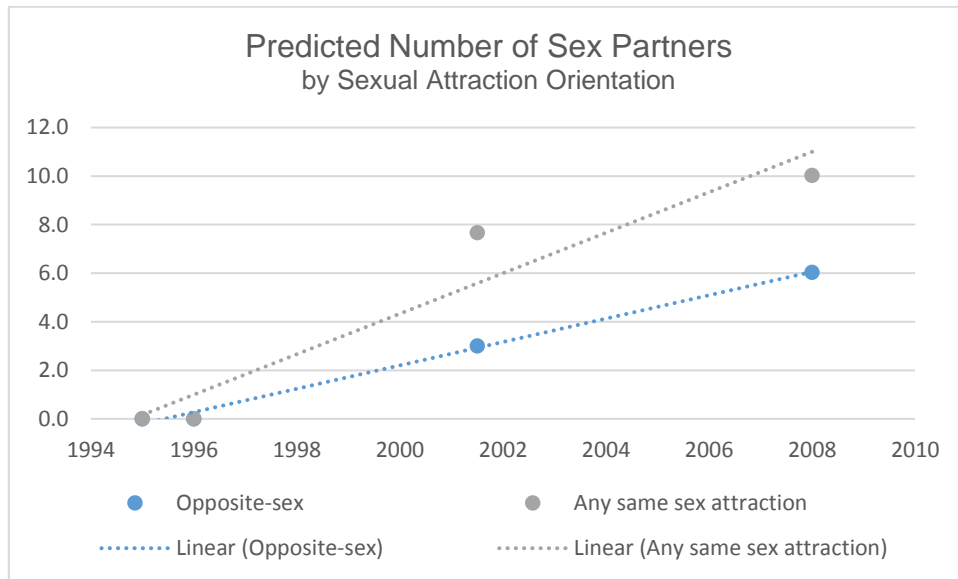


Figure 2.6 Individual growth trajectories of predicted number of cumulative sexual partners by gender, Add Health 1994-2008.

CHAPTER 3: Butt what do we know? Individual and partnership factors associated with heterosexual anal intercourse

3.1 Abstract

Background. Heterosexual anal intercourse (HAI) is an understudied sexual behavior and poses unique risks and challenges to STD transmission and prevention. The aim of this study was to explore individual characteristics associated with ever having had HAI and partner characteristics associated with recent HAI.

Methods. We used data collected from STD clinics in Los Angeles County between April 2012 and May 2014. Participants were eligible for the study if they were: (1) age 15 – 29 years, (2) reported giving oral sex to a partner of the opposite sex, in the past 90 days, and (3) attended one of twelve public STD clinics in Los Angeles County. Computer assisted self-interviews were used to collect information on demographic characteristics and sexual behaviors, while STDs were assessed by laboratory testing. Three different analyses were conducted for this study: (1) individual-level logistic regression analyses to examine factors associated with lifetime report of HAI (i.e., ever having HAI), (2) a sub-analysis to assess attitudes and behaviors of HAI, and (3) hierarchical, mixed effects, repeated measures analyses to assess partner-level and individual-level factors associated with recent (past 3 months), partner-specific HAI.

Results. Among the 244 participants in this study, 49% of our population reported ever having AI and 35% reported HAI with a recent sex partner. Sub analyses revealed that 51% of our sample viewed AI as intimate or very intimate, and more people said that they were comfortable having AI in a main partnership rather than a casual relationship. Black/African American participants were less likely than White participants to have had AI (AOR= 0.11; 95% CI: 0.03, 0.41). Those

who reported consuming alcohol once or twice a month were almost three times as likely to report HAI as someone who reported no alcohol use in the past year (AOR= 2.9; 95% CI: 1.18, 7.01), and those who had a sexual partner who had been incarcerated in the past year were a little over three times as likely to have had AI (AOR=3.3; 95% CI: 1.44, 7.42). Partner characteristic models indicated that HAI was more likely to occur in main, longer, and more committed partnerships. HAI was also more likely to occur in relationships where receiving or making threats of physical violence were present.

Conclusion. Among our participants, substantial proportions reported both ever AI and recent, partner-specific AI. Results further highlight that HAI is associated with certain individual-level demographic factors. Most notably, our results indicate the importance of relationship contexts for people engaging in HAI.

3.2 Introduction:

Sexually transmitted diseases (STDs) present an important, preventable, and continuing public health problem due to the many immediate and long-term health issues associated with these infections. Adolescents and young adults continue to bear a disproportionate burden of STDs in the population, and, in 2016, disease rates increased from previous 2015 estimates for Chlamydia, Gonorrhea, and Syphilis (5). Certain risk behaviors and sexual activities can increase the risk of STDs in adolescents and young adults, particularly anal intercourse (AI). While national survey prevalence estimates of ever having AI for ages 15-44 have been 33% for women and 39% for men, some studies have reported as high as 41% of participants reported having engaged in AI (11, 12). Studies targeting adolescents and young people have reported AI prevalence estimates of 11% and 16% in various study populations (13, 14), and, in general, most studies indicate that condom use during HAI is uncommon (17, 62).

Systematic reviews of the literature revealed that, when compared to vaginal intercourse, AI increased risk for male-to-female transmission of HIV-1 (15), and found receptive AI to be a higher risk sexual activity for contracting HIV than receptive vaginal intercourse (VI) (16). While most research on HAI has focused on HIV transmission and prevention implications, some studies provide evidence of increased risk for other STDs (17, 19). In a study of high-risk women, those who reported unprotected VI had half the risk of having had an STD compared to women who had both unprotected VI and AI (AOR=0.39; 95% CI = 0.23, 0.67) (12). Additionally, a study investigating the prevalence of urogenital and anal Chlamydia and Gonorrhea infections found significant proportions of the study population presenting with anal-only Chlamydia (25.4%) and Gonorrhea (18.5%) infections (100). These results suggest that AI-related infections would have been missed without rectal screening protocols for STDs.

Limited research has investigated AI as a sexual behavior but it has suggested demographic characteristics—age(10, 101), gender(10), race/ethnicity(19, 102, 103), and socioeconomic status(102)—as well as high risk behaviors (e.g. transactional sex, drug/substance use, and sex under the influence of drugs/other substances (12, 17, 19, 63, 67, 69, 70)) that are associated with HAI. Additionally, relationship status is associated with HAI and reported more frequently in main relationships than in casual sex relationships (62, 66). However, there are also studies that report AI being associated with transactional sex and/or one-time sex partners (12, 19, 67). Adding a final layer of relationship context complexity, some studies have suggested that HAI occurs more often in relationships where intimate partner violence (IPV) is present (104, 105). Given the potential for increased risk for STDs, more research into partnership contexts is needed to fully understand when people are engaging in HAI and other STD risk factors/behaviors that may be coinciding with AI to better inform prevention and testing. This study aims to describe individual and partnership characteristics associated with HAI for young people ages 15-29 attending public STD clinics in Los Angeles County using individual- and partner-level data.

3.3 Methods:

Study setting and participants. This study uses data from a prior study that originally aimed to assess factors associated with pharyngeal gonorrhea among young people. Prior approvals from the Institutional Review Board at the University of California Los Angeles and the Los Angeles County Department of Public Health were obtained before recruitment began. Young men and women visiting public STD clinics in Los Angeles County between April 2012 and May 2014 were recruited for the study if they were: (1) age 15 – 29 years, (2) reported giving oral sex to a partner of the opposite sex, in the past 90 days, and (3) attended one of twelve public STD clinics in Los Angeles County. Those who were eligible and interested in participating completed a self-administered questionnaire on sexual risk behaviors and received STD screenings (urogenital and pharyngeal). Participants provided written informed consent and received \$25 for their time.

Data collection and variables. The study survey was administered using a web-based, computer assisted self-interview and took approximately 45 minutes to complete. The questionnaire included information on: (1) demographic characteristics, (2) partner characteristics and partner-level sexual behaviors, and (3) general sexual risk behaviors, knowledge, and attitudes.

This study leverages questions from the survey focusing on AI to further our understanding of this sexual behavior. We defined AI in two ways from the survey: (1) ever having had AI, and (2) recent, partnership-defined HAI for repeated measures analyses. Ever AI was interpreted as ever HAI since a majority of our participants reported opposite-sex sex partners (89%) and most who reported some same-sex partners were women (77%). For partner-specific HAI, participants were asked to report on up to three of their most recent sexual partners (last 6 months). In these questions, they were asked the gender of their sex partner and whether or not they engaged in protected or unprotected AI which were used to create our measure of HAI.

Individual-level factors included in analyses were demographic factors—age, race/ethnicity, gender of sex partners—and risk behaviors—transactional sex drug/substance use, partner’s incarceration status. Behavioral variables such as transactional sex and partner’s incarceration status were assessed for the past year—e.g. “In the past 12 months, how many times have you had sex with someone who has been to jail or prison?” Partner-specific factors were collected for up to 3 sexual partners in the past 6 months including partner demographic characteristics and relationship characteristics (e.g. partnership type, length of partnership, and commitment to partner). For example, participants were asked, “how would you describe your relationship with [last partner]?” Participants could choose between main, casual, one-time, trade, or they could write in their own partner description. Each of these answer choices included a study-specific definition of the partnership type. Within partnerships, we also investigated the association of IPV with HAI. Participants were asked questions such as, “how often has/did [Partner’s Nickname] threaten you with violence, pushed or shoved you, or thrown something at you that could hurt?” For these questions, respondents could choose a timeframe during which the IPV happened (later categorized as ever) or respond never.

Statistical Analysis. Descriptive statistics were calculated for all continuous (medians, ranges) and categorical (frequencies and percentages) demographic, behavioral, and sexual risk behavior characteristics. Variables tested for inclusion in the multivariable models were based on bivariate analyses or based on the existing literature. Differences between groups were evaluated using t-tests, chi-square methods, and Fisher’s exact test as appropriate. Bivariate and multivariable logistic regression was used to investigate the associations between ever having had AI and other individual factors (gender, race/ethnicity, gender of sex partners) and risk behaviors of interest (substance use, incarcerated sex partner).

Crude and adjusted hierarchical, mixed effects, repeated measures models using generalized estimating equations were used to determine associations of partnership-specific factors with HAI. Each was analyzed individually for an association with HAI using bivariate,

hierarchical repeated measures models. Multivariable, hierarchical, mixed effects, repeated measures models were used to determine the associations of individual- and partnership-specific characteristics with engaging in HAI during the partnership. Due to collinearity between partnership characteristics and IPV variables, these associations were assessed in separate models. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) were reported for each test of association. All analyses were conducted using SAS version 9.4 (97).

3.4 Results:

Descriptive overview of study participants. The largest proportions of our participants were between the ages of 20-24 (48%), female (57%), and identified as non-Hispanic Black/African American (53%). Less than half of participants were employed (45%), and very few reported being homeless (7%). Most reported having only heterosexual sex partners (89%) and 49% (n=116) reported ever having had AI. The prevalence of chlamydia was 14% and, because of oversampling of gonorrhea cases from the original study, 27% had gonorrhea. A large proportion of our study participants reported that they drank alcohol once or twice in the past month (45%). Two-thirds of respondents reported that they had tried marijuana while lower proportions reported using club (17%) or other drugs (20%). When it came to sexual risk behaviors, about half of our study participants reported having had sex with someone on the same day they met them, and 32% reported having been in a sexual situation they regretted because of drinking. Very few of our participants reported being paid for sex in the past year (11%), and most reported that their sexual partners had not been incarcerated in the past year (78%) (Table 3.1).

Factors associated with ever having HAI. Individual factors that were associated with HAI (p -value < 0.05) were gender, race/ethnicity, use of alcohol in the past year, other substance use (herbals, cocaine, or prescribed drugs), having had sex with someone met on the same day, being paid to have sex in the past year, having had sex with someone who had been recently

incarcerated, having sex while drinking alcohol, and having been in a sexual situation they later regretted due to drinking.

Multiple models were created to assess multivariable associations based on categories of variables (i.e. demographic, general risk behaviors, and sexual health behaviors). The final model included all known and necessary confounders, as well as variables that remained significant during model iterations. In the final model, race/ethnicity, alcohol consumption, and a having a recently incarcerated sex partner all remained associated with ever having had HAI (Table 3.1). For race/ethnicity differences, Black/African American participants were less likely than White participants to have had HAI (AOR= 0.11; 95% CI: 0.03, 0.41). Those who reported drinking alcohol once or twice a month were 2.87 times as likely to have had HAI than those who reported no alcohol use in the past 12 months (95% CI: 1.18, 7.01). Finally, participants who reported having a sexual partner who had been incarcerated in the last 12 months were more likely to have had HAI compared to those without recently incarcerated sex partners (AOR= 3.26; 95% CI: 1.44, 7.42).

Attitudes and behaviors regarding AI. A sub-analysis (n=116) was conducted for only those reporting HAI to better understand the intimacy of AI and partnerships in which people feel comfortable having HAI. Most of the demographic patterns observed in the larger sample were also observed in the sub-sample, however there was a slightly larger proportion of males (50.1%). Results revealed that 51% felt HAI was intimate or very intimate. Comparatively, 77% reported that they felt VI was intimate or very intimate. Very few respondents indicated that they would feel comfortable having HAI in a casual relationship (n=37) while more respondents indicated that they would feel comfortable having VI in a casual relationship (n=65). Finally, consistent condom use for either HAI or VI was fairly infrequent with only about a third of our study participants (32%) reporting consistent condom use for HAI and 37% reported consistent condom use for VI in the past 3 months (Table 3.2).

Partner analyses. There were 235 participants that named one recent sexual partner, 167 that named two, and 115 that named a third partner for a total of 517 partner observations. Of the participants that named recent sexual partners, about half (49%) named three total partners. Of those that named recent sex partners, 23% percent of participants reported HAI with one partner, 13% reported HAI with a second partner, and 14% reported HAI with a third partner. Within all of the partnerships listed, 35% were partnerships in which HAI occurred. Variables found to be associated with recent HAI in bivariate models were demographic characteristics—individuals' race, partner's race—and relationship characteristics—type of relationship, length of partnership, commitment to partner, being threatened with and threatening partners with violence.

Multiple final models used to investigate the significant associations of partner-level factors with recent, partner-specific HAI and to avoid issues of collinearity (Figure 3.1). Multivariable models that assessed type of partnership, IPV (Figure 3.1), and HAI included individuals' age, gender, and race/ethnicity, and partner's age and race/ethnicity. Participants who reported having been threatened with physical violence were more likely to have had HAI compared to those who were never threatened by their partners (AOR= 2.24; 95% CI: 1.15, 4.34). Similarly, participants who threatened their partners with violence were also more likely to have engaged in HAI compared to those who never threatened their partners (AOR= 2.14; 95% CI: 1.04, 4.44). Finally, participants that reported any IPV were 2.71 times as likely to report HAI as those who never experienced IPV (95% CI: 1.49, 4.93). Through all models investigating the relationship of IPV, partnership type, and HAI, age and type of partnership remained significantly associated with having HAI. Notably, HAI was approximately three times as likely to occur in main partnerships compared to casual or one-time partnerships across all final models.

Models assessing length of partnership, IPV, and HAI as well as commitment to partner, IPV, and HAI included individuals' age, gender, and race/ethnicity, and partner's age and race/ethnicity. Participants who were threatened with violence were again more likely to have reported HAI compared to those were not threatened with violence (AOR: 2.44; 95% CI: 1.23,

4.85). Participants who threatened their partners were also more likely to report HAI than those who never threatened with partners with violence (AOR: 2.38; 95% CI: 1.14, 4.95). Finally, participants who reported any IPV in their relationships were 2.71 times as likely to report HAI in those relationship compared to those who did not experience IPV (95% CI: 1.44, 5.11). In these models, length of time with partner remained significantly associated with reporting HAI with HAI being reported 2.5 times as often in relationships that lasted more than a year compared to those lasting less than a month.

For models that investigated commitment to partner, IPV and HAI, participants who were threatened by their partners were more likely to report having HAI in those partnerships compared to those who were never threatened with violence (AOR: 2.41; 95% CI: 1.20, 4.86). Similarly, participants who threatened their partners with violence were more likely to report having HAI with that partner (AOR: 2.68; 1.28, 5.63). As with previous models, participants who reported IPV were three times as likely to report HAI compared to those who reported no IPV (95% CI: 1.61, 5.61). In all adjusted models for IPV variables, level of commitment to partner remained significantly associated with HAI with those being very or completed committed to their partners about 2.5 times as likely to report HAI compared to those not committed to their partners.

3.5 Discussion:

Among our study participants, the prevalence of ever AI was 49%, which is higher than most studies previously reporting on AI. Our study contributes new partner-specific prevalence estimates for recent HAI ranging from 13%-23%. Additional findings from this study indicate that several individual and partnership characteristics are associated with engaging in HAI. Individual analyses add and expand on the associations of ever having had AI and individuals' race/ethnicity, alcohol consumption, and having had a sexual partner who was recently incarcerated, Unique to our study is our ability to provide insights into relationship contexts of recent HAI highlighting the importance of longer, main, and more committed partnerships and

presence of any IPV but most notably being threatened or threatening partners with physical violence. Our results expand the limited literature on HAI as a sexual behavior especially in relationship-specific contexts.

In our study, we assessed the role of relationship types and characteristics in a variety of ways. First, using individual-level variables, we investigated the association of transactional sex with ever AI. Transactional sex has been historically linked with HAI (19, 106), but our adjusted analyses were not able to confirm these findings due to lack of transactional sex within our population. Using the sub-sample of participants who reported ever having AI, we also investigated the relative intimacy of AI and the types of relationships in which people would feel comfortable having AI. A little over half of our study participants indicated that felt AI is an intimate act and most indicated that they would be more comfortable having HAI in main partnerships. These results are consistent with previous research that indicate women have AI with people they know and trust, and that AI can be used as a way to express intimacy (106, 107). This could have particular implications for condom use which may not be preferred in committed partnerships (65).

Finally, our results are consistent with previous investigations of HAI and IPV, but add to the literature by focusing on recent partnerships and HAI. In our study, participants reporting any IPV were more likely to also report having HAI in those relationships. Specifically, participants who were threatened with violence by their partners and participants who threatened their partners with violence were more likely to have engaged in HAI. Previous studies have found AI to be more likely reported in relationships with physical or sexual violence (108), and that women with a recent history of IPV were more likely report unprotected AI (105). These results help to confirm the findings from our study, and demonstrate lasting behavior patterns across different study populations. One interesting finding in the literature suggests that HAI was more likely to occur in relationships where violence was reciprocal (108). While not explicitly investigated in this study for reciprocal IPV, our results do suggest that HAI is associated with being threatened with violence despite who instigates the threats. Finally, a further exploration of the relationship

between IPV and having a recently incarcerated sexual partnership indicated an association between these two partnership characteristics. Since incarceration status of sexual partner is often assessed and used as a marker of high-risk sexual networks (109), this question could also be used as a marker of IPV and incorporated into rectal STD screening protocols as an indicator of high-risk HAI.

Despite the contributions of this study, our findings should be interpreted in consideration of some of the limitations of this study. Data collected on behaviors and sexual behaviors of interest were collected based on self-report. Although this information was collected using self-administered interviews, data on socially stigmatized or illicit activities may suffer from reliability and validity issues resulting in response bias and potential underestimation of these behaviors (110-112). Furthermore, these participants were recruited from patients attending public STD clinics and may not be representative of all young people attending sexual health clinics or receiving sexual health care with their private physicians. Finally, point estimates from some analyses should be interpreted with caution due to small sample sizes, although their general direction of associations can be used to inform future studies with larger sample to obtain more precise estimate.

3.6 Conclusions:

These results help to highlight that HAI is a complex sexual health behavior that requires special considerations when creating and designing sexual health education and prevention messaging. Despite known sexual health risks of AI, safe AI messaging continues to be under-represented in sexual health prevention messaging and education. Based on our study results, messages seeking to increase healthy HAI behaviors should incorporate individual characteristics and consider relationship contexts. Additionally, our study findings indicate that incarceration status, as it relates to IPV, may be a useful tool in identifying people who may be having HAI and at particular risk for rectal STDs.

3.7 Tables and Figures:

Table 3.1. Descriptive statistics, bivariate and multivariable analyses for individual demographic characteristics and health behaviors, SHaYP Study, 2012 (n=243)

	Freq.	(%)	Prevalence of AI (%)	Bivariate P-value	Final Model			
					AOR	Lower Limit	Upper Limit	P- value
<i>Demographic Characteristics</i>								
Age				0.0547				
15-19	52	(21)	35		--	--	--	--
20-24	117	(48)	50		1.29	(0.56	, 2.95)	0.5543
25-29	74	(30)	57		2.01	(0.82	, 4.93)	0.1294
Gender				0.0387				
Male	106	(44)	57		--	--	--	--
Female	137	(56)	43		0.55	(0.29	, 1.05)	0.0691
Race				0.0046				
African American	128	(53)	39		0.11	(0.03	, 0.41)	0.0009
Hispanic	73	(30)	62		0.36	(0.10	, 1.29)	0.1174
White	21	(9)	71		--	--	--	--
Other	21	(9)	57		0.39	(0.08	, 1.79)	0.2232
Gender of sex partners				0.3930				
Heterosexual partners only	217	(89)	48		--	--	--	--
Some same sex partners	26	(11)	58		1.87	(0.63	, 5.55)	0.2604
Work and Student Status				0.1944				
Employed	108	(45)	54					
Student	46	(19)	38					
Unemployed, non-student	86	(36)	48					
Homeless				0.4637				
Yes	16	(7)	40					
No	227	(93)	50					
Ever had anal intercourse				--				
Yes	116	(49)	--					
No	120	(51)	--					
Positive for Gonorrhea				0.6946				
Yes	63	(27)	51					
No	169	(73)	48					
Positive for Chlamydia				0.7929				
Yes	34	(14)	47					
No	204	(86)	49					
<i>Risk Behaviors</i>								
Been in jail in past 12 months				0.9411				
Yes	50	(23)	50					
No	168	(77)	49					
Alcoholic beverage consumption past year				0.0362				
Never	40	(19)	30		--	--	--	--
Once or twice a month	95	(45)	54		2.87	(1.18	, 7.01)	0.0205
Weekly	59	(28)	58		2.00	(0.76	, 5.26)	0.1585
Daily or almost daily	17	(8)	32		1.33	(0.36	, 4.97)	0.6736
Marijuana use in the past year				0.1801				
Never	64	(31)	41					

Once or twice a month	47	(23)	60					
Weekly	32	(16)	44					
Daily or almost daily	61	(30)	14					
Used club drugs in the past year				0.2601				
Yes	31	(17)	47					
No	147	(83)	58					
Used other drugs in the past year				0.0372				
Yes	31	(20)	44					
No	126	(80)	65					
<i>Sexual Health Behaviors</i>								
Met a sex partner on the internet				0.2708				
Yes	70	(32)	54					
No	149	(68)	46					
Had sex with someone met on same day				0.0181				
Yes	109	(50)	57					
No	110	(50)	41					
Someone paid you to have sex in past 12 months				0.0466				
Yes	23	(11)	70					
No	196	(90)	46					
Had any transactional sex in past 12 months				0.1349				
Yes	34	(16)	62					
No	185	(84)	46					
Had sex with someone who takes drugs in past 12 months				0.6733				
Yes	10	(5)	60					
No	205	(94)	49					
Had sex with someone who had been to jail in past 12 months				0.0105				
Yes	47	(21)	66		--	--	--	--
No	170	(78)	45		3.26	(1.44	, 7.42)	0.0047
Used club drugs when having sex in the past year				0.9221				
Yes	149	(84)	49					
No	28	(16)	50					
Used other drugs when having sex in the past year				0.3470				
Yes	133	(83)	57					
No	28	(17)	47					
Sexual situation regretted because of drinking				0.0051				
Never	147	(67)	43					
Once	44	(20)	70					
Two or more	27	(12)	48					
Sexual situation regretted because of using drugs				0.6930				
Never	183	(84)	48					
Once	21	(10)	57					
Two or more	13	(6)	54					

Table 3.2. Descriptive statistics for anal-only sub-sample investigating the intimacy of anal intercourse and partnerships in which participants were comfortable having anal intercourse, SHaYP Study, 2012 (n=116).

	Giving oral sex		Receiving oral sex		Vaginal Intercourse		Anal Intercourse	
	Freq.	(%)	Freq.	(%)	Freq.	(%)	Freq.	(%)
Intimacy of sex act								
Not really intimate	48	(42)	45	(39)	27	(23)	57	(49)
Intimate/Very intimate	66	(58)	71	(61)	89	(77)	59	(51)
Types of relationship feel comfortable performing sex act								
Main partner	99	--	88	--	95	--	99	--
Casual partner	41	--	63	--	65	--	37	--
Condom use for sex act (past 3 months)								
Inconsistent	49	(83)	49	(92)	69	(63)	50	(68)
Consistent	10	(17)	4	(8)	41	(37)	24	(32)
Condom use for last sex act								
Yes	7	(12)	6	(10)	44	(38)	36	(31)
No	52	(88)	52	(90)	71	(62)	80	(69)

Estimates of Partnership Variables from IPV Models



Estimates for IPV Variables

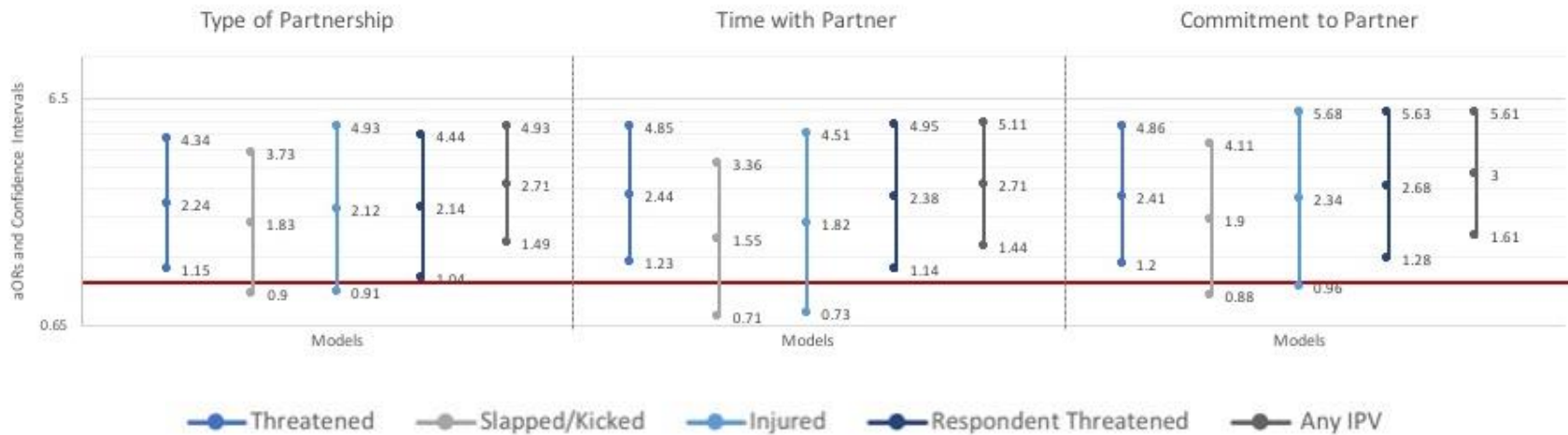


Figure 3.1. Hierarchical, repeated measures adjusted odds ratios (AORs) assessing the associations between relationship characteristics and IPV with heterosexual anal intercourse, SHaYP Study, 2012 (n=517). Top row, from left: AOR ranges for type of partnership, length of partnership, and commitment to partner in five models with IPV variables. Bottom row, from left: AORs for IPV variables (being threatened by partner, being slapped/kicked by partner, being injured by partner, threatening partner, and any IPV) for each relationship measure.

CHAPTER 4: Just fake it: The validity of using the Marlowe and Crowne Social Desirability Scale to assess response bias among young people in Los Angeles County

4.1 Abstract

Background. Social desirability (SD) is a response bias that can be problematic for sexual health research. In 1960, Marlowe and Crowne developed a 33-item scale for measuring SD. Despite its age, this Marlowe-Crowne Social Desirability Scale (MC-SDS) became one of the most popular SD scales used. However, its validity should be reevaluated for use among young people in the 21st century.

Methods. We used descriptive statistics, factor analysis, and item response theory (IRT) to evaluate the performance of the MC-SDS among young persons aged 15-29 years attending 12 STD clinics in Los Angeles County.

Results. Psychometric analyses suggest a minimum of 15 questions from the MC-SDS work well in our young, urban population and differ from other short form versions. Of these 15 items, 20% were determined to be harder to answer based on underlying SD, and about half could better differentiate between question scores for average SD. Finally, older age groups provided more socially desirable answers.

Conclusions. Our results illustrate that 15 of the original 33 items are better for measuring SDS in our young, urban participants compared to previous MC-SDS short forms. Validated instruments should be continuously evaluated for usefulness when used in more contemporary or more diverse populations.

4.2 Introduction

Much of the existing research on sexual health and other sensitive health topics depend on survey data and, often, self-reported health information. A major concern with using survey data for evaluating sexual health is the reliability and accuracy of the information being collected. Social desirability (SD) is a bias that can occur when participants answer certain questions in a way that satisfies their perception of the “right” or “acceptable” answer according to social norms rather than answering truthfully. This bias can be especially harmful in behavioral research causing us to over- or under-estimate true health effects (71, 72). To measure the potential influence that SD has on study participants’ questionnaire responses, Marlowe and Crowne developed a 33-item SD scale (MC-SDS) in the 1960s validated in white, male undergraduate students at The University of Kentucky (73). This scale was designed based on “cultural approval” as a motivational factor and aimed to distinguish SD from psychopathological personality traits previously thought to influence survey responses (73-75). Based on this scale, “[a] low need for social approval implies a degree of independence of cultural definitions of acceptable behavior.” (74)

Since its inception, the MC-SDS has become one of the most popular measures of SD and has been converted into many different versions of short-form scales (84, 113-117). The MC-SDS has been used to determine the impact of SD on a variety of self-reported behaviors including studies of physical activity (76), dietary intake (77), and condom use (78). In a review of self-report studies using the MC-SDS, Van de Mortel found that very few studies used a scale to assess social desirability, and, of those that assessed social desirability (79). Among those studies using a social desirability scale, about half found that social desirability did influence their outcomes, but very few then used statistical methods to try to account for this bias in their research (79). However, despite its wide usage (80, 81) and numerous validation studies (78, 81-85), the appropriateness and validity of the full MC-SDS in young, ethnically diverse populations is questionable due to the relevance of certain questions (i.e. voting and driving a car) and the dated language. Additionally, there are conflicting evidence on the ability of the scale to distinguish

between self-report and validated measures(80) and on its usefulness in estimating under-reporting for certain behaviors such as substance use(81, 83). The current research aims to contribute to the literature on the MC-SDS by validating the full MC-SDS in a young, urban population attending public STD clinics. Additionally, this research seeks to determine the optimal questions from the MC-SDS for measuring SD and to estimate the associations of MC-SDS scores with demographic characteristics.

4.3 Methods

Study setting and participants. The original purpose of the data collected for this study was to assess factors associated with pharyngeal gonorrhea. The methods have been previously described.(118) Briefly young men and women visiting public STD clinics in Los Angeles County between April 2012 and May 2014 were recruited for the original study if they were: (1) age 15 – 29 years, (2) reported giving oral sex to a partner of the opposite sex in the past 90 days, and (3) attended one of twelve public STD clinics in Los Angeles County. By design, individuals were recruited who were pharyngeal gonorrhea positive (cases) and individuals who tested negative were recruited as a comparison. Given that pharyngeal gonorrhea screening was not routine practice in the clinics, active screening was conducted in order to identify participants with and without pharyngeal gonorrhea. Those who were eligible and interested in participating also completed a self-administered questionnaire on sexual risk behaviors. Participants provided written informed consent and received \$25 for their time.

Data collection and variables. The study survey was administered using a web-based, computer assisted self-interview and took approximately 45 minutes to complete. The questionnaire included information on: (1) demographics; (2) partner characteristics and event level sexual behaviors; (3) general sexual risk behaviors, knowledge, and attitudes; and (4) the MC-SDS. Additionally, study participants were tested for urogenital Chlamydia/gonorrhea and pharyngeal gonorrhea, and test results were confirmed using medical records.

This study focuses on the 33 true/false items of the MC-SDS with minor modifications. Table 1 includes all questions and scoring criteria for scale questions. There are two questions for which their answer choices were altered prior to survey administration: (1) "Before voting, I thoroughly investigate the qualifications of all the candidates," and (2) "I never make a long trip without checking the safety of my car." Since persons attending public STD clinics in LA may not be able to afford, need, or drive a car and may not be eligible to vote, answer choices for the above questions were modified to also include a not applicable option in addition to the true and false answer choices. Scale scores were calculated for the full 33-item scale and the scale without the altered questions. For the MC-SDS, higher scores indicate that participants provided more socially desirable answer choices. Additionally, scores were calculated based on two popular MC-SDS short forms: the Reynolds (1982) (119) 13-item form and the short forms (10a, 10b, and combined 20-items) developed by Strahan and Gerbasi (1972) (113).

Finally, there are some demographic characteristics that have been associated with differences in MC-SDS scores such as age, gender, education, and race/ethnicity (80). We used age, gender, work and education status, race/ethnicity and homeless status to assess similar potential differences in MC-SDS scores among our participants.

Statistical analyses. Descriptive statistics were calculated for demographic characteristics (frequencies and percentages) and MC-SDS scores (means, medians, standard deviations). MC-SDS scores were calculated as raw scores and percentage scores for all 33 items, 31 items, the 13-item Reynolds' short-form, and the Strahan and Gerbasi short-forms (10a, 10b, and combined). Additionally, reliability analyses were used to determine the internal consistency of the full 33-item scale, known short-form versions, and short form versions established from the current study.

Exploratory factor analyses were used to reduce the number of MC-SDS questions used and identify the questions that worked best in our young, urban population. There were several moderately correlated variables among the scale questions ($|0.3|$ - $|0.7|$), therefore oblique

rotations were used in our factor analyses. The rotations considered were oblimin, obvarimax, and promax. Since the answer choices for two questions were altered, they were not used in factor analyses. Conservatively, each analysis allowed for 5 potential latent factors to emerge from the 31 questions used, although the scree plot suggested that only 3—possibly 4—factors would be necessary to allow for the maximum variance explanation with the optimal number of variables. After determining the optimal scale structure from factor analyses, descriptive characteristics were calculated for the identified questions and score configurations.

Next, an IRT analysis was performed on all 33 items from the MC-SDS. The IRT analyses focuses not on the total scale, but rather each individual question item and its' ability to measure SD among respondents. Here, we focus on using IRT to better describe survey items identified through our factor analyses particularly in how difficulty they were to answer in a socially desirable way and how well they differentiated between answers for people not particularly socially motivated to answer in a socially acceptable way. The traditional Rasch model provides an estimate of the probability of a providing a correct answer—or socially desirable answer—to a scale item based on two determinants, namely the item's measured difficulty for answering correctly, and corresponding participant's ability to provide that correct answer. The concept of participant's ability for the purposes of this study is interpreted as the level of underlying *motivation* to provide a socially desirable answer for each scale item.

Finally, we used bivariate and multivariable linear regression analyses to determine the associations of demographic characteristics with MC-SDS scores. Mean score changes and 95% confidence intervals (CIs) were reported for all associations. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary NC) (97).

4.4 Results/Discussion

Description of study sample. Of the 243 participants in this study, 56% were female, and a large proportion were between the ages of 20-24 (48%). A little more than half self-identified as

Black/African American while 30% reported being Hispanic. Most of our study participants reported only having opposite-sex sex partners, but 11% of our participants did report having some same-sex sex partners in addition to opposite-sex partners. Over a third of our sample reported being unemployed (36%), but relatively few reported being homeless (7%) (Table 2).

MC-SDS score descriptors. The mean MC-SDS score for all 33-items ($n=107$) was 21.5 (standard deviation (SD)= 5.4) and scores ranging from 6 to 33. After dropping the two questions with the altered answer choices from 33-item scale, the mean score also dropped to 18.7 (SD= 5.2), but the total number of participants with useable data increased ($n=187$). Substantial proportions of our participants were unable to answer the two questions that were of particular concern. Almost 25% of our study participants responded *not applicable* to “Before voting, I thoroughly investigate the qualifications of all the candidates,” and 27% responded *not applicable* to “I never make a long trip without checking the safety of my car.” Neither of these questions were used in later short form configurations. Using the Reynolds short form, the average score was 9 ($n=207$). Finally, the average scores from the two Strahan and Gerbasi short forms and their combination form were 6.4 (Short Form A, $n=210$), 5.7 (Short Form B, $n=207$), and 12.2 (Combined, $n=201$) (Table 3). Figure 1 visually presents each score calculated as a percentage in order to compare frequencies of scores across all scale configurations. The frequencies for the total 33-item scale appear to be normally distributed in our population. However, the Reynolds short form and the combined Strahan and Gerbasi form are all slightly negatively skewed with higher frequencies for higher SDS scores. As expected, the total 33-item scale had the highest internal reliability score of all scale variations (Cronbach’s $\alpha= 0.8$); however, the Reynolds 13-item form (Cronbach’s $\alpha= 0.71$) and the combined Strahan and Gerbasi form (Cronbach’s $\alpha= 0.74$) also had moderately high internal reliability among our participants.

Factor analysis. Factor analyses were used to determine the best selection of questions to measure SDS in our population. The two analyses that allowed for the maximum variance to

be explained and successfully reduced the number of questions needed to do so were the oblimin and promax rotations. There were 4 latent constructs identified by both of these rotations. The oblimin rotation identified (factor loadings ≥ 0.4) 15 questions and promax identified 16 questions (same questions, plus one) that best represented the latent constructs present in the MC-SDS (Table 3). The median scores for these new scale configurations were 9.5 (oblimin) and 10 (promax) with approximately the same internal reliability scores (Cronbach's $\alpha = 0.71$ and 0.72 , respectively).

Notably, there is no complete replication of either short form identified through our analyses in our study population. Many of the questions used in either of the short forms were selected through our factor analyses indicating that there are some questions from the scale that are better suited in multiple populations and across different time spans. For example, "There have been occasions when I have taken advantage of someone" and "I'm always willing to admit it when I make a mistake" are two questions that appear in the Reynolds and Strahan and Gerbasi short forms. However, there are a few questions that did not appear on either short form and were selected by our analyses. These questions are "On occasions I have had doubts about my ability to succeed in life," and "My table manners at home are as good as when I eat out in a restaurant." So, while there are many similarities between the short forms previously established, there does appear to be a lack of a one-size-fits-all approach to short forms. Despite the contributions of these analyses, we were limited in our ability to assess the two questions for which the answer choices were altered in our analyses. However, since a quarter of our study participants found these questions not applicable to their circumstances, this may not be a major limitation among our study participants.

Item Response Theory Analysis. In our IRT analyses (Table 1), ability—or quantified underlying SD motivation—ranged from -7.5 to 5.0 . Lower difficulty parameters indicate that even participants who were less motivated to answer in a socially acceptable (lower ability scores) way

had a 50% chance of choosing the socially desirable answer (easier questions). Conversely, harder questions had higher difficulty parameters (>0) and indicated that participants needed to be more motivated to provide a socially desirable answer to have a 50% chance of providing the socially desirable answer. Easier (difficulty parameter ≤ -1) and medium difficulty (difficulty parameter between -1 and 0) questions compose approximately two-thirds of the original scale, 75% of the promax configuration, and 80% of the oblimin configuration. An example of one of the easier questions included in the promax and oblimin configurations was “When I don’t know something I don’t mind at all admitting it” (difficulty= -4.2 , p -value= 0.0160) where even participants who cared less about providing the socially desirable answer still have at least a 15% chance of agreeing with the statement (SD scoring presented in Table 2), and those of who were neutral in their desire for social approval have approximately a 90% chance of choosing the socially desirable answer of agreeing. This suggests that most people would confirm that they would admit when they don’t know something. A medium difficulty question was “I sometimes feel resentful when I don’t get my way” (difficulty= -0.2 , p -value= 0.0241) where participants with neutral SD motivation had approximately a 50% chance of disagreeing with this statement. Twenty-seven percent of the original scale consisted of harder questions, while more difficult questions made up 25% of the promax configuration and 20% of the oblimin configuration. For example, some of the questions that had higher difficulty parameter values and were part of the promax and oblimin configurations include, “there have been occasions when I felt like smashing things” (difficulty= 0.7 , p -value <0.0001), “I can remember ‘playing sick’ to get out of something” (difficulty= 0.4 , p -value= 0.0013), and “I have never deliberately said something that hurt someone’s feelings” (difficulty= 0.8 , p -value= 0.0003). Specifically, participants needed to be more interested in providing socially acceptable answers to have at least a 50% probability of answering in a socially desirable way for the scale item “I have never deliberately said something that hurt someone’s feelings.” Even at the highest measure of SD motivation not quite 100% of our study participants were able to provide the socially desirable answer. An example of one of the harder

questions on the scale, though not selected in the promax or oblimin analyses, was “I have almost never felt the urge to tell someone off” (difficulty=3.0, p-value=0.0267) where participants with highest social motivation only had approximately a 65% chance of answering in the affirmative. These analyses do illustrate that the promax and oblimin configurations have slightly fewer difficult questions, although the proportions of question types is relatively consistent from the original scale.

Our analysis also showed that 33% of the original 33 questions were determined to be more differentiating—or able to provide more information regarding SDS answering preferences—for participants who were neutral in their motivation to provide socially acceptable answers. This is indicated by having slopes (Table 4.1) of Item Characteristic Curves (ICCs) (figures not presented) greater than or equal to 1.0. Questions that are more differentiating can more easily distinguish between participants who provide socially desirable answers (vs. not socially desirable answers) for those neither particularly motivated or un-motivated to provide socially desirable answers. The oblimin (47%) and promax (44%) configurations had higher proportions of more differentiating questions. Examples of questions with more differentiating ability from the oblimin and promax configurations are “I sometimes feel resentful when I don’t get my way” (slope=2.0, p-value<0.0001), “there have been occasions when I have taken advantage of someone” (slope=1.5, p-value<0.0001), and “I am always courteous, even to people who are disagreeable” (slope=1.6, p-value<0.0001).

These IRT analyses help to elaborate on specific question characteristics and how well these questions performed among our participants. Despite the contributions of these IRT analyses, the results should be interpreted with some limitations in mind. Namely, we have a relatively small sample for IRT analyses (≤ 200 respondents). However, the goal of these analyses are to describe the performance of this scale in our population, not to validate the scale items’ ability to measure the constructs of SD. For this reason, these analyses still provide valuable information.

Demographic characteristics associated with MC-SDS Scores. Finally, we assessed demographic characteristics associated with providing socially desirable answers. We were not able to confirm previous associations of gender (85), race/ethnicity (80, 83), nor work or student status (83, 85) with SDS scores in any configuration for our participants. The only demographic characteristic associated with MC-SDS scores among our study participants was age. On average, age categories 20-24 and 25-29 SDS scores (more SD answers) were 3 points higher than participants 15-19 in the 31-item configuration, and approximately 2 points higher in the oblimin, and promax configurations (Table 2). This suggests that younger people could be less motivated by social approval when answering sensitive health questions. Conversely, it could also indicate that older age groups are more likely to behave in a socially acceptable, or responsible, way and answer truthfully. As mentioned briefly in the introduction, there are limitations inherent to the scale itself including its' ability to accurately measure SD to capture non-truthful responses (80, 81, 83). Perhaps participants agree with certain statements because they are true and do reflect their own behavior despite being the SD answer choice. While the MC-SDS may not provide the ideal measure of SD, behavioral survey research is plagued by under-reporting of sensitive health topics and it does attempt measure that response bias. Additional research into the accuracy of the MC-SDS in measuring SD and new measurement tools or methods to determine the best way to account for response bias in our data collection is needed.

4.5 Conclusions

This study suggests that there are, optimally, 15 questions from the MC-SDS that work well in our young, urban population. These 15 items mimic the items' difficulty levels in similar proportions to the original scale, ensuring a range of questions aimed at being more or less difficult to answer for participants' based on their underlying desire to respond according to their perceptions of the "correct" or socially desirable answer. Our resulting short form differed from the original questions by highlighting more questions that were better able to distinguish between

socially desirable and truthful answers for persons with average socially desirable motivations. Finally, the only demographic characteristic that was associated with MC-SDS scores in our population was age indicating that older age groups provided more socially desirable answers (higher SDS scores). These results suggest that the questions used in the MC-SDS short forms do not necessarily transfer between study populations and that some care should be taken in determining which short forms are used. Additionally, even validated instruments should be continuously evaluated for usefulness when used in more contemporary or more diverse populations.

4.6 Tables and Figures:

Table 4.1. MC-SDS Questions, correct scoring, configurations, and IRT analysis results, SHaYP data (n=243), Los Angeles, CA, 2012.

No.	Score	Difficulty	P-Value	Slope	P-Value	Question
1	T	-2.4	0.005	0.6	0.0068	Before voting I thoroughly investigate the qualifications of all the candidates.
2†	T	-3.4	0.010	0.5	0.013	I never hesitate to go out of my way to help someone in trouble.
3	F	-0.9	0.000	0.8	<.0001	<i>It is sometimes hard for me to go on with my work if I am not encouraged.</i>
4†	T	0.2	0.110	0.9	<.0001	<i>I have never intensely disliked anyone.</i>
5	F	-0.1	0.243	1.2	<.0001	<i>On occasions I have had doubts about my ability to succeed in life.</i>
6†	F	-0.2	0.024	2.0	<.0001	<i>I sometimes feel resentful when I don't get my way.</i>
7	T	-3.4	0.044	0.3	0.0448	I am always careful about how I dress.
8	T	-1.9	<.0001	0.9	0.0001	<i>My table manners at home are as good as when I eat out in a restaurant.</i>
9	F	0.9	0.001	0.7	0.0001	If I could get into a movie without paying and be sure I was not seen I would probably do it.
10	F	-0.2	0.170	0.9	<.0001	<i>On a few occasions, I have given up something because I didn't think much of my ability to do it.</i>
11‡	F	-0.3	0.065	0.8	<.0001	I like to gossip at times.
12†	F	-0.6	0.002	0.9	<.0001	<i>There have been times when I felt like rebelling against people in authority even though I knew they were right.</i>
13	T	-1.3	<.0001	2.1	<.0001	<i>No matter who I'm talking to, I'm always a good listener.</i>
14†	F	0.4	0.001	1.5	<.0001	<i>I can remember "playing sick" to get out of something.</i>
15‡	F	-0.3	0.021	1.5	<.0001	<i>There have been occasions when I have taken advantage of someone.</i>
16‡	T	-1.9	<.0001	0.9	0.0001	<i>I'm always willing to admit it when I make a mistake.</i>
17‡	T	-2.5	0.000	0.8	0.001	I always try to practice what I preach.
18	T	-0.6	0.112	0.4	0.0135	I don't find it particularly difficult to get along with loudmouthed, obnoxious people.
19‡	F	-0.7	0.001	0.9	<.0001	I sometimes try to get even rather than forgive and forget.
20†	T	-4.2	0.016	0.5	0.0221	<i>When I don't know something I don't mind at all admitting it.</i>
21†	T	-1.3	<.0001	1.6	<.0001	<i>I am always courteous, even to people who are disagreeable.</i>
22‡	F	1.6	<.0001	1.0	<.0001	At times I have really insisted on having things my own way.

23‡	<i>F</i>	<i>0.7</i>	<i><.0001</i>	<i>1.5</i>	<i><.0001</i>	<i>There have been occasions when I felt like smashing things.</i>
24†	<i>T</i>	<i>-5.6</i>	<i>0.078</i>	<i>0.3</i>	<i>0.0829</i>	<i>I would never think of letting someone else be punished for my wrong-doings.</i>
25‡	T	-5.3	0.051	0.4	0.058	I never resent being asked to return a favor.
26‡	T	-0.8	0.000	0.9	<.0001	I have never been irked when people expressed ideas very different from my own.
27	T	-0.7	0.003	0.9	0.0002	I never make a long trip without checking the safety of my car.
28†	F	0.1	0.337	1.0	<.0001	There have been times when I was quite jealous of good fortune of others.
29	T	3.0	0.027	0.3	0.0263	I have almost never felt the urge to tell someone off.
30†	F	-0.3	0.043	1.2	<.0001	I am sometimes irritated by people who ask favors of me.
31	T	0.2	0.308	0.4	0.0093	I have never felt that I was punished without cause.
32	F	-1.0	0.001	0.7	0.0001	I sometimes think when people have a misfortune they only got what they deserved.
33‡	<i>T</i>	<i>0.8</i>	<i>0.000</i>	<i>0.9</i>	<i><.0001</i>	<i>I have never deliberately said something that hurt someone's feelings.</i>

T=True; F=False

Strahan, R. and Gerbasi, K. C. (1972) short forms 1‡ (10 items) and 2† (10 items)

Darker shading indicates Reynolds, W. M. (1982) short form (13 items)

Oblimin configuration bold formatting (15 questions)

Promax configuration italics formatting (16 questions)

Table 4.2. Demographic characteristics crude and adjusted associations with MC-SDS scale configurations, SHaYP data (n=243), Los Angeles, CA, 2012.

	Freq. (%)		31-Items (n=187)					Oblimin Rotation (n=200)					Promax Rotation (n=199)				
			Crude		95% CI			Crude		95% CI			Crude		95% CI		
			P-value	AOR	LL	UL	P-value	P-value	AOR	LL	UL	P-value	P-value	AOR	LL	UL	P-value
<i>Characteristics</i>																	
<i>Gender</i>																	
Male	106	44	--					--					--				
Female	137	56	0.665	0.7	-0.82	2.21	0.367	0.358	0.6	-0.24	1.42	0.161	0.544	0.5	-0.36	1.39	0.249
<i>Age</i>																	
15-19	52	21	--					--					--				
20-24	117	48	0.021	3.0	1.12	4.97	0.002	0.024	1.7	0.60	2.72	0.002	0.012	1.9	0.80	3.04	0.001
25-29	74	30	0.044	3.0	0.85	5.16	0.006	0.035	1.7	0.53	2.90	0.005	0.050	1.8	0.51	3.01	0.006
<i>Race/Ethnicity</i>																	
African American	128	53	0.563	1.0	-1.55	3.60	0.434	0.737	0.4	-1.06	1.84	0.594	0.734	0.5	-1.06	1.99	0.548
Other	21	9	0.450	-1.5	-4.78	1.72	0.357	0.440	-1.0	-2.82	0.87	0.299	0.404	-1.0	-2.98	0.90	0.295
White	21	9	--					--					--				
Hispanic	73	30	0.928	0.1	-2.53	2.74	0.937	0.914	-0.1	-1.56	1.38	0.906	0.917	0.1	-1.48	1.62	0.927
<i>Sexual partners</i>																	
Heterosexual	217	89	--					--					--				
Some same-sex	26	11	0.312	-2.0	-4.39	0.48	0.116	0.266	-1.2	-2.63	0.13	0.076	0.241	-1.4	-2.82	0.09	0.066
<i>Work/student status</i>																	
Employed	108	45	--					--					--				
Student	46	19	0.427	1.5	-0.61	3.58	0.166	0.638	0.6	-0.53	1.78	0.288	0.485	0.8	-0.47	1.97	0.229
Unemployed	86	36	0.532	-0.8	-2.46	0.79	0.313	0.333	-0.7	-1.55	0.24	0.151	0.313	-0.7	-1.66	0.22	0.132
<i>Homeless</i>																	
Yes	16	7	0.340	1.4	-1.59	4.48	0.352	0.255	1.1	-0.65	2.80	0.222	0.225	1.2	-0.59	3.04	0.185
No	227	93	--					--					--				

Table 4.3. Descriptive statistics for MC-SDS scale configurations and number of factors identified for each rotation, SHaYP data (n=243), Los Angeles, CA, 2012.

Scale Variation	N	Mean	Std Dev*	Minimum	Median	Maximum	Cronbach's Alpha**
Total 33-item MC-SDS Scale	107	21.5	5.4	6.0	22.0	33.0	0.80
Removing 2 problem questions (31 items)	187	18.7	5.2	4.0	18.0	31.0	0.79
Reynolds 13-item Short Form	207	9.0	2.9	0.0	9.0	14.0	0.71
Strahan and Gerbasi Short Form A (10 items)	210	6.4	2.0	2.0	6.5	10.0	0.56
Strahan and Gerbasi Short Form B (10 items)	207	5.7	2.0	0.0	6.0	10.0	0.57
Strahan and Gerbasi Combined***	201	12.2	3.7	2.0	12.0	20.0	0.74
Oblimin Configuration (15 items)	200	9.4	3.0	1.0	9.5	15.0	0.71
Promax Configuration (16 items)	199	10.0	3.1	1.0	10.0	16.0	0.72

Type of Rotation	Factor1	Factor2	Factor3	Factor4	Factor5	Eigenvalue Sums	Total Explained Variance
Initial- Iterated Principal Factor Analysis	3.97	1.72	1.08	0.75	0.72	6.76	0.77
Varimax	2.97	1.83	1.40	1.23	0.85	7.44	0.84
Oblimin	3.32	1.96	1.76	1.74	0.85	8.78	1.00
Obvarimax	2.51	1.97	2.13	2.06	1.67	10.35	1.17
Promax	3.41	2.17	1.76	1.95	0.89	9.29	1.05

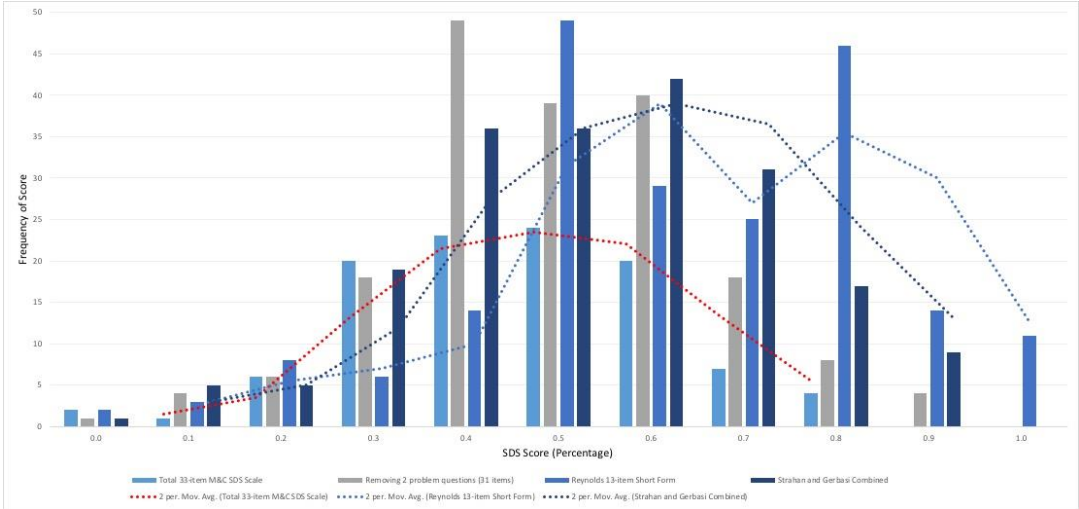
*Standard deviation

**Standardized Cronbach's alpha

***10a +10b

Bold border indicates number of factors selected from rotation (Eigenvalue>1.0)

Percentage score distributions for MC-SDS score configurations (total, 31 items, Reynolds, Strahan and Gerbasi)



Percentage score distributions for MC-SDS score configurations (Promax and Oblimin)

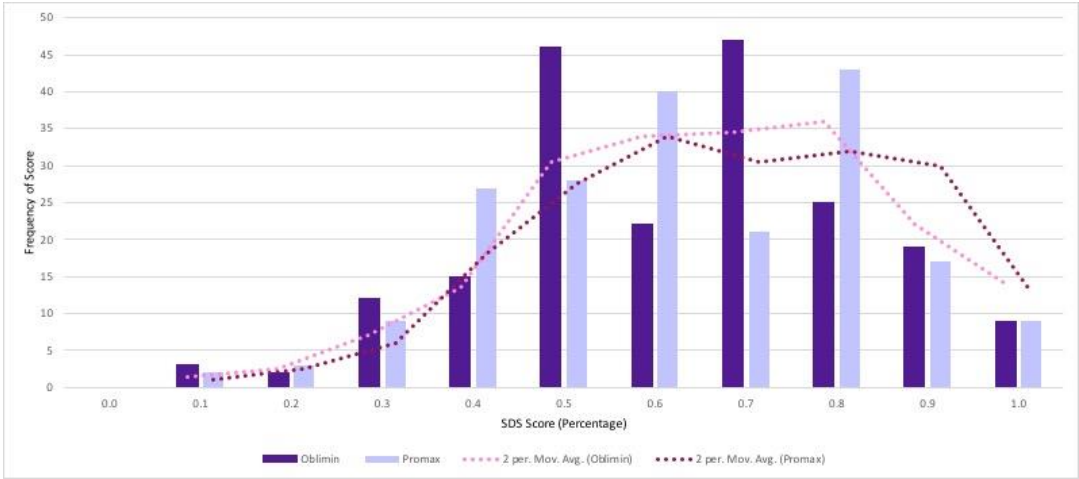


Figure 4.1. Percentage score distributions for various MC-SDS score configurations, SHaYP data (n=243), Los Angeles, CA, 2012.

CHAPTER 5: Significance and Public Health Relevance

The continued high rates of STDs among young persons, the association of these infections with adverse sequelae (79-82), and the growing concern of drug resistant diseases—specifically Gonorrhea—underscore the need for further research to better understand the myriad of factors influencing adolescent and young adult sexual behaviors. Further, there is evidence to support that sexual health behaviors are established during adolescence (83). Understanding risk behaviors and how behaviors change over time can help to better address the sexual health needs of young people and establish healthy sexual behaviors that they can carry into adulthood.

The first study contributes to the literature by establishing the longitudinal effects of differing levels of factors influences on the number and timing of sexual partnership over time. Increases in overall sexual partners and the occurrence of concurrent partners were associated with longitudinal influences of broader influences such as lesser degrees of parental support and being a native English speaker or having higher lever levels of acculturation. This particular finding suggests that there are socio-cultural influences on sexual health behaviors that operate outside of individual factors and influence a persons' risk. Culturally-specific interventions can be designed and used for 2nd and 3rd immigrant generations who may be particularly vulnerable to participating in sexual risk behaviors. While the first study also highlighted the impacts of individual demographic characteristics on both outcomes over time, one of the more interesting findings showed that current and past substance use—including binge drinking—increased sexual partners and concurrent sexual relationships over time. This finding is particularly important in illustrating the importance of addressing sexual health and substance use simultaneously in public health interventions due to how often they coincide. Finally, the first study implemented a lesser used technique of individual growth models to better elucidate factors related to increasing sexual partner over time. We found that the trajectories of sexual partners

over time were not only explained by time, but by demographic characteristics with a noticeable change in trajectory pattern for young people with some same-sex sexual attraction. These models were particularly helpful in teasing out to what extent factors contributed to an increase or decrease in sexual partners or concurrency. These results can be used to further justify the need for targeted interventions that address different concerns related to varying races/ethnicities and life stages. As sexual behaviors and demographic characteristics that affect these behaviors (e.g. marital status), change over time, early interventions can be used to develop healthy sexual health behaviors, and later interventions can be designed to help reinforce these pre-established behaviors.

Additionally, this dissertation adds to the less well-established literature on associations of risk behaviors with engaging in recent HAI. Specifically, this dissertation contributes a new partner-specific prevalence estimate of 35% for HAI in recent partnerships (past 6 months). Additional findings from regression analyses indicate that several individual and partnership characteristics are associated with engaging in HAI. Individual factors associated with having had AI were individuals' race/ethnicity, alcohol consumption, and having had a sexual partner who was recently incarcerated. Unique to this dissertation are the insights into relationship contexts of recent HAI. Specifically, HAI was more likely to be reported in longer, main, and more committed partnerships, as well as relationships where IPV was present. These results indicate the importance of considering sexual behaviors, especially specific sex acts, within the context of relationships. More research, specifically at the partnership level, can better describe partner dynamics that shape behaviors within sexual relationships. While many STD interventions address individual factors associated with sexual risk behaviors, partner dynamics should be considered when designing public health interventions including addressing harder topics such as IPV. This dissertation further suggests that having a partner who was recently incarcerated may be a potential screening question for rectal STD screening due to its' association with higher-risk HAI where IPV is present.

Finally, this dissertation further contributes to the literature by evaluating the usefulness of a popular social desirability scale—MC-SDS—in evaluating social desirability in a young, urban population. Often, social desirability is cited as a limitation of sexual health studies. While this is a known limitation, very few studies attempt to measure or account for this bias. One popular way of quantifying SD is the older, but still population, MC-SDS. Results from this study suggest that there are some questions from the MC-SDS that work better in a young, urban population, and that these questions are not necessarily the same short forms that have been created and validated previously. Additionally, this study touches on a potential limitation of the MC-SDS in being able to identify SD answers from potentially mature, responsible answers that happen to be the socially desirable answer. The results from this study provide a bit of caution when automatically using previously developed scales, despite whether they have been previously validated, without first determining the validity of using them in whatever new study population you are researching. Additionally, it suggests that there are opportunities for developing new and innovative ways to measure and account for social desirability that are more robust when encountering populations who may be answering truthfully even if it is in the socially desirable way.

Taken together, the results from each study in this dissertation helps to further our understanding of sexual health behaviors in adolescents and young people that can be used in interventions to reduce the burden of STDs among young people. Additionally, they highlight the importance of considering not only the individual engaging in the behaviors but broader and partnership influences that may impact their behaviors. Finally, this study seeks to use innovative analyses and approaches to better sexual health research. By continuously improving our own study methodology we can perhaps contribute to a better understanding of the complexities and nuances of sexual behaviors.

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