ABSTRACT

Sex Education and HIV Testing Among Young Men Who Have Sex with Men: Findings From the 2006-2010 and 2011-2015 National Survey of Family Growth

Jace D. Pierce, M.P.H.

Mentor: Kelly R. Ylitalo, Ph.D.

The purpose of this study was to examine the relationship between sex education and subsequent HIV testing among young men who have sex with men (YMSM). Data were from YMSM aged 15-24 years at interview in the 2006-2010 or 2011-2015 National Survey of Family Growth. Sex education included three contexts (formal institutions, parents, and healthcare providers) and the primary outcome was ever-HIV testing. Multivariate models adjusted for sociodemographics and data were weighted to account for the sampling design. Overall, 42.4% had ever-tested for HIV. YMSM were more likely to have ever-tested for HIV if they talked with a parent/guardian about HIV/AIDS prevention (adjusted prevalence ratio[aPR]=1.48; 95%CI:1.07-2.06), talked with a healthcare provider about HIV/AIDs transmission (aPR=1.64; 95%CI:1.13-2.38), condom use (aPR=1.61; 95%CI:1.13-2.30), and the importance of HIV testing (aPR=1.83; 95%CI:1.22-2.73). Tailored sex education by parent(s) and healthcare providers related to HIV/AIDS appears to significantly increase the likelihood of HIV testing among YMSM.

Sex Education and HIV Testing Among Young Men Who Have Sex with Men: Findings From the 2006-2010 and 2011-2015 National Survey of Family Growth

by

Jace D. Pierce, B.S.

A Thesis

Approved by the Department of Health, Human Performance, and Recreation

_____

Paul M. Gordon, Ph.D., Chairperson

Submitted to the Graduate Faculty of
Baylor University in Partial Fulfillment of the
Requirements for the Degree
of

Master of Public Health

Approved by the Thesis Committee

_____

Kelly R. Ylitalo, Ph.D., Chairperson

_____

Beth A. Lanning, Ph.D.

_____

Christine C. Limbers, Ph.D.

Accepted by the Graduate School

May 2018

_____

J. Larry Lyon, Ph.D., Dean

Page bearing signatures is kept on file in the Graduate School.

TABLE OF CONTENTS

LIST OF TABLES

ACKNOWLEDGMENTS

First, I would like to thank my Heavenly Father for His strength and compassion. I would also like to thank my parents for their endless support and encouragement. There are not enough words to describe how thankful I am to both of you. Thank you for listening to me voice my frustrations and celebrating my many successes while in the MPH program. To my advisor and thesis chairperson, Dr. Kelly Ylitalo, I could not have asked for a better mentor and thesis chairperson. Thank you for investing in me and equipping me with the knowledge and skills needed to produce high quality work and continue my pursuit of a Ph.D. and research career. Thank you to both Dr. Beth Lanning and Dr. Christine Limbers for serving on my thesis committee and providing crucial feedback and suggestions for improving my thesis. Finally, thank you to all my closest friends for supporting me throughout the MPH program.

DEDICATION

To my beloved uncle, Larry Tribble, for all his love and support during my youth and encouraging me to achieve my dream of becoming a true academic scholar

LIST OF ABBREVIATIONS

ACASI.....Audio Computer-Assisted Self-Interviewing Technique
AIDS .....Acquired Immunodeficiency Syndrome
CAPI .....Computer-Assisted Personal Interviewing Technique
CDC .....Centers for Disease Control
GRID..... Gay-Related Immune Deficiency
HIV .....Human Immunodeficiency Virus
LGBTQ .....Lesbian, Gay, Bisexual, Transgender, and Queer
MSA.....Metropolitan Statistical Areas
MSM ..... Men who have sex with men
MMWR.....Morbidity and Mortality Weekly Report
NCHS..... National Center for Health Statistics
NHAS.....National HIV/AIDS Strategy
NSFG .....National Survey of Family Growth
ONAP.....Office of National AIDS Policy
PPS.....Probability Proportionate to Size
PSU ..... Primary Sampling Unit
SSU ..... Second Stage Sampling Unit
STD.....Sexually Transmitted Disease
STI.....Sexually Transmitted Infection
TIGER..... Topologically Integrated Geographic Encoding and Referencing system
YRBSS.....Youth Risk Behavior Surveillance System
YMSM .....Young men who have sex with men
U.S. .....United States
USDHHS.....United States Department of Health and Human Services
WHO.....World Health Organization

CHAPTER ONE

Introduction

Background and Significance

The Human Immunodeficiency Virus (HIV) is the lentivirus that causes HIV infections and leads to the development of the acquired immunodeficiency syndrome (AIDS). HIV continues to disproportionally affect the adolescent and young adult populations in the United States (Centers for Disease Control [CDC], 2017c). In 2015, 22% of the 39,500 new HIV diagnoses in the United States occurred among those aged 13-24 years.(CDC, 2014c, 2017c). The number of new HIV diagnoses among adolescents and young adults remains high when compared to other populations. However, this finding only represents one portion of the larger HIV problem among youth in the U.S.

In 2013, approximately 60,900 adolescents and young adults aged 13-24 years were living with HIV and 31,300 (51%) were living undiagnosed (CDC, 2017c). This finding is a major public health concern as HIV seropositive adolescents and young adults who are living undiagnosed are more likely to be unaware of their HIV serostatus and their ability to sexually transmit HIV (Campsmith, Rhodes, Hall, & Green, 2010; Duncan MacKellar et al., 2005). To further exacerbate this problem, adolescents and young adults are more likely than their older peers to engage in HIV risk-taking behaviors, such as unprotected sexual intercourse and sexual intercourse with a large number of sex partners (Blake et al., 2001; Garofalo, Deleon, Osmer, Doll, & Harper, 2006).

National surveillance data show that the initiation of sexual risk-taking behaviors and the use of drugs/alcohol is most prominent during adolescence and/or emerging adulthood (Kann et al., 1998). Furthermore, national data continue to show that the prevalence of these risk-taking behaviors remains high among the adolescent and young adult populations (Eaton et al., 2008). Data from the Youth Risk Behavior Surveillance System (YRBSS) show that 43% of all U.S. high school students surveyed in 2015 did not use a condom during the last time they had sex and 21% had used alcohol or drugs prior to their last sexual encounter (Kann, 2016). Similar national data from the 2011-2015 National Survey of Family Growth (NSFG) show that a third of male adolescent participants aged 15-19 years did not use a condom during their last sexual encounter (Abma & Martinez, 2017). These high-risk sexual behaviors leave many adolescents and young adults susceptible to HIV, but specific subpopulations may be more likely to perform these risk-taking behaviors and, consequently, acquire HIV (CDC, 2017a, 2017c).

The subpopulation of adolescents and young adults who self-identify as lesbian, gay, bisexual, transgender, or queer (LGBTQ) are among those at highest risk for acquiring HIV (CDC, 2017c). Research suggests that LGBTQ adolescents are more likely than their heterosexual peers to engage in a variety of sexual risk-taking behaviors, such as drinking alcohol and/or using drugs prior to sexual intercourse, having unprotected intercourse (e.g., unprotected anal intercourse), engaging in sexual intercourse earlier in the life course, and having a large number of sex partners (Blake et al., 2001; Garofalo, Wolf, Kessel, Palfrey, & DuRant, 1998). Although there are many HIV risk-taking behaviors among the LGBTQ population, unprotected anal intercourse

remains the most common route of HIV transmission among gay and bisexual youth in the U.S. (CDC, 2014b, 2017c).

Young gay and bisexual males, which are part of a specific subgroup of the LGBTQ population, are disproportionally affected by HIV in the U.S. (CDC, 2017c). YRBSS data produced by the CDC show that 88.8% of adolescents in grades 9-12 identified as heterosexual, 6.4% identified as bisexual, and only 2.0% identified as homosexual (Kann, 2016). In 2015, 8,807 adolescents and young adults were diagnosed with HIV in the U.S. and 81% of all these new diagnoses were among young gay and bisexual males (CDC, 2017c).

Although sexual orientation is helpful to categorize adolescents and young adults for various reasons, it is not the best way to document HIV prevalence and risk. This is because the risk of acquiring HIV is not based on self-identity or sexual orientation, but rather on the behavior(s) performed (e.g., unprotected same-sex intercourse and needle sharing) (Mustanski, Newcomb, Du Bois, Garcia, & Grov, 2011; Young & Meyer, 2005). Since same-sex behavior is of primary interest, it is necessary that surveillance systems capture the number of U.S. adolescents engaging in same-sex behavior. Nationwide, 48% of U.S. high school students had engaged in sexual contact with only the opposite sex, 45.7% had not engaged in sexual contact, 4.6% had engaged in sexual contact with both sexes (i.e., male and female), and only 1.7% had engaged in sexual contact with the same sex (e.g., male-only) (Kann, 2016).

A dense body of literature and HIV surveillance data suggest that gay, bisexual, and other men who have sex with men (collectively referred to as MSM) in the U.S. continue to be severely affected by HIV (CDC, 2013, 2017a). CDC data produced in

2015 show that MSM accounted for approximately 56% of the 1.1 million people living with HIV. However, young men who have sex with men (hereafter referred to as YMSM), which is a specific subpopulation of both the MSM and adolescent/young adult populations, is a group most severely affected by HIV. In 2011, approximately 93% of all new HIV infections among male adolescent and young adults aged 13-29 years were attributed to male-to-male sexual contact. Furthermore, the YMSM population aged 13-24 years also experienced a 26% increase in the percentage of new HIV infection in 2008-2011 (CDC, 2014b). This increase was the greatest among any other group in the U.S. The large number of incidence cases of HIV and overall prevalence of HIV among YMSM can be attributed to the groups' high rates of unprotected anal intercourse, which is the sexual behavior that puts an individual most at risk for HIV acquisition (Dudley, Rostosky, Korfhage, & Zimmerman, 2004; Hays et al., 1997)

The adolescent and young adult population, specifically the subpopulation of YMSM, are prime targets to reduce HIV transmission and increase uptake of HIV prevention methods, such as HIV testing. However, classifying and tracking YMSM is difficult as the definition of the YMSM population is not consistent across large research efforts. Moreover, the concept of identity is often used to document HIV incidence and prevalence rather than the sexual behaviors performed (Mustanski et al., 2011; Young & Meyer, 2005)

The Definitional Dilemma

The acronym "MSM" was coined in the early 1990s to describe men who engage in same-sex behavior (M. Glick, Muzyka, Salkin, & Lurie, 1994). Prior to the use of the acronym "MSM," terms and labels that typically described this population were based

solely on personal identity and sexual orientation (i.e., gay, homosexual, or queer) (Young & Meyer, 2005). These initial terms exclude many men who engage in same-sex behavior but happen to not identify as gay or bisexual. Thus, the adoption of the acronym "MSM" is related to the need for distinction between performed sexual behavior and personal identity (Mustanski et al., 2011; Young & Meyer, 2005)

The adoption of the term "MSM" is beneficial for two research-related reasons. First, the use of the term MSM is advantageous from an epidemiologic standpoint as researchers tracking disease and risk can avoid the complex social and cultural issues that come from the use of identity-driven terms, such as "homosexual," "gay," and "bisexual." (Young & Meyer, 2005). As a result, the problems associated with the transmission of diseases, such as HIV, are not placed on the members of the population that self-identify as gay/homosexual, but rather on the behavior that impacts disease transmission (Young & Meyer, 2005). Second, epidemiologists and researchers that use surveillance systems to track disease and use the term "MSM" have the unique ability to seperate behaviors from identities. This is important distinction as behaviors, not identities, lead to acquisition of many diseases, such as HIV (Young & Meyer, 2005). Thus, the acronym "MSM" captures men that engage in same-sex practices, regardless of sexual orientation or personal identity (Mustanski et al., 2011; Young & Meyer, 2005). Although the use of the term MSM allows epidemiologists to capture men that perform same-sex behaviors, many other researchers continue to advise against its use and have argued that public health professionals should instead adopt culturally sensitive language (Khan & Khan, 2006; Young & Meyer, 2005)

In addition to the "MSM" acronym, the term "young men who have sex with men" and corresponding acronym "YMSM" also suffers from similar definitional issues. According to various national organizations and large-scale survey efforts that collect, and report disease surveillance data related to YMSM define "young" as the age range of 13-24 years (CDC, 2014c; Duncan MacKellar, Valleroy, Karon, Lemp, & Janssen, 1996; WHO, 1995). The age range of 13-24 years corresponds to key developmental periods of adolescence and emerging adulthood. Adolescence is considered the lifespan development period that characterizes the transition from puberty to maturity and the beginning of adulthood. The World Health Organization (WHO) suggests that adolescence encompasses the age range of 10-19 years (WHO, 1995). In contrast, Arnett (2000) was the first to coin the term "emerging adulthood, "which encompasses late adolescence and early adulthood. The term "emerging adulthood" corresponds to the distinct age range of 18-25 years (Arnett, 2000). Although there is an ill-defined age range difference between adolescence and emerging adulthood, persons in both developmental periods of life are more likely to engage in risk behaviors, including HIV and other sexual risk-taking behaviors (e.g., unprotected anal intercourse) (Fergus, Zimmerman, & Caldwell, 2007).

Importance of Identifying Correlates of HIV Testing

HIV is an ongoing public health problem in the U.S. and has received significant attention from a variety of national and federal directives, including the National HIV/AIDS Strategy (NHAS) and *Healthy People 2020,* which is a 10-year national health objective strategy developed by the United States Department of Health and Human Services (USDHHS) (ONAP, 2015; USDHHS, 2017). *Healthy People 2020* and

the NHAS have both developed goals to improve and increase engagement in HIV prevention efforts, increase access to care, improve health outcomes for persons living with HIV, and reduce HIV-related health disparities and inequities (ONAP, 2015; USDHHS, 2017)

The NHAS includes four primary goals: (1) reducing the number of new HIV infections; (2) increasing access to care and significantly improving health outcomes for persons living with HIV; and (3) reducing HIV-related health disparities (ONAP, 2015). Similar to the NHAS, the Office of Disease Prevention and Health Promotion (ODPHP) and *Healthy People 2020* have denoted HIV as a leading public health concern in the U.S. and has created various strategies to combat the spread of HIV (USDHHS, 2017). Both the NHAS and *Healthy People 2020* include strategies for preventing HIV transmission and increasing uptake of HIV testing among MSM, including YMSM (ONAP, 2015; USDHHS, 2017).

Since YMSM are at a substantial risk for acquiring HIV (CDC, 2014c), *Healthy People 2020* has created specific goals and objectives to measure progress in reducing HIV transmission, increasing access to care, and reducing HIV-risk taking behaviors (e.g., unprotected anal sex) among YMSM (USDHHS, 2017). The *Healthy People 2020* HIV-related goals related to YMSM are: (1) to reduce the number of new AIDS cases among adolescent and adult men who have sex with men (MSM) (HIV-6); (2) to reduce the percentage of young gay and bisexual males in grades 9 through 12 who engage in HIV-risk behaviors (HIV-24); and (3) to increase the proportion of men who have sex with men (MSM) who report having been tested for HIV in the past 12 months (HIV-14) (USDHHS, 2017). Although these goals are specifically related to YMSM and MSM,

other *Healthy People 2020* HIV-related goals are also important to combat the spread and improve HIV-related health outcomes of YMSM (USDHHS, 2017). For example, the HIV-13 goal was designed to increase the proportion of persons living with HIV, including YMSM, who know their HIV serostatus (USDHHS, 2017).

One factor that may influence HIV testing behaviors among adolescents and young adults, including YMSM, is the receipt of formal sex education. Formal sex education refers to instruction that takes place in a school, youth center, church, or other community setting (Lindberg, Maddow-Zimet, & Boonstra, 2016). Data from the 2011-2013 NSFG show that more than 85% of all adolescents aged 15-19 years received formal sex education on how to prevent HIV/AIDS, more 90% received formal sex education on how to prevent sexually transmitted infections (STIs), and more than 80% received formal sex education on how to say no to sex (Lindberg et al., 2016). In contrast, only 55% of adolescent males and 60% of adolescent females received formal sex education about methods of birth control (Lindberg et al., 2016). In addition, only 50% of adolescent females and 58% of adolescent males received instruction on how to properly use a condom (Lindberg et al., 2016).

Between 2006-2010 and 2011-2013, male adolescents' receipt of formal sex education on a variety of topics did not significantly change. These formal sex education topics included how to say no to sex (82% to 84%), how to prevent STIs (92% to 91%), and how to prevent HIV/AIDs (88% to 86%) (Lindberg et al., 2016). However, male adolescents' receipt of formal sex education on methods of birth control has significantly decreased from 61% in 2006-2010 to 55% in 2011-2013.

Similar to the national goals and objectives created for HIV prevention, *Healthy People 2020* has also created specific goals and objectives to address the topic of formal sex education. The *Healthy People 2020* formal sex education-related goal is to increase the proportion of adolescents who received formal instruction on reproductive health topics before they were 18 years old (FP-12) (USDHHS, 2017). For male adolescents, the objectives are related to increasing the proportion of male adolescents who received formal instruction about abstinence from 82.5% in 2006-2010 to 90.8% (FP-12.2), birth control methods from 60.8% in 2006-2010 to 66.9% (FP-12.4), and HIV/AIDS prevention from 87.9% to 96.7% by the year 2020 (FP-12.6). Ultimately, receipt of these sex education topics, including those related to HIV/AIDS and STI prevention, may be associated with HIV testing among YMSM.

In addition to formal sex education, many adolescents and young adults also receive sexual health instruction on a range of topics from parents. However, certain sex education topics are more commonly received from parents than others. Data from the 2006-2013 NSFG show that only 70% of all male adolescents and 78% of female adolescents aged 15-19 years have talked with a parent about one of the following six sexual health topics: (1) how to say no to sex; (2) methods of birth control; (3) sexually transmitted infections (STIs); (4) where to get birth control, (5) how to properly use a condom; and/or (6) how to prevent HIV infection (Lindberg et al., 2016). Within each sexual health topic, there are also significant differences between genders. For example, male adolescents were more likely to discuss condom use with their parents compared to female adolescents. In contrast female adolescents were more likely to discuss the other five topics with parents compared to male adolescents (Lindberg et al., 2016).

Data from the 2011-2013 NSFG show that only 58% of male adolescents received parental instruction on how to properly use a condom, 86% received information from parents on how to prevent HIV/AIDS, and 91% self-reported parental instruction on how to prevent STIs (Lindberg et al., 2016). These findings suggest that many male adolescents are not receiving parental sex education on topics directly linked to HIV/AIDS prevention. In addition to HIV/AIDS specific topics, 84% of male adolescents received parental instruction on how to say no to sex, 55% received instruction of methods of birth control, and only 38% received information on where to get birth control (Lindberg et al., 2016).

Similar to the national goals and objectives created for HIV prevention and formal sex education, *Healthy People 2020* has also created specific goals and objectives to address the topic of parent-adolescent sex communication. The *Healthy People 2020* parent-adolescent sex communication-related goal is to increase the proportion of adolescents who have talked to a parent or guardian about reproductive health topics before they were 18 years old (FP-13) (USDHHS, 2017). For male adolescents, the objectives are related to increasing the proportion of male adolescents who talked to parent or guardian about abstinence from 41.2% to 45.3% (FP-13.2), birth control methods from 29.2% to 32.1% (FP-13.4), HIV/AIDS prevention from 37.8% to 41.6% (FP-13.6), and sexually transmitted diseases from 48.1% to 52.9% by the year 2020 (FP-13.8). It may be possible that some of the sex education topics discussed with parents may be associated with HIV testing, especially those topics that are related to HIV/AIDS or sexually transmitted infections (STIs).

Health care providers and physicians are another crucial sexual health resource for many adolescents. The American Medical Association and the American Pediatrics Association both recommend that health care providers and physicians discuss sexuality and sexual behaviors with adolescents (Elster, 1997). Although these associations recommend confidential sexual health communication between adolescents and health care providers, many health care providers do not talk with their adolescent patients about sexual health issues during regular health visits (Donaldson, Lindberg, Ellen, & Marcell, 2013). Data from the 2006-2010 NSFG show that only 21% of sexually experienced adolescent males self-reported having STI/HIV prevention discussion with their health care provider in the previous year (Donaldson et al., 2013). In addition, only 22% of sexually experienced adolescent males discussed information about the methods of birth control from a provider in the previous year (Donaldson et al., 2013). Similar to formal sex education and sex education by parents, it may be hypothesized that patient-provider conversations directly related to HIV/AIDS and STI prevention are associated with HIV testing.

Purpose

The purpose of this study is to examine the associations between formal sex education, sex education by parents, patient-provider sexual health communication, and HIV testing behaviors using a nationally representative sample of sexually active YMSM aged 15-24 years. The questions and health information that are associated with HIV testing could be used to inform the approaches taken by health care providers, family members, and formal institutions (e.g., schools, community centers, and churches) to prevent HIV transmission, increase HIV testing, and better serve YMSM. The proposed

project will also help to determine if formal institutions, health care providers, and parents are comprehensively addressing the sex education needs of YMSM and discussing topics that are most relevant to the YMSM population.

Research Questions and Hypotheses

1) First, the study aims to determine which formal sex education topics are associated with HIV testing behaviors (i.e., ever been tested and tested in the last 12 months) among sexually active YMSM aged 15-24 years.
    a. We hypothesized that YMSM aged 15-24 years who received formal sex education on how to use a condom, sexually transmitted diseases (STDs), and/or how to prevent HIV/AIDS will be more likely to have ever been tested for HIV and/or tested for HIV in the last 12 months than sexually active YMSM aged 15-24 years who did not receive formal sex education on those topics.
2) Second, the study aims to determine which sex education topics presented by parents are associated with HIV testing behaviors (i.e., ever been tested and tested in the last 12 months) among sexually active YMSM aged 15-24 years.
    a. We hypothesize that sexually active YMSM aged 15-24 years who reported having received sex education by parents on how to use a condom, sexually transmitted diseases (STDs), and/or how to prevent HIV/AIDS will be more likely to have ever been tested for HIV and/or tested for HIV in the last 12 months than sexually active YMSM aged 15-24 years who did not receive sex education by parents on those topics.

3) A third aim of the study is to determine which topics presented during patient-provider sexual health communication and education are associated with HIV testing among sexually active YMSM aged 15-24 years.
    a. We hypothesize that sexually active YMSM aged 15-24 years who reported having received patient-provider sexual health communication and education on how HIV/AIDS is transmitted, the correct use of condoms, and/or getting tested and knowing your HIV status will be more likely to have ever been tested for HIV and/or tested for HIV in the last 12 months than sexually active YMSM aged 15-24 years who did not receive patient-provider sexual health communication and education on those topics.

Limitations

There are several potential limitations of this study. First, the data from the 2006-2010, 2011-2013, and 2013-2015 NSFG are self-reported, and as a result, are subject to recall bias. Recall bias is a type of information bias that can result in misclassification of participants (i.e., exposed persons may be misclassified as unexposed and vice versa) (Aschengrau & Seage, 2013). Since the NSFG is retrospective in nature, participants must recall whether they had received formal sex education and sex education by parents on a variety of topics. The NSFG methodology incorporated age restrictions to limit the threat of recall bias (e.g., the questions related to receipt of sex education were only asked to participants aged 15-24 years); however, participants still may have been misclassified based on their own recall of exposure.

In addition to the issue of recall bias, cross-sectional survey designs also cannot adequately assess the temporal relationship between the exposure of interest and the

outcome of interest (Aschengrau & Seage, 2013). For example, the temporal relationship related to the associations between the independent variables of interest (e.g., formal sex education and sex education by parents) and the dependent variables of interest (e.g., ever tested for HIV and HIV testing in the last 12 months) cannot be adequately assessed as the cross-sectional survey design does not account for timing of the exposure and outcome. As a result, the study cannot determine whether receipt of sex education/communication preceded the HIV testing behavior(s) in question.

Another limitation of the current study directly corresponds with the design of the NSFG questionnaire. The NSFG questionnaire only measures the occurrence/receipt of formal sex education, sex education by parents, and patient-provider sexual health communication topics. This study would need additional information/variables to assess receipt of sex education/communication in more detail. For example, the study is unable to determine the information source (e.g., mother, father, or another guardian) for the sex education by parent(s) variables and the location where formal sex education was received (e.g., church, community center, and school-based sex education). These factors may influence the relationship between the independent variables of interest and health/behavioral outcomes. For example, the receipt of sex education by mothers may impact health and behaviors differently than the receipt of sex education by fathers (Clawson & Reese- Weber, 2003; Fasula & Miller, 2006; Whitaker, Miller, May, & Levin, 1999).

The methodology of the current study may also have several limitations. First, the study used complex survey weights that were developed by the National Center for Health Statistics (NCHS). The data were analyzed separately for each NSFG interviewing

period (i.e., 2006-2010 and 2011-2015). The current study aimed to scale to the full population by utilizing a total survey weight that would account for the complex sampling design. The corresponding weights for the 2006-2010 and 2011-2015 NSFG were each scaled down by a factor of two since two different data files were combined. Although the data were analyzed using a total complex survey weight, the results could not be reported as 2006-2015 since there is a 15-month gap in interviewing between the 2006-2010 and 2011-2015 survey periods (NCHS, 2014, 2016). The 2013-2015 NSFG user guide also suggests that the weights were not designed or adjusted for the purpose of accounting for the 15-month gap and reporting total findings from the two time periods (NCHS, 2014, 2016).

A second potential limitation was that the fact that very few YMSM participants (n=4) reported having been tested for HIV in the past 12 months. The study originally aimed to assess associations between the independent variables of interest and both ever tested for HIV and tested for HIV in the past 12 months. Prevalence ratios (PRs) and adjusted prevalence ratios (aPRs) using the HIV testing 12-month variable as the dependent variable could not be calculated due to the small sample size of YMSM that had been tested for HIV in the past 12 months. Nevertheless, this finding is extremely important as it highlights the fact that HIV testing among the YMSM population fails to meet the CDC's recommendations, the HIV testing goals and objectives set by *Healthy People 2020* and highlights the need for opt-out HIV testing strategies.

A third potential limitation may be present in how patient-provider sexual health communication about HIV was assessed in each of the NSFG interviewing years. The variable names in the patient-provider sexual health communication about HIV universe

are consistent across interviewing years; however, one variable in the universe differed in the types of participants who were asked its corresponding question. The NSFG variable "TALKDOCT" in the 2013-2015 NSFG refers to the question, "Has a doctor or other medical care provider ever talked with you about HIV, the virus that causes AIDS?" Participants were then asked to answer "yes," "no," "I don't know," or they could have refused to answer the question. In contrast, the "TALKDOCT" variable in the 2006-2010 NSFG refers to the question, "Did a doctor or other medical care provider talk with you about AIDS after you had this last HIV test (outside of blood donation)?" The answer choices were the same as the 2006-2010 NSFG. The most important difference is that the question in the 2006-2010 NSFG was only applicable to NSFG participants that had ever been tested for HIV. As a result, the patient-provider sexual health communication about HIV could not be combined in the present study. In addition, PRs and aPRs could only be calculated using data specific to each respective NSFG interviewing period (i.e., 2006-2010 and 2011-2015).

Public Health Benefits

The HIV epidemic in the U.S. continues to be a major public health concern, especially among the adolescent and young adult population. In 2015, adolescents and young adults aged 13 to 24 years accounted for over 22% of all new HIV diagnoses in the U.S. (CDC, 2017c). Moreover, 81% of these diagnoses occurred among gay and bisexual males (CDC, 2017c). Approximately, 93% of all diagnosed HIV infections among adolescents and young adults aged 13-19 years were from male-male sexual contact. The subpopulation of YMSM aged 13-24 years, which includes gay and bisexual males, experienced a 26% increase in diagnosed HIV infections from 2008-2011. In addition,

national data suggest that many YMSM remain unaware of their serostatus and ability to sexually transmit HIV (Duncan MacKellar et al., 2005; Smith, Le, Finlayson, Oster, & DiNenno, 2010).

A recommendation and public health goal for addressing the high incidence rates of HIV and the lack of awareness of HIV status among high risk populations, such as YMSM, is to increase HIV testing (USDHHS, 2017). Two *Healthy People 2020* objectives directly related to this recommendation include increasing the proportion of men who have sex with men (MSM) who report having been tested for HIV in the past 12 months (HIV-14) and increasing the proportion of persons living with HIV, including YMSM, who know their HIV serostatus (USDHHS, 2017). The HIV testing levels uncovered by this study may be compared to those recommendations and goals produced by both the CDC and *Healthy People 2020*. This will help determine if YMSM are getting tested regularly and if testing numbers meet current national objectives both for the total population and the YMSM population.

The current study is centered on identifying correlates of HIV testing behaviors specific to YMSM aged 15-24 years, which remain largely unexplored by current literature. The information gleaned from this study adds to the current knowledge of HIV testing among YMSM. Identifying the specific correlates of HIV testing would help researchers and public health professionals improve strategies and interventions aiming to increase HIV testing among YMSM. Specifically, health educators and organizations (e.g., schools, faith organizations, and youth-serving organizations) can use the information obtained from this study to construct program materials, health messages, and have discussions about HIV testing. In addition, parents can use the information to

develop communication strategies and identify sexual health topics to discuss with their children. This information may also encourage parents to discuss HIV testing and HIV prevention methods with their children. The information obtained from this study may be used to inform the approaches taken by both healthcare providers and family planning clinicians to better serve YMSM and encourage regular HIV testing.

CHAPTER TWO

Overview of Factors Impacting HIV Testing Among YMSM

Introduction

The Acquired Immune Deficiency Syndrome (AIDS) was first discovered in 1981 when five cases of previously healthy men who self-identified as homosexual and resided in Los Angeles, California were treated for *Pneumocystis carinii* pneumonia (CDC, 1981b; Masur et al., 1981). The unusually large number of *Pneumocystis carinii* pneumonia cases led to a nationwide investigation to discover the possible causes of the rare disease (Curran & Jaffe, 2011). A corresponding *Morbidity and Mortality Weekly Report (MMWR)* produced by the CDC in 1981 suggested that the disease exhibited by these homosexual men was acquired through sexual contact, specifically male-male sexual contact, and compromised the human immune system (CDC, 1981b; Masur et al., 1981). After the first cases of AIDS were identified, CDC researchers published multiple *MMWR*s that documented other similar cases among gay/homosexual men throughout the U.S., including multiple cases in New York City (CDC, 1981a). As a result, the CDC and many other scientists suggested that the disease was directly linked to the gay/homosexual lifestyle (CDC, 1981a, 1981b; Masur et al., 1981).

AIDS was initially termed Gay-Related Immune Deficiency (GRID) and called the "gay plague" by the CDC, doctors, researchers, and newspapers (Curran & Jaffe, 2011; Lawrence, 1982). However, the acronym GRID was soon rendered obsolete as similar cases of the disease emerged in other populations, such as injection drug users (Masur et al., 1981), Haitians (CDC, 1982a), small children and infants (CDC, 1982b),

female Americans (CDC, 1983), and blood transfusion patients (Ammann et al., 1982). It was not until after 1983 that the Human Immunodeficiency Virus (HIV) was discovered by scientists and identified as the etiologic agent of AIDS (Barré-Sinoussi et al., 1983). After Barré-Sinoussi and colleagues (1983) identified HIV, CDC researchers began to document HIV transmission and discovered that same-sex intercourse was only one of many modes of HIV transmission.

After the discovery of HIV in 1994, scientists learned that HIV strategically attacks and destroys the human body's $CD4^+$ T-cells, which are crucial pieces of the human immune system (Alimonti, Ball, & Fowke, 2003; Dalgleish et al., 1984). Once a person is infected with HIV, the lentavirus slowly progresses, $CD4^+$ T-cell counts drop, and the immune system develops an inability to fight off many opportunistic illnesses and common diseases (Naidoo, Naidoo, Padayatchi, & Abdool Karim, 2010; Tortorella, Gewurz, Furman, Schust, & Ploegh, 2000). For example, Tuberculosis, which is caused by the bacterium *Mycobacterium tuberculosis*, can enter the body via inhalation and take advantage of a compromised immune system (Naidoo et al., 2010; Tortorella et al., 2000). In addition to Tuberculosis, other opportunistic illnesses, such as *Pneumocystis carinii* pneumonia (most common) and Kaposi sarcoma, are also able to take advantage of an HIV-related weakened immune system (Selik et al., 2014).

HIV can easily destroy $CD4^+$ T-cells, compromise the human immune system, and leave the body susceptible to deadly opportunistic infections (Alimonti et al., 2003; McCune, 2001). Unfortunately, there is no known cure for HIV/AIDS; however, there are several medications (antiretroviral medications), treatments, and interventions available to reduce the symptoms associated with HIV/AIDS, improve life expectancy,

and improve quality of life (May et al., 2014; Palella Jr et al., 1998). Nevertheless, the CDC recommends that individuals limit their exposure to the most common routes of HIV transmission by abstaining from high-risk behaviors, such as unprotected sexual intercourse and needle-based drug injection (CDC, 2016a, 2016b, 2016c). HIV can be transmitted via unprotected sex (i.e., anal, oral, and vaginal sex) (CDC, 1983), blood transfusions (Ammann et al., 1982; Lackritz et al., 1995), needle-based drug injections (CDC, 2016c), breastfeeding (CDC, 1983, 2016c), and from mother to child during pregnancy (i.e., congenital transmission) (CDC, 2016c). Contrary to popular belief, the primary mode of transmission worldwide is through heterosexual contact (i.e., opposite-sex intercourse) (UNAIDS, 2014). However, the most common mode of HIV transmission in the U.S. is through male-male sexual contact (CDC, 2016c).

The CDC has developed a three-stage classification system to assess the severity of HIV infections for surveillance purposes (Schneider et al., 2008; Selik et al., 2014). The aim of the classification system is to identify HIV seropositive persons based on their $CD4^+$ T-cell count and/or presence of an AIDS-defining disease (Schneider et al., 2008; Selik et al., 2014). In general, the first two stages are referred to as acute and chronic HIV infections and are characterized by drops in $CD4^+$ T-cell counts and a lack of AIDS-defining opportunistic illnesses (Selik et al., 2014). In stage 3, an individual receives an AIDS diagnosis when their $CD4^+$ T-cell count falls below 200 $CD4^+$ T-cells per cubic millimeter of blood and/or they develop one of many AIDS-defining opportunistic illnesses, such as Kaposi sarcoma and HIV-related wasting syndrome (Selik et al., 2014).

Three decades have passed since the first case of HIV/AIDS was first identified in 1981. In 2015, there was approximately 36.7 million people living with HIV worldwide (WHO, 2016). Currently, approximately 1.2 million people are living with HIV in the United States (CDC, 2016c). Racial and ethnic minorities are disproportionally affected by HIV (CDC, 2014c). For example, African Americans comprise 13.3% of the total U.S. population, yet account for 43% of the 1.2 million people living with HIV in the U.S. and for over 44% of all new HIV diagnoses in 2014 (CDC, 2014c). Furthermore, Hispanic/Latinos account for 21% of all persons living with HIV (CDC, 2017b). However, gay/homosexual men, especially racial and ethnic minority gay men, are severely affected by HIV in the U.S. (CDC, 2013, 2014b, 2017a, 2017b).

In 2016, it was estimated that gay, bisexual, and other MSM constitute approximately 2% of the United States population (CDC, 2016a; Copen, Chandra, & Febo-Vazquez, 2016). Although MSM represent a relatively small proportion of the United States population, they are more severely affected by HIV than any other group in the United States (CDC, 1982b, 2013, 2014a, 2015, 2017a). In 2014, gay/homosexual men accounted for approximately 55% of the 1.2 million people living with HIV in the U.S. and 83% of all new HIV diagnoses among U.S. males aged 13 years and older (CDC, 2017a). Overall, gay/homosexual men account for a 15.3% of all undiagnosed HIV infections in the United States, with young gay/homosexual men and other young MSM aged 13-24 years (hereafter referred to as YMSM) bearing the largest amount of undiagnosed infections and the greatest health burden (CDC, 2014b). Recent 2008-2014 national data show that HIV infections have declined by 18-20% overall in the U.S. and

by 18% among gay/homosexual men aged 13-24 years (CDC, 2017c). Nevertheless, the YMSM population continues to experience high rates of new HIV infections and the number of seropositive YMSM remains disproportionally high.

In 2015, 8,807 adolescent and young adults aged 13-24 years were diagnosed with HIV (CDC, 2017c). Moreover, adolescent and young adults aged 13-24 years accounted for nearly 22% of all new HIV infections in the United States (CDC, 2017c). Of all the adolescents and young adults diagnosed with HIV, 81% were young gay and bisexual men aged 13-24 years (CDC, 2017c). In 2013, a total of 60,900 adolescents and young adults aged 13-24 were living with HIV and 31,300 (i.e., 51%) were living undiagnosed in the U.S. (CDC, 2015, 2017c). As a result, many adolescent and young adults, including YMSM, remain unaware of their HIV serostatus and ability to transmit HIV (Duncan MacKellar et al., 2005).

African American and Hispanic/Latino YMSM are both subgroups of YMSM that are at an elevated risk for acquiring HIV (Hall, Byers, Ling, & Espinoza, 2007; Warren et al., 2008). In 2015, 55% of all HIV diagnoses among youth aged 13-24 years were African American males, 24% were Hispanic/Latino males, and only 16% were white males (CDC, 2017c). Although the number of new HIV infections among African American YMSM remained stable, Hispanic/Latino MSM experienced a 20% increase in the number of new HIV during the same period over the 2008-2014 period (CDC, 2017b). These findings suggest that African American and Hispanic/Latino YMSM are less likely to be aware of their HIV status and may be less likely to engage in HIV prevention measures (i.e., HIV testing) (CDC, 2014a, 2017b; Leonard, Rajan, Gwadz, &

Aregbesola, 2014; Duncan MacKellar et al., 2006; Mimiaga, Goldhammer, Belanoff, Tetu, & Mayer, 2007).

Overall, high HIV incidence and prevalence rates among YMSM can be attributed to a variety of risk factors, such as lack of awareness of current HIV status and partner's HIV status (Pantalone, Tomassilli, Starks, Golub, & Parsons, 2015), high rates of unprotected anal intercourse (Ekstrand, Stall, Paul, Osmond, & Coates, 1999; Koblin et al., 2006; Pantalone et al., 2015), large number of male sex partners (Valleroy et al., 2000), and an overall lack of knowledge about HIV transmission (Mimiaga et al., 2007). As a result, prevention strategies, such as HIV testing and community-based HIV interventions, are needed to combat the spread of HIV, identify undiagnosed individuals, and link seropositive YMSM to care/treatment.

HIV Testing

HIV tests are both primary and secondary prevention measures used to reduce transmission and increase HIV status awareness (Dean & Fenton, 2010; Meanley et al., 2015; Noble, Jones, Bowles, DiNenno, & Tregear, 2017). HIV testing is the first step to becoming aware of one's current HIV status and meeting clinical benchmarks on the HIV continuum of care (e.g., diagnosis, link to health care, and initiation of treatment) (Gardner, McLees, Steiner, Del Rio, & Burman, 2011; Koenig, Hoyer, Purcell, Zaza, & Mermin, 2016; Skarbinski et al., 2015). Health care providers and public health professionals are able to offer HIV tests as a means of identifying HIV seropositive individuals who are unaware of their status and link them to care/treatment (Farnham et al., 2013; Gardner et al., 2011). An increased awareness of current HIV status can result in increased partner notification (Mansergh, Marks, & Simoni, 1995; Marks et al., 1994),

improved sexual health behaviors (Higginbotham et al., 2000), and initiation of HIV treatment (i.e. antiretroviral medications) (Frasca et al., 2014; Skarbinski et al., 2015; Valdiserri, Holtgrave, & West, 1999).

Despite the disproportionately high rates of HIV among gay/homosexual men, many gay men have never been tested and lack awareness of their HIV status (CDC, 2013; Phillips, Ybarra, Prescott, Parsons, & Mustanski, 2015). For example, the CDC (2008) reported that approximately one in five men in a sample of MSM in 21 large U.S. cities tested positive for HIV and over half of the seropositive MSM were unaware of their HIV serostatus. The CDC also suggests that the clear majority of HIV transmission occurs among persons who are unaware of their HIV serostatus (CDC, 2013). Thus, HIV testing is a necessary line of secondary prevention to prevent future HIV transmission (Duncan MacKellar et al., 2005). Unfortunately, many YMSM, especially those of color, may be unaware of their HIV serostatus (Duncan MacKellar et al., 2005). As a result, MSM and YMSM should be regularly tested to become aware of their HIV serostatus to reduce the risk of HIV transmission (Meanley et al., 2015).

The CDC recommends that sexually active gay/homosexual men and other MSM be tested for HIV annually (Branson et al., 2006). In addition, the CDC suggests that high-risk gay/homosexual men and other MSM who are young, have multiple same sex partners, and/or use illicit drugs may benefit from getting tested every three to six months (Branson et al., 2006; Workowski & Berman, 2010; Workowski & Bolan, 2015).

Opt-out HIV testing for adolescents and young adults is one method used to meet the CDC's recommendations and increase HIV testing uptake among high-risk populations, including YMSM (Gullón, Verdejo, de Miguel, Gómez, & Sanz, 2016). The

United States Preventive Services Task Force recommends all health care providers and clinicians implement an opt-out HIV testing procedure for all persons aged 15-65 years (Moyer, 2013). This recommendation coincides with the CDC's 2006 revised recommendations to provide opt-out HIV testing/screening for all persons aged 13-64 years (Branson et al., 2006). In addition to national recommendations, research studies have also called for opt-out HIV testing to increase uptake of testing among high risk adolescents and young adults, including YMSM and MSM of color (Duncan MacKellar et al., 2006; Vincent, McFarland, & Raymond, 2017).

Opt-out HIV testing and the national HIV testing recommendations for high-risk populations are strategies that can be used to attain the HIV goals and objectives set by many national and governmental agencies, including *Healthy People 2020*. Two primary objectives within *Healthy People 2020* (HIV-13 and HIV-14) are to (1) increase the number of persons who know they are HIV seropositive, and (2) increase the number of adolescents and young adults who have ever been tested for HIV (USDHHS, 2017). The HIV-13 objective notes that only 80.9% of persons aged 13 and older living with HIV were aware of their serostatus in 2006; however, *Healthy People 2020* aims to reach 90.0% by 2020 (USDHHS, 2017). Furthermore, the HIV-14 sub-objectives specifically focus on reducing HIV transmission and increasing HIV uptake among MSM (USDHHS, 2017). In 2008, only 62.2% of MSM were tested for HIV in the previous 12 months (USDHHS, 2017); however, *Healthy People 2020* aims to increase this percentage to 68.4% by 2020 (USDHHS, 2017). To accomplish these goals and objectives, it is necessary to promote HIV testing to populations at the highest risk of acquiring HIV, including YMSM (Meanley et al., 2015).

In addition to the low rates of HIV testing among YMSM found by the CDC, other research studies also suggest that HIV testing among YMSM remains relatively low, especially when compared to other high-risk groups (Leonard et al., 2014; Duncan MacKellar et al., 2006; Phillips et al., 2015; USDHHS, 2017; Wilkerson, Fuchs, Brady, Jones-Webb, & Rosser, 2014). Furthermore, large-scale research studies and national trend data suggest that HIV testing rates among YMSM and other MSM are suboptimal and do not reach *Healthy People 2020* objectives nor coincide with the CDC's HIV testing recommendations. For example, Finalyson and colleagues (2011) used data from the National HIV Behavioral Surveillance System to create a recent national report on HIV testing prevalence. The report indicated that less than 65% of YMSM had been tested for HIV in the previous 12 months (Finlayson et al., 2011), which falls below the *Healthy People 2020* goal of 68.4% (USDHHS, 2017). As a result, many YMSM, especially racial and ethnic minority YMSM, remain unaware of their true HIV status and their ability to transmit HIV (CDC, 2013).

Recent HIV testing is associated with having a healthcare provider that is knowledgeable about MSM sexual behaviors and willing to discuss sexual orientation (Bernstein et al., 2008; Prestage et al., 2009; Wall, Khosropour, & Sullivan, 2010), having multiple male sex partners (Maguen, Armistead, & Kalichman, 2000; Sumartojo et al., 2008; Wilkerson et al., 2014), engaging in unprotected sexual intercourse (Povinelli, Remafedi, & Tao, 1996), and having parent-adolescent communication about sex behaviors (Bouris, Hill, Fisher, Erickson, & Schneider, 2015). Investigating the facilitators to HIV testing among YMSM is crucial for understanding the low rates of HIV testing and developing methods to increase HIV testing uptake (Phillips et al.,

2015). As a result, the current study will examine the associations between formal sex education, parent-adolescent sex communication, patient-provider sexual health communication, and HIV testing behaviors among YMSM.

Formal Sex Education

Formal sexual health education refers to instruction that takes place in a school, youth center, church, or other community setting (Lindberg et al., 2016). National public health and medical professional organizations, including the American Public Health Association, Society of Adolescent Health and Medicine, American Academy of Pediatrics, and the American College of Obstetricians and Gynecologists (ACOG) support the comprehensive approach to formal sexuality education adolescents and young adults (American College of Obstetricians and Gynecologists, 2016; American Public Health Association, 2005; Breuner, Mattson, Child, & Health, 2016; Committee on Psychosocial Aspects of Child Family Health, 2001). Furthermore, the vast majority of the American population support the idea of implementing formal sexuality education in the public-school system (Eisenberg, Bernat, Bearinger, & Resnick, 2008).

The CDC has suggested that educating students about HIV/AIDS and other STDs could increase adolescents' likelihood of being tested. A study conducted by Voetsch and colleagues (2009) used YRBS data to examine correlates of HIV testing among U.S. high school students. The results indicated that high school students who had ever received HIV/AIDS instruction in school were more likely to have ever been tested for HIV (13.2%) than high school students who had not received HIV/AIDS instruction in school (9.7%) (Voetsch et al., 2009).

Although formal sex education about HIV/AIDS prevention is has been shown to be associated with HIV testing among high school students, not every student receives HIV/AIDS instruction. A School Health Policies and Programs Study produced by the CDC found that 85% of U.S. high schools taught students how HIV is spread and 77% taught students about HIV testing and treatment (Kann, Telljohann, & Wooley, 2007).

Sex Education by Parents

Adolescence and emerging adulthood are crucial life-span development periods in which youth begin to develop and mold their personal identity, search for a sense of self, and construct personal beliefs and values (Arnett, 2000; Erikson, 1968; Schwartz, Côté, & Arnett, 2005). As a result, many adolescents engage in risk-taking behaviors to develop their identity and discover their sense of self (Erikson, 1968). However, the risk-taking behaviors performed during adolescence and young adulthood may lead to poor sexual health outcomes (Fortenberry et al., 2010; Steinberg & Morris, 2001). Since risk-taking behaviors are common in adolescence, researchers have attempted to further investigate the roles parents and the family environment play in encouraging and strengthening healthy adolescent development (Steinberg & Morris, 2001). Fortunately, it is well-known that parents, families, and family cohesion can help mitigate many of the high-risk behaviors performed in adolescence (Fisher, 1989).

The family environment is a crucial source of support for adolescents and can strongly impact adolescent sexual attitudes and behaviors (Moore, Peterson, & Furstenberg, 1986; Perrino, González-Soldevilla, Pantin, & Szapocznik, 2000). Past research suggests that parental monitoring and parent-adolescent sex communication can serve as primary predictors for adolescent sexual behaviors (Buhi & Goodson, 2007;

Hadley et al., 2009; Markham et al., 2010). For example, parent-adolescent sex communication can positively impact safer sex behaviors (e.g., condom use) (DiClemente et al., 1996; DiClemente et al., 2001; Guilamo-Ramos et al., 2011; Hadley et al., 2009; Miller, Levin, Whitaker, & Xu, 1998; Whitaker et al., 1999), reduce sexual risk-taking behaviors among adolescents (e.g., unprotected anal intercourse and drug use before sex) (Aspy et al., 2007; Markham et al., 2010; Rodgers, 1999), and even predict future visits to a health care provider (Marcell, Ford, Pleck, & Sonenstein, 2007).

Unfortunately, most of parent-adolescent sex communication research has been conducted with heterosexual adolescents (Bouris et al., 2010; Garofalo, Mustanski, & Donenberg, 2008; Ryan, Russell, Huebner, Diaz, & Sanchez, 2010; Thoma & Huebner, 2014). Thus, these predictors and findings may not generalize and directly relate to sexual behaviors and parent-adolescent communication among YMSM.

Sexual orientation disclosure to parents. The parent-adolescent dynamic may be strongly influenced by adolescent sexual orientation disclosure (D'augelli, Hershberger, & Pilkington, 1998; Ryan et al., 2010); however, it is unclear whether sexual orientation disclosure to parents positively or negatively impacts the parent-adolescent dynamic (Bouris et al., 2015; Thoma & Huebner, 2014), the communication patterns exhibited in various forms of parent-adolescent communication among gay/homosexual men and other YMSM may be systematically different than patterns of parent-adolescent communication among heterosexual adolescents (Bouris et al., 2015; Thoma & Huebner, 2014). As a result, it is unclear whether positive findings associated parent-adolescent sex communication in heterosexual adolescents will generalize to gay/homosexual men and other YMSM (Thoma & Huebner, 2014).

Disclosing one's sexual orientation to parents can be a difficult experience for many gay/homosexual adolescents. Moreover, fear of negative parental reactions and damaged relationships are common reasons why many gay/homosexual adolescents choose not to disclose to parents (Carnelley, Hepper, Hicks, & Turner, 2011). Parental communication about sex topics during adolescence may help mitigate many of the risk factors associated HIV among the YMSM population (Bouris et al., 2015); however, parental communication may be influenced by sexual orientation disclosure to parents. In a more recent study, Thoma & Huebner (2014) discovered that parent-adolescent communication about sex topics and parental monitoring was positively associated with unprotected same-sex anal intercourse among YMSM who had disclosed their sexual orientation to their parents. This finding was corroborated by Bouris, Hill, Fisher, Erickson, and Schneider (2015) which found that mother-son communication about general sexuality was negatively associated with HIV testing for homosexual and bisexual YMSM. Thus, we cannot assume that the benefits parent-adolescent sex communication on heterosexual adolescent sexual health behaviors (Guilamo-Ramos et al., 2011; Hadley et al., 2009), including HIV testing (Clawson & Reese- Weber, 2003), will generalize to gay/homosexual men and other YMSM (Thoma & Huebner, 2014).

Parent-adolescent communication, specifically about sexual health topics, may be influenced by the male adolescent's self-identity and level of "outness" to family and friends (Bouris et al., 2010; Bouris et al., 2015; Thoma & Huebner, 2014). This finding could be a result of family rejection and/or broken/fractured parent-adolescent communication (Carnelley et al., 2011; D'augelli et al., 1998; Rothman, Sullivan, Keyes, & Boehmer, 2012; Ryan et al., 2010). Thus, many YMSM who do not self-identify as

gay/homosexual and/or have not disclosure their sexual orientation to parents may only receive general sexual health topics (e.g., waiting to have sex and methods of birth control) or sex education/communication at all. However, more research is needed to determine if YMSM that self-identify as gay/homosexual more likely to report having received sex education by parents on topics directly impacting gay/homosexual men, such as how to prevent HIV/AIDS and sexually transmitted diseases.

Patient-Provider Sexual Health Communication

Strong patient-provider sexual health communication has been linked to a variety of positive sexual health behaviors, including uptake of HIV testing and adherence to HIV treatment (Mimiaga et al., 2007; Schneider et al., 2008). However, fear of discrimination, confidentiality breaches, and heterosexual assumptions are common barriers reported by gay/homosexual men that can inhibit patient-provider health communication and limit engagement in preventive health measures. In addition, many health care providers remain hesitant to talk about sexual health topics, are unsure of the correct sexual health questions to ask, and lack knowledge about sexual health issues directly impacting gay/homosexual men and other MSM.

Qualitative research has indicated that many young gay/homosexual men believe that patient-provider conversations are inconsistent, lack inclusive language, and do not contain the right questions and educational information about the sexual health issues impacting gay men (Fuzzell, Fedesco, Alexander, Fortenberry, & Shields, 2016; Hinchliff, Gott, & Galena, 2005). To provide inclusive care and prevent the transmission of HIV, health care providers must first be aware of each patient's sexual orientation, sexual health needs, and behaviors (Petroll & Mosack, 2011). Past research shows that

health care providers who are more comfortable discussing sexual orientation and sexual behaviors are more likely to recommend a HIV test to gay/homosexual men and other MSM (Owczarzak, Lechuga, & Petroll, 2011; Vincent et al., 2017). Unfortunately, health care providers are often unaware the sexual orientation and the same sex behaviors of their MSM patients (Petroll & Mosack, 2011).

The majority of patient-provider communication research has focused on examining the outcomes associated with sexual health information disclosure among gay/homosexual individuals (Bernstein et al., 2008; Chapin-Bardales et al., 2016; Vincent et al., 2017; Wall et al., 2010). In contrast, limited attention has been placed on examining the importance of the type of questions asked to assess sexual health needs and the educational information presented by the provider (Fuzzell et al., 2016). Thus, additional research is needed to determine which sexual health topics are commonly discussed in patient-provider interactions among YMSM. In addition, more research is needed to determine which sex topics, presented during patient-provider interactions, if any, are linked to HIV testing among YMSM.

Literature Review Methods

A total of three separate literature reviews were conducted using multiple research literature databases and search engines. The databases and search engines used to conduct the literature review included PsychINFO, Web of Science, Google Scholar, PubMed, and Scopus. Reference lists from identified studies were also used to conduct the literature review.

First, a literature review was conducted to identify research studies that examined the relationship between the receipt of formal sex education on a variety of

sex education topics and HIV testing among YMSM. The specified databases were searched using specific combinations of terms: [HIV testing] AND [sex education or formal sex education or HIV education] AND [gay men OR YMSM OR MSM]. For a study to be included and retained it must have: (1) taken place in the United States; (2) been published in English; (3) measured HIV testing (e.g., HIV testing in the last 12 months and ever having an HIV test) as a primary outcome or secondary outcome of the study; (4) studied the YMSM or MSM population; (5) studied the adolescent and young adult population (i.e. persons aged 25 years or less); and (6) examined the association between receipt of formal sex education and HIV testing behaviors.

The second literature review was conducted to identify research studies that examined the relationship between parent-adolescent sex communication and HIV testing among YMSM. Similar to the first literature review, specific combinations of terms and phrases were used to identify relevant articles: [parent-adolescent sex communication OR sex education by parents] AND [HIV testing or HIV behaviors] AND [gay men OR YMSM OR MSM]. Relevant studies were also identified through previously published literature that examined the relationship between parent-adolescent communication and HIV testing (Bouris et al., 2015). For a study to be included and retained it must have: (1) taken place in the United States; (2) been published in English; (3) measured HIV testing (e.g., HIV testing in the last 12 months and ever having an HIV test) as a primary outcome or secondary outcome of the study; (4) studied the YMSM or MSM population; (5) studied the adolescent and young adult population (i.e. persons aged 25 years or less); and (6) examined the role parents play in increasing uptake of HIV testing.

The third literature review was conducted to identify research studies that examined the relationship between patient-provider sexual health communication and HIV testing among YMSM. Similar to the two previous literature reviews, specific combinations of terms and phrases were used to identify relevant articles: [patient-provider communication OR health care provider] AND [HIV testing or HIV behaviors] AND [gay men OR YMSM OR MSM]. Relevant studies were also identified through previously published literature that examined the relationship between patient-provider sexual health communication and HIV testing (Meanley et al., 2015). For a study to be included and retained it must have: (1) taken place in the United States; (2) been published in English; (3) measured HIV testing (e.g., HIV testing in the last 12 months and/or ever having an HIV test) as a primary outcome or secondary outcome of the study and/or examined HIV recommendations; (4) studied the YMSM or MSM population; and (5) examined the role health care providers and/or health visits in increasing uptake of HIV testing.

Literature Review Results

Definition of YMSM

The findings from reviewed literature and other research articles included the current thesis suggests that the definition of YMSM varies. The World Health Organization defines YMSM as males aged 10-24 years who have sex with other males (WHO, 1995). In addition, the CDC primary produces HIV reports on YMSM aged 13-24 (CDC, 2014b). In contrast to the definition set forth by WHO and the reports produced by the CDC, many of the research studies reviewed expanded this age range to

include YMSM up to the age of 29 years (Duncan MacKellar et al., 2006; Duncan MacKellar et al., 2005; Meanley et al., 2015). One study studied reported a cutoff age of 30 years (S. N. Glick & Golden, 2014). However, the most common maximum age across reviewed studies was 19 years (Bouris et al., 2015; Leonard et al., 2014; Thoma & Huebner, 2014). Furthermore, many studies set the minimum age for eligibility at 18 years (Meanley et al., 2015; Wilkerson et al., 2014), 16 years (Bouris et al., 2015; Garofalo et al., 2008), 15 years (Duncan MacKellar et al., 2006) or 14 years (Phillips et al., 2013; Thoma & Huebner, 2014).

The current thesis included only YMSM aged 15-24 for three primary reasons. First, research has shown that the inclusion of YMSM under the age of 18 years is critical to understanding the HIV risk factors among YMSM (Garofalo et al., 1998; Mustanski et al., 2011). Furthermore, the inclusion of YMSM aged 18 years and below is necessary as many risk factors and high-risk behaviors, such as unprotected sexual intercourse and substance use, occur during adolescence and emerging adulthood (Erikson, 1968; Fortenberry et al., 2010; Mustanski et al., 2011). Second, the age range of 15-24 years will remain consistent with data reported by the CDC (CDC, 2014b, 2017c). Thus, our findings may be more applicable to future research studies and national trend data. Finally, the National Survey of Family Growth questions related to formal sex education and parent-adolescent sex communication are only asked of persons aged 15-24. Thus, excluding YMSM outside of this age range is necessary since males below the age of 15 are not eligible to take the NSFG questionnaire and males aged 25 and older were not asked the NSFG questions related to our intendent variables of interest (i.e., formal sex education and sex education by parents).

Formal Sex Education and HIV Testing

The current literature review did not uncover any research articles that examined the association between formal sex education and HIV testing among the YMSM population. Other studies that examined the association between formal sex education and HIV testing among adolescents and young adults were included since no studies matched the predetermined literature review inclusion. These studies also present important information related to specific formal sex education topics, such as HIV/AIDS instruction.

A study conducted by Voetsch and colleagues (2009) used YRBS data to examine correlates of HIV testing among U.S. high school students. The results indicated that high school students who had ever received HIV/AIDS instruction in school were more likely to have ever been tested for HIV (13.2%) than high school students who had not received HIV/AIDS instruction in school (9.7%) (Voetsch et al., 2009). The sample obtained in Voetsch and colleagues (2009) consisted of both male and female students. Furthermore, the researchers did not conduct any analyses based on same-sex behaviors or sexual orientation. As a result, the results may not be generalizable to the YMSM population.

A study conducted by Ma, Fisher, and Kuller (2014) used data from the 2009 YRBSS to examine the association between the exposure to school-based HIV/AIDS education programs and multiple sexual health behavioral outcomes, including HIV testing. The results of the study indicated that adolescents and young adults that reported exposure to HIV/AIDS education were close to 1.5 times more likely to have ever been tested for HIV (Ma, Fisher, & Kuller, 2014). Although receipt of school-based HIV/AIDS education was associated with HIV testing, it is important to note that the

sample contained both male and females. In addition, the researchers did not stratify or conduct follow-up analyses based on same-sex behaviors or sexual orientation. Thus, the results are not generalizable to the YMSM population, which is the population of interest for the current thesis.

One additional study of interest was Coyle and colleagues (2001), which was a randomized controlled trial (RCT). The study aimed to assess the impact of the Safer Choices sex education and HIV prevention curriculum, which is a 2-year school-based HIV and STD prevention program for students in high school (Coyle et al., 2016). Safer Choices was intended impact and modify several cognitive and personal factors related sexual risk-taking behavior, such as HIV related knowledge and attitudes toward safe sex behaviors. Coyle and colleagues (2001) hypothesized that students in schools that were assigned the Safer Choices intervention would report more frequent testing of HIV in contrast to students enrolled in the control schools who received a standard knowledge-based sex education curriculum. The results did not show a significant increase in HIV testing among students that at the 19 month and 31 months' follow-up. Similar to other studies found across the literature, Coyle and colleagues (2001) included both genders and only assessed one grade level (i.e., 9^{th} graders).

Only a small amount of research has examined the relationship between formal sex education topics and HIV testing among adolescents and young adults (Coyle et al., 2016; Ma et al., 2014; Voetsch et al., 2009). The results of the current literature review suggest that formal sex education is associated with uptake of HIV testing among adolescents and young adults (Ma et al., 2014; Voetsch et al., 2009). However, it is not clear whether these results are generalizable to YMSM population as the results came

from samples that consisted of both males and females. In addition, the studies reviewed did not examine associations between specific topics, such as how to say no to sex or how to use a condom, and HIV testing among adolescents and young adults. This finding represents an apparent gap in the literature related to HIV testing. Limited research on specific formal sex education and a lack of research on the associations between formal sex education and HIV testing among YMSM suggests that further research is needed.

Sex Education by Parents and HIV Testing

A total of three research articles were included for full-text evaluation (see Table 2.1); however, only one study directly examined the YMSM population (Bouris et al., 2015). Two other research articles were retained to highlight important gaps in the research literature, justify the need for research on sex education by parents among the YMSM population, and showcase previously examined associations between specific topics discussed with parents and HIV testing among youth (Balaji et al., 2017; Clawson & Reese- Weber, 2003). In addition, one study used data from the NSFG, which contained similar methodology to the current thesis (Balaji et al., 2017).

One common pattern found in the reviewed literature was most of the parent-adolescent sex education/communication research has been conducted on heterosexual adolescents (Balaji et al., 2017; Bouris et al., 2010; Clawson & Reese- Weber, 2003; Garofalo et al., 2008; Thoma & Huebner, 2014). Unfortunately, recent systematic reviews and meta-analyses have found that research on parent-adolescent sex communication among lesbian, gay, and bisexual (LGB) adolescents is extremely limited (Santa Maria, Markham, Bluethmann, & Mullen, 2015). In addition, the majority of the past research that examined parental influences on LGB adolescents' sexual health

behaviors have primarily focused on the role parents play in sexual orientation disclosure (Carnelley et al., 2011; D'augelli et al., 1998; Rothman et al., 2012; Ryan et al., 2010). Thus, research on parent-adolescent sex communication among lesbian, gay, and bisexual (LGB) adolescents represents a large gap in the research literature.

Very few research studies have examined the association between parent-adolescent sex communication and HIV testing among adolescents and young adults (Balaji et al., 2017; Bouris et al., 2015; Clawson & Reese- Weber, 2003). is one of the few identified research studies that examined parental influences on adolescent HIV testing. The researchers found that more frequent parental communication about sex was associated with ever having an HIV test among white, heterosexual college students aged 18-21 years (Clawson & Reese- Weber, 2003). This finding supports the idea that parent-adolescent communication about sex is linked to adolescent and young adult HIV testing behaviors (Bouris et al., 2015; Leonard et al., 2014); however, it also corroborates the finding that the majority of past research has been placed on studying parental influences on heterosexual adolescents' behaviors rather than at-risk populations, such YMSM (Bouris et al., 2010; Bouris et al., 2015).

In a more recent study, Bouris, Hill, Fisher, Erickson, and Schnider (2015) found that YMSM who reported mother-son communication about sex, specifically about male-to-male sexual intercourse, was associated with having ever been tested for HIV and tested for HIV in the last 6 months. Unfortunately, the researchers also discovered that mother-son discussions about general puberty and sexuality were negatively associated with routine HIV testing among YMSM of color aged 16-19 years (Bouris et al., 2015). This finding is consistent with other past studies that suggest parent-adolescent

communication about sex topics can negatively associated with unprotected same-sex anal intercourse among YMSM (Thoma & Huebner, 2014). As a result, this finding also supports the idea that parent-adolescent communication patterns may operate differently among YMSM and that positive findings from parent-adolescent sex communication research on heterosexual adolescents may not generalize to the YMSM population (D'augelli et al., 1998; Thoma & Huebner, 2014).

Only a small amount of research has examined the relationship between parent-adolescent communication about sex and overall health among YMSM (Bouris et al., 2010; Bouris et al., 2015; Thoma & Huebner, 2014). In general, the role parents play in influencing sexual behavior and attitudes among YMSM is not well-understood (Bouris et al., 2010). Furthermore, little to no attention has been placed on examining parental influences on HIV testing among YMSM (Bouris et al., 2015). Thus, the relationship between parent-adolescent sexual health communication and HIV testing among young gay men and other YMSM needs to be further examined (Bouris et al., 2015). As a result, more research is needed to determine which types of communication and topics presented during parent-adolescent sexual health communication, if any, are linked to HIV testing among YMSM.

Patient-Provider Sexual Health Communication and HIV Testing

The reviewed literature indicated that health care providers and health care visits play an integral role in promoting HIV testing to at-risk populations, including gay/homosexual men and other YMSM (Meanley et al., 2015; Mimiaga et al., 2007; Owczarzak et al., 2011; Vincent et al., 2017; Wall et al., 2010). The reviewed literature (see Table 2.2) suggested that there are three primary topics strongly related to patient-

provider sexual health communication and HIV testing among YMSM. These topics include provider recommendations for HIV testing, sexual orientation disclosure to a health care provider, and patient-provider discussion about HIV prevention and behaviors.

One of the most common factors associated with HIV testing among MSM was visiting a health care provider in the past 12 months (Joseph et al., 2014; Katz, Swanson, & Stekler, 2013; Lo, Turabelidze, Lin, & Friedberg, 2012; Meanley et al., 2015; Phillips et al., 2013; Reilly et al., 2014). For example, a study conducted by Phillips and colleagues (2013) found that MSM in Washington, D.C. who had visited a health care provider in the last 12 months were over two times more likely to have tested for HIV in the last year. In another study, Joseph and colleagues (2014) found that only 55% of the 505 Hispanic/Latino MSM in Miami-Dale County and New York City that visited a health care provider in the last year had been tested for HIV. In addition to these findings, past research studies have also found that the lack of a visit to a regular health care provider increases the odds of not being tested for HIV, especially in the previous 12 months (Reilly et al., 2014).

Overall, these findings suggest that health care visits and health care providers are instrumental in promoting HIV testing among YMSM. However, other variables, such as sexual orientation disclosure to a provider and patient-provider discussions about HIV prevention, may help to further explain the relationship between recent visits to a health care provider and HIV testing uptake among MSM and YMSM (Duncan MacKellar et al., 2006; Meanley et al., 2015; Wall et al., 2010).

Recommendations for HIV testing. The reviewed literature suggested that MSM and YMSM rarely receive recommendations for HIV tests by their regular health care providers (< 60% of the time) (Owczarzak et al., 2011; Phillips et al., 2013; Wall et al., 2010). For example, one study found that 62.9% of 458 YMSM who were recruited via Facebook ads visited a health-care provider in the last 12 months; moreover, only 9.3% of those who recently visited a health care provider reported being offered an HIV test at their last visit (Phillips et al., 2013). In a similar study, Wall, Khosropour, and Sullivan (2010) recruited 4,620 MSM who had visited a health care provider in the last 12 months via MySpace banner ads. Only 30% of the 4,620 MSM were offered an HIV test by a health care provider or nurse in the last 12 months (Wall et al., 2010). Thus, these results highlight the fact that there are numerous missed opportunities to offer testing services and, consequently, increase HIV testing among MSM and YMSM (Joseph et al., 2014). Furthermore, this finding suggests that many health care providers are not adequately discussing HIV testing as a method of prevention with MSM and YMSM (Duncan MacKellar et al., 2006; Owczarzak et al., 2011; Phillips et al., 2013; Wall et al., 2010).

Same-sex attraction and sexual orientation disclosure. Same-sex attraction and sexual orientation disclosure is an important piece of many patient-provider interactions and may play a major role in increasing uptake of HIV testing among MSM and YMSM (Bernstein et al., 2008; Chapin-Bardales et al., 2016; Vincent et al., 2017; Wall et al., 2010). Overall, the reviewed literature indicated that MSM who disclose same sex attraction and/or their sexual orientation to a health care provider are more likely to receive a recommendation for an HIV test recommendation (Joseph et al., 2014; Owczarzak et al., 2011; Petroll & Mosack, 2011; Vincent et al., 2017; Wall et al., 2010).

For example, Bernstein and colleagues (2008) recruited 452 MSM from New York City and found that 39% did not disclose their same-sex attraction and/or orientation to their health care providers. Nevertheless, those who had been tested for HIV were two times more likely to have disclosed their same-sex attraction to their health care providers (Bernstein et al., 2008).

In a more recent study, Vincent, McFarland, and Raymond (2017) discovered that MSM in San Francisco, CA, who disclosed their sexual orientation to their health care providers were eight times more likely to receive a recommendation for HIV testing. This finding coincides with the fact that MSM who disclosure their sexual orientation to a health care provider are more likely to receive and HIV test recommendation (Joseph et al., 2014; Owczarzak et al., 2011; Petroll & Mosack, 2011; Vincent et al., 2017; Wall et al., 2010).

The findings from the reviewed literature underscore the importance of the provider being aware of each patient's sexual orientation, sexual health needs, and behaviors to better serve and offer services to YMSM (Petroll & Mosack, 2011). For example, Wall and colleagues (2010) discovered that YMSM who did not feel comfortable disclosing their same-sex attraction and behaviors because they felt the need to hide their sexual preferences were less likely to receive an HIV testing recommendation. A supportive and affirmative environment in which YMSM can openly discuss their sexual orientation, same-sex attraction, and same-sex behaviors may be one of the most important factors that motivate YMSM to engage in sexual health care and preventative measures (e.g., HIV and STI testing) (Meanley et al., 2015; Petroll & Mosack, 2011).

Patient-provider discussions about HIV prevention. The sexual health topics discussed in previous patient-provider interactions may help explain the relationship between seeing a regular health care provider in the last year, receiving and HIV testing recommendation, and HIV testing among MSM and YMSM. For example, Meanley and colleagues (2015) found that young MSM who visited a doctor and whose provider discussed HIV prevention were over nine times more likely to have been tested for HIV. However, the question used to assess patient-provider discussion about HIV prevention was a dichotomous item (0= No; 1=Yes) and specific prevention topics, such as how to use a condom, were not assessed (Meanley et al., 2015).

The reviewed literature also indicated that patient-provider discussions about HIV and safer sex behaviors is relatively uncommon among MSM (Klitzman & Greenberg, 2002; Margolis, Wolitski, Parsons, & Gómez, 2001; Marks et al., 2002; Meanley et al., 2015). For example, MacKellar and colleagues (2006) used data from the CDC's Young Men's Survey (YMS) to assess correlates of HIV testing among a sample of 2,797 men. The results of this study indicated that the 57% of YMSM that had ever discussed HIV testing with their primary care physician were two times more likely to have had a recent HIV test (Duncan MacKellar et al., 2006).

Although previous studies have shown that discussing HIV prevention and behaviors with YMSM is positively associated with HIV testing (Duncan MacKellar et al., 2006; Meanley et al., 2015), the relationship between various prevention topics discussed during patient-provider discussions and HIV testing among YMSM remains under-examined and represents a major gap in the research literature.

Conclusion

By conducting this review, valuable information related to the factors impacting HIV testing uptake among young gay/homosexual men and other MSM was obtained. In addition, major gaps in the research literature were documented and ultimately helped frame the scope of the present research project. The results of the literature review revealed that HIV testing among young MSM is suboptimal (Finlayson et al., 2011; Duncan MacKellar et al., 2006; Phillips et al., 2015). Although HIV testing levels do not match the CDC's recommendations or reach the *Healthy People 2020* HIV testing objectives, it is apparent that formal sex education, patient-provider sexual health communication, and parent-adolescent sex education/communication can play integral roles in increasing uptake of HIV testing among young MSM.

Research on the relationship between parent-adolescent sexual health communication and HIV testing among young MSM is extremely limited. Moreover, the topics discussed during parent-adolescent sexual health communication have not been identified and linked to HIV testing. Thus, the role parents play in HIV testing among young MSM represents a major gap in the research literature.

Most of the research on patient-provider sexual health communication among YMSM has focused on visits to a health care provider and the disclosure of sexual orientation to a provider. Both topics have been linked to HIV testing, but the sexual health content discussed during patient-provider interactions is understudied. This gap in the literature needs to be addressed as the research literature suggests that specific content may influence the relationship between seeing a health care provider and HIV testing among YMSM.

Table 2.1

Review of Sex Education by Parents and HIV Testing Studies

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Citation: (Bouris et al., 2015) **Purpose:** Document the HIV testing behaviors and serostatus of YMSM and to explore sociodemographic, behavioral, and maternal correlates of HIV testing in the past 6 months	**Size:** (n=135) YMSM	**Age:** (M = 18.47), SD = 0.81) **Race:** 83.7% Black/African American; 5.2% Latino **Sexual Orientation:** 65.9% Gay/Homosexual; 31.1% Bisexual	**Independent Variables:** Mother-Son Communication about: (1) puberty, biology, and general human sexuality (e.g., how babies are made); (2) how to resist sexual pressure from partner; (3) sexual satisfaction and desire; (4) having sex with a male; (5) having sex with a female; (6) having sex with a transgender female; (7) STIs and HIV/AIDS; and (8) condoms. All variables were dichotomous (0 = No, 1 = Yes).	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); Had an HIV test in last 6 months (0 = No, 1 = Yes)	**Frequency:** Mothers most often discussed condoms (M = 4.14; SD = 1.33), STIs and HIV/AIDS (M = 3.53; SD = 1.56), and general human sexuality (M = 2.89; SD = 1.41) **HIV Testing History:** 90.3% of YMSM ever had an HIV test; 70.9% had tested in past 6 months **Factors Associated with HIV Testing:** Mother-son communication about sex with males was associated with HIV testing (OR = 2.36; 95% CI = 1.13-4.94); Mother-son communication about general human sexuality was

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
					negatively associated with HIV testing (OR = .45; 95% .24-.85); Mother-son communication about condoms (OR= 1.15; 95% CI = .64-2.09) was positively associated with HIV testing, but the finding was non-significant.
Citation: (Clawson & Reese- Weber, 2003) **Purpose:** Examine the moderating role of timing of first discussion of sexual intercourse with mothers and fathers on the relationship between the amount of sexual communication and sexual risk-taking behaviors in late adolescence. Determine the benefits of parents talking to their adolescents about sex before sexual activity begins.	**Size:** (n=214) adolescents. A total of 101 males and 113 females.	**Age:** (M = 19.9) **Race:** 82.2% White; 9.3% African American; 5.6% Latino **Sexual Orientation:** 97.7% Heterosexual; 0.9% Bisexual; 0.5% Homosexual	**Independent Variables:** Amount of parent-adolescent sexual communication was measured by Likert scale from 1 to 5 (1 = none; 5 = a lot) on nine sex topics: (1) pregnancy; (2) fertilization; (3) intercourse; (4) menstruation; (5) sexually transmitted diseases; (6) birth control; (7) abortion; (8) prostitution; and (9) homosexuality. Timing of parent-based was measured by asking the age reported of first discussion.	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes)	**Factors Associated with HIV Testing:** Earlier and more frequent parental communication about sexual topics was positively associated with having ever had an HIV test for both males and females (R^2 = 0.06; β = -.02; *Final Model* χ^2 = 12.79*; p*<.01 *).*

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
			tested for HIV/AIDS; (3) birth control methods used; (4) number of pregnancies; and (5) number of partners		
Citation: (Balaji et al., 2017) **Purpose:** To use data from the 2006-2010 and 2011-2013 National Survey of Family Growth in order to examine the association of parent-adolescent communication and HIV testing.	**Size:** (n=7252) adolescents/young adults aged 18-24. A total of 3359 males and 3893 females.	**Age:** (M = 19.9) **Race:** 82.2% White; 9.3% African American; 5.6% Latino **Sexual Orientation:** N/A	**Independent Variables:** Parent-adolescent communication about: (1) how to say no to sex; (2) methods of birth control; (3) where to get birth control; (4) sexually transmitted diseases; (5) how to prevent HIV/AIDS; (6) how to use a condom. All variables were dichotomous (0 = No, 1 = Yes).	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes)	**Factors Associated with HIV Testing:** Men were more likely to have ever been tested for HIV if they talked to their parent(s) about: (1) how to prvent HIV/AIDS (aPR = 1.25; CI = 1.09-1.43) and (2) how to use a condom (aPR = 1.20; CI = 1.06-1.36).

Table 2.2

Review of Patient-Provider Sex Communication and HIV Testing Studies

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Citation: (Meanley et al., 2015) **Purpose:** To examine YMSM's access to a medical provider in the last 12 months. In addition, the purpose was to examine the association between patient-provider conversations about HIV/STI prevention and various types of HIV testing behaviors: Non-Testers, HIV-Only Testing, and HIV and STI Testing	**Size:** (n = 304) YMSM in the Detroit, MI metropolitan area	**Age:** (M = 22.9; SD = 2.87) **Race:** 51.2% Black/African American; 24.8% White/Caucasian; 14.8% Latino/Hispanic **Sexual Orientation:** 85.2% Gay/Homosexual; 8.6% Bisexual	**Independent Variables:** Provider Discussion about HIV prevention was measured by asking participants if they had ever talked with a doctor about HIV prevention. This was measured by a dichotomous item (0 = No; 1 = Yes); YMSM were also asked the extent to which they felt comfortable discussing their sexual behaviors with a medical provider. This was measured using a 4-point Likert scale (1 = Strongly Disagree; 4 = Strong Agree). YMSM were aasked to provide the number of times in the past 12 months that they had visited a health care provider	**Dependent Variables:** YMSM were asked to mark which of the following health care services that they have ever received: (1) HIV testing; (2) STI testing for syphilis, gonorrhea, or chlamydia; (3) anal Pap smear; and (4) Vaccination for hepatitis A, hepatitis B, and human papillomavirus (HPV). Never Testers = participants who reported never having tested for HIV or other STIs; HIV Only = participants who ever tested for HIV but never tested for other STIs**;** HIV and Other = participants who reported having ever tested for HIV as well as at least one other STI	**HIV Testing History:** 82% of YMSM had tested for HIV; 63.3% have tested for HIV and at least one other STI; 16.7% were never testers; 17.8% were HIV Only testers **Correlates of HIV Testing:** Only 18.5% of Never Testers reported having had HIV prevention discussions with medical provider; YMSM in the HIV & STI testing category reported a higher percentage of discussion with medical providers (77.2%; χ^2 = 89.75; p<.001). Thus, YMSM who reported had discussions about HIV were more likely to have been tested for HIV (OR = 9.78; 95% CI = 2.67-35.85).

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
					Visits to a Health Care Provider: YMSM that tested for HIV and/or STIs and accessed a medical provider in the previous year were more likely than Never Testers to have had discussions with a provider about HIV prevention (OR = 9.78; 95% CI = 2.67-35.85; *p*=.01); 56.7% had visited a health care provider in the last 12 months.
Citation: (Katz et al., 2013) **Purpose:** To examine correlates of HIV testing among MSM attending Gay City Health Project (GCHP)'s HIV testing program, a Seattle community-based organization. To examine motivations for HIV testing among MSM.	**Size:** (n = 7,176) MSM who attended Seattle-based Gay City Health Project's HIV testing program	**Age:** (Median = 30; IQR = 24-39) **Race:** 79% White/Caucasian; 5% Black; 9% Asian **Sexual Orientation:** N/A	**Independent Variables:** Participants were asked if they have a regular health care provider. This was measured by a dichotomous item (0 = No; 1 = Yes).	**Dependent Variables:** Participants were asked "why did you decide to be tested today?" If the participant selected "it is time for my regular test," then they were coded as regular testers.	**Correlates of HIV Testing:** Having a regular health care provider (aRR = 1.07; 95% CI = 1.02-1.12) and having 10 or more sexual partners (aRR = 1.20; 95% CI = 1.16-1.25) were associated with regular HIV testing

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Citation: (Bernstein et al., 2008) **Purpose:** To examine the relationship between disclosing sexual orientation and/or same-sex attraction to a health care provider and HIV testing among MSM who were recruited through the National HIV Behavioral Surveillance (NHBS) in New York City (NYC).	**Size:** (n = 452) MSM in NYC	**Age:** (Median = 28) **Race:** ≈ 33% White/Caucasian; 21% Black; 28% Hispanic **Sexual Orientation:** > 75% Gay/Homosexual; 20% Bisexual	**Independent Variables:** Participants were asked if they had ever disclosed to a health care provider that they were attracted to men, had sex with another man, and/or were homosexual/gay. This was measured by a dichotomous item (0 = No; 1 = Yes); Visited a health care provider in the last year. This was measured by a dichotomous item (0 = No; 1 = Yes);	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); Had an HIV test in last 12 months (0 = No, 1 = Yes); Health care provider ever recommended an HIV test (0 = No, 1 = Yes).	**HIV Testing History:** 90% tested for HIV. **Correlates of HIV Testing:** MSM who had ever been tested for HIV were more likely to have disclosed their sexual orientation and/or attraction to their health care providers (aOR = 2.10; 95% CI = 1.01-4.38); MSM who were HIV tested in the last year were not more likely to have disclosed to their health care providers (OR = .98; 95% CI = .65-1.48) **Recommendation of HIV Test:** ≈ 33% had ever received a recommendation for an HIV test from a health care provider; MSM who reported seeing a health care provider in the last year were more likely to have disclosed to a health care provider (OR = 1.48; 95% CI = .98-2.23).

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Citation: (Chapin-Bardales et al., 2016) **Purpose:** Identify factors associated with HIV testing in the past 12 months among MSM National HIV Behavioral Surveillance (NHBS) participants in San Juan, Puerto Rico, in order to characterize MSM who are and are not testing as recommended.	**Size:** (n = 352) MSM in San Juan, Puerto Rico	**Age:** 31% were aged 18-24 years; 18% were aged 25-29 years; 28% were aged 30-39 years **Race:** 100% Latino/Hispanic **Sexual Orientation:** 86% Gay/Homosexual; 14% Bisexual/Heterosexual	**Independent Variables:** Having visited a health care provider in the past 12 months was measured by asking a dichotomous (0 = No, 1 = Yes) question. MSM were asked if they had ever disclosed their sexual orientation or information about having sex with men to a health care provider. This was measured by asking a dichotomous (0 = No, 1 = Yes) question. MSM were also asked about how many male sex partners they had in the last 12 months.	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); HIV test in last 12 months (0 = No, 1 = Yes)	**HIV Testing History:** 82% had ever received an HIV test; 50% had an HIV test in the past 12 months. **Correlates of HIV Testing:** Having an HIV test in the last 12 months was associated with having visited a health care provider in the past 12 months (aPR = 1.4; 95% CI = 1.04-1.8), having told a health care provider that they are gay/homosexual, are attracted to men, and/or have sex with men (aPR = 1.4; 95% CI = 1.1-1.7), and having four or more sex partners (aPR, 1.5; 95 CI = 1.2-2.0).
Citation: (Reilly et al., 2014) **Purpose:** Determine factors associated with lack of recent HIV testing among a population of MSM in NYC who report that they are uninfected.	**Size:** (n = 448) MSM in NYC	**Age:** (Median = 28; IQR = 22-39) **Race:** 40.8% Hispanic; 29.6% White; 20.9% Black; 8.7% Other	**Independent Variables:** Visiting a healthcare provider in past 12 months was assessed using a dichotomous item (0 = No, 1 = Yes)	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); Date of test result was used to determine if an HIV test was acquired in the last 12 months.	**HIV Testing History:** 100% had ever received an HIV test; 23.9% had not been tested for HIV in the past 12 months.

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
		Sexual Orientation: 77% Gay/Homosexual; 20.8% Bisexual; 2.2% Heterosexual			**Correlates of HIV Testing:** Not testing for HIV in the past 12 months was associated with a lack of a visit to a health care provider in the past 12 months (aPR = 2.5; 95% = 1.9-3.2) and non-gay sexual identity (aPR = 1.4; 95% CI 1.0-1.8)
Citation: (Phillips et al., 2013) **Purpose:** To explore demographic and behavioral differences among various categories of HIV testers in the Washington, D.C. area.	**Size:** (n = 458) MSM in Washington, D.C.	**Age:** 66.8% were aged 18-24 years; 33.2% were aged 35+ years **Race:** 49.6% White; 29.5% Black/African American **Sexual Orientation:** 84.5% Gay/Homosexual; 15.5% Bisexual/Straight	**Independent Variables:** Saw health care provider in the last 12 months was assessed using a dichotomous item (0 = No, 1 = Yes); Participants were asked to respond with their number of sex partners. Participants were then categorized into either the 1-4 sex partners group or 5 or more sex partners group.	**Dependent Variables:** Participants were categorized into one of three groups: (1) frequent testers-testing four or more times in the past two years; (2) testing 1-3 times in the past two years; (3) not testing in the past two years.	**HIV Testing History:** 30.8% reported testing for HIV at least four times in the previous two years; 68.2% had tested for HIV in the past 12 months **Correlates of HIV Testing:** Frequent testers (men that tested at least twice a year) were more likely to have seen a health care provider in the last year (aOR = 2.28; 95% CI = 1.31-3.98) and more likely to have five or more sex partners compared to 1-4 partners in the last year (aOR = 1.52; 95% CI = 1.01-2.27).

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Citation: (Wall et al., 2010) **Purpose:** Describe the prevalence of being offered an HIV test among MSM and to examine the factors associated with offering an HIV test	**Size:** (n = 4.620) MSM recruited via MySpace banner ad recruitment	**Age:** 83.3% were aged 18-29 years; 10.8% were aged 30-39 years; 4.4% were aged 40-49 years; 1.4% were aged 50 years or older **Race:** 44.5% White; 30.7% Hispanic; 13.1% Black/African American **Sexual Orientation:** 72.9% Gay/Homosexual; 24.3% Bisexual; 0.6% Heterosexual/Straight	**Independent Variables:** Disclosure of previous male-male sexual activity to a provider in the last 12 months. This was assessed using a dichotomous item (0 = No, 1 = Yes). Participants were asked to provide their number of sex partners in the last 12 months.	**Dependent Variables:** Offered an HIV test in the last 12 months by a doctor, nurse, health care provider, or someone in their office (0 = No, 1 = Yes);	**Recommendation of HIV Test:** 30% of MSM were offered an HIV test in the past 12 months **Correlates of HIV Test Recommendation:** Being offered an HIV test in the last 12 months was associated with disclosing male-male sexual activity to the health care provider (aOR = 19.22, 95% CI = 15.79-23.41). However, the magnitude of association decreased as age increased; higher number of sex partners was associated with being offered an HIV test in the last 12 months (OR = 1.13; 95% CI = 1.06-1.20).
Citation: (Vincent et al., 2017) **Purpose:** To examine the associations	**Size:** (n = 244) MSM in the San Francisco Bay Area	**Age:** (M = 37.4, SD = 12.50) **Race:** 55.7% White; 21.7% Hispanic	**Independent Variables:** Visited a health care provider in the last 12 months.	**Dependent Variables:** Offered an HIV test in the last 12 months by a health care	**HIV Testing History:** 79.9% of MSM were tested for HIV in the last 12 months

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
between sociodemographic characteristics, visits to heath care providers, and recommendation of HIV testing in the past 12 months. In addition, the study sought to examine the association between sexual orientation disclosure and recommendation of HIV testing in the past 12 months.		**Sexual Orientation:** 93.9% Gay/Homosexual; 4.5% Bisexual; 1.6% Heterosexual/Straight	This was assessed using a dichotomous item (0 = No, 1 = Yes). Disclosed sexual orientation to a health care provider. This was assessed using a dichotomous item (0 = No, 1 = Yes).	Provider (0 = No, 1 = Yes)	**Recommendation of HIV Test:** 66% of MSM were offered an HIV test in the past 12 months **Correlates of HIV Test Recommendation:** MSM who disclosed their sexual orientation to their health care providers were over eight times more likely to have received a recommendation for an HIV test in the last 12 months (aOR = 8.45; 95% CI = 2.83-25.23)
Citation: (Lo et al., 2012) **Purpose:** To examine the factors associated with HIV testing among MSM in St. Louis, MO using the National HIV Behavioral Surveillance system.	**Size:** (n = 339) MSM in the St. Louis metropolitan area	**Age:** (Median = 35) **Race:** 70% White; 17% Black; 4% Hispanic **Sexual Orientation:** N/A	**Independent Variables:** Visited a health care provider in the last 12 months. This was assessed using a dichotomous item (0 = No, 1 = Yes). Disclosed sexual orientation to a health care provider. This was assessed using a dichotomous item (0 = No, 1 = Yes).	**Dependent Variables:** HIV test in last 12 months (0 = No, 1 = Yes);	**HIV Testing History:** 58% of MSM were tested for HIV in the last 12 months **Correlates of HIV Testing:** MSM were more likely to have been tested during the last 12 months if they had visited a health care provider (aPR = 1.6; CI = 1.3-2.1); or had disclosed same sex

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
			Participants were asked to provide their number of sex partners in the last 12 months.		attraction to a health care provider (aPR = 1.6; CI = 1.2-2.0); or had more than one male sex partner in the last 12 months (aPR = 1.2; 95% CI = 1.0-1.4)
Citation: (Joseph et al., 2014) **Purpose:** To examine the HIV testing behavior among a sample of sexually active Hispanic/Latino MSM in NYC and Miami-Dade County.	**Size:** (n = 608) MSM in NYC and Miami-Dade County	**Age:** (M = 34.6; SD = 9.45) **Race:** 100% Hispanic/Latino **Sexual Orientation:** 70.4% Gay/Homosexual	**Independent Variables:** Visited a health care provider in the last 12 months. This was assessed using a dichotomous item (0 = No, 1 = Yes). Disclosed sexual orientation to a health care provider. This was assessed using a dichotomous item (0 = No, 1 = Yes).	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); HIV test in last 12 months (0 = No, 1 = Yes);	**HIV Testing History:** 25.7% have never tested for HIV; 49.3% had not tested in the last 12 months **Correlates of HIV Testing:** MSM were more likely to have been tested during the last 12 months if they had visited a health care provider (aPR = 1.6; CI = 1.3-2.1), disclosed same sex attraction to a health care provider (aPR = 1.6; CI = 1.2-2.0), and had more than one male sex partner in the last 12 months (aPR = 1.2; 95% CI = 1.0-1.4)
Citation: Owczarzak, Lechuga, and Petroll (2011)	**Size:** (n = 709) MSM in Milwaukee, WI.	**Age:** (M = 34.6; SD = 9.45)	**Independent Variables:** Visited a health care provider in the last 12	**N/A**	**Recommendation of HIV Test:** 49.3% of MSM were offered an

(continued)

In-text Citation and Study Purpose	*Sample Size*	*Demographics*	*Independent Variables of Interest*	*Dependent Variables of Interest*	*Results/Key Findings*
Purpose: To examine the relationship between having a primary care provider, HIV risk behavior, and HIV testing behaviors among MSM in Milwaukee, WI.		**Race:** 100% Hispanic/Latino **Sexual Orientation:** 70.4% Gay/Homosexual	months. This was assessed using a dichotomous item (0 = No, 1 = Yes). Disclosed sexual orientation to a health care provider. This was assessed using a dichotomous item (0 = No, 1 = Yes).		HIV test by and health care provider **Correlates of HIV Test Recommendation:** Health care providers were more comfortable were more likely to recommend an HIV test ($\chi^2 = 15.95$, $p < .01$)
Citation: (Duncan MacKellar et al., 2006) **Purpose:** To evaluate the correlates of recent HIV testing among YMSM in 6 large U.S. cities.	**Size:** (n = 2,797) MSM in 6 large U.S. cities (i.e. Baltimore, MD; Dallas, TX; Los Angeles, CA; Miami, FL; New York, NY; and Seattle, WA)	**Age:** 49% were aged 23-29 years; 51% were aged 26-29 **Race:** 50% White; 24% Hispanic; 19% Black; 6% Asian **Sexual Orientation:** N/A	**Independent Variables:** Use of a regular health care provider. This was assessed using a dichotomous item (0 = No, 1 = Yes). If the participant used a health care provider, they were asked if they discussed HIV testing with the provider (0 = No, 1 = Yes).	**Dependent Variables:** Ever had an HIV test (0 = No, 1 = Yes); HIV test in last 12 months (0 = No, 1 = Yes)	**HIV Testing History:** 54% tested for HIV in the last year and 12% had never tested **Correlates of HIV Testing:** HIV testing in the last 12 months was associated with discussing HIV with a provider (aOR = 1.9; 95% CI = 1.4-2.4); having 6-19 lifetime male sex partners (aOR = 1.5; 95% CI = 1.1-1.9); having 20 or more male sex partners (aOR = 1.8; 95% CI = 1.4-2.3)

CHAPTER THREE

Methods

Background and Significance

The following sections describe the methods for resolving each research questions of the *Sex Education and HIV Testing Among Young Men Who Have Sex with Men: Findings From the 2006-2010 and 2011-2015 National Survey of Family Growth* research study. A review of the research questions and the National Survey of Family Growth (NSFG) questionnaire items used to address each question can be found in Table 3.1. In addition, the following sections describe the background and history of the NSFG, the NSFG sample design, independent and dependent variables of interest, formation of the study sample, and the statistical analyses that were conducted to answer each research question.

Overview of the National Survey of Family Growth

The NSFG is designed and administered by the National Center for Health Statistics (NCHS), which is an agency within the United States Department of Health and Human Services' Centers for Disease Control and Prevention (CDC). The NSFG is authorized by Federal law, Section 306(b) 1 (H) of the Public Health Service Act (42 USC 242), which directs the NCHS to collect various statistics and provide trend data related to social determinants of health, health care utilization and access, pregnancy outcomes, family formation, dissolution, and growth (Lepkowski, Mosher, Davis, Groves, & Van Hoewyk, 2010; Lepkowski et al., 2013). Furthermore, the purpose of the

NSFG is to obtain detailed and reliable information related to the factors affecting marriage, divorce, cohabitation, family building, pregnancy, childbearing, parenthood, adoption, use of sexual and reproductive health care/services, attitudes toward sex and contraception, and overall men's and women's health (Lepkowski et al., 2010; Lepkowski et al., 2013).

The NSFG uses a multi-stage probability-based, nationally representative household sample population of men and women aged 15-44 years. The target population for the NSFG consists of all non-institutionalized women and men aged 15-44 years that reside in any of the 50 United States or the District of Columbia. Currently, the NSFG is fielded using a continuous interviewing design, which allows the NSFG interviews to be conducted every year if funding is readily available. Thus, the NSFG data collected is produced in continuous time periods rather than each individual year (i.e., a periodic interviewing design). The fieldwork is conducted by the University of Michigan's Institute for Social Research. The following section provides a brief history of the NSFG and describes major changes implemented in each cycle and/or time period. For the proposed research study, we will be using data from the 2006-2010, 2011-2013, and 2013-2015 NSFG time periods.

Brief History of the NSFG Periodic Interviewing Cycles

The NSFG was created in 1971 by the National Center of Health Statistics (NCHS). Prior to the development of the NSFG in 1971 and the implementation of NSFG Cycle 1 in 1973, private organizations served as the primary conductors of various smaller national surveys of married women (Freedman, 1959). From 1965 to 1970, university researchers that acquired federal funding took over the smaller national

surveys of married women (Westoff, 1975). In 1971, the NSFG expanded on these initial surveys by interviewing a large, nationally representative sample of women aged 15-44 years (Lepkowski et al., 2010).

The NSFG Cycles 1-6 were part of a periodic interviewing design (Bachrach, Horn, Mosher, & Shimizu, 1985; French, 1978; Grady, 1981; Judkins, Mosher, & Botman, 1991; Kelly, Mosher, Duffer, & Kinsey, 1997; Mosher, 1982; Mosher & Bachrach, 1996). Thus, the NSFG cycles consisted of several years of preparation (e.g., planning, data processing, and training a large number of interviewers), but only one year of primary data collection. NSFG Cycles 1-5 focused primarily on pregnancy history, contraceptive use, marriage history, demographics, and birth intentions. Questions related to cohabitation, adoption, sexually transmitted diseases, AIDs-related knowledge, and HIV/AIDs behavior was added in 1988. From NSFG Cycle 1 in 1973 through NSFG Cycle 5 in 1995, response rates ranged from 78.7-90.2% (see Table 3.2). Notable landmarks include the over-sampling of African American women in 1973 (Mosher, 1982), teens aged 15-19 years in 1982 (Mosher & Bachrach, 1996), and Hispanic Women in 1995 (Kelly et al., 1997; Mosher & Bachrach, 1996). In addition, all women aged 15-44 years regardless of marital status were eligible to be interviewed in 1982. The computer-assisted personal interviewing (CAPI) and audio computer-assisted self-interviewing (ACASI) techniques took the place of the standard NSFG paper and pencil interviewing technique in 1995 to improve quality and consistency in the NSFG data, and monetary incentives were introduced in 1995 to improve NSFG response rates.

The modern cycles of the NSFG began in 2002 with the NSFG Cycle 6 interviews. The NSFG Cycle 6 remained a one-time data collection effort (i.e., part of a

periodic interviewing design). All women aged 15-44 years were eligible to complete the NSFG Cycle 6 questionnaire; however, the NSFG Cycle 6 also included an independent national sample of males aged 15-44 years. As a result, the NSFG Cycle 6 questionnaire was broken up into two different parts. First, a questionnaire was specifically designed for women aged 15-44 years. The questionnaire was similar to all previous NSFG Cycle questionnaires since it was constructed to assess the same topics, such as pregnancy history, contraceptive use and access, marriage, demographics, major event histories, adoption, knowledge of HIV/AIDS, and birth intentions. The female questionnaire covered: (1) demographic characteristics, household roster, childhood background; (2) pregnancy, birth history, adoption, and non-biological children; (3) marital and relationship history; (4) sterilizing operations and impaired fecundity; (5) contraceptive history and pregnancy wantedness; (6) family planning and medical services; (7) birth desires and intentions; (8) infertility services and reproductive health; (9) insurance, residence and place of birth, religion, past and current work, child care, and attitudes; and (10) ACASI. These same topics are also covered in each subsequent NSFG (i.e. 2006-2010, 2011-2013, and 2013-2015 NSFG).

Second, a new separate questionnaire was specifically designed for males aged 15-44 years. The questions included in the new male questionnaire were similar to the female questionnaire; however, the questionnaire was less complex and contained questions specific to males, such as questions related to sex with males and STD/HIV risk behaviors. The sections included in the male questionnaire covered: (1) demographic characteristics, household roster, childhood background, and marital/cohabiting status; (2) sex communication and number of sexual partners; (3) current wife or cohabitating

partner; (4) recent sexual partners and first sexual partner; (5) former wives and first cohabiting partner; (6) other biological children, other adopted children, and other pregnancies; (7) fathering; (8) desires and intentions for future children; (9) health conditions and health services; (10) residence and place of birth, religion, military service, past and current work, and attitudes; and (11) ACASI. These same topics are also covered in each subsequent NSFG (i.e., 2006-2010, 2011-2013, and 2013-2015 NSFG).

The sample size for NSFG Cycle 6 (n=12,571) was larger than all other previous NSFG Cycles due to the inclusion of males. All women aged 15-44 years (n=7,643) represented a larger portion of the sample size while all males aged 15-44 years (n=4,928) represented a smaller portion. Similar to the previous NSFG Cycle 5, the NSFG Cycle 6 also over-sampled Black and Hispanic women; however, the NSFG Cycle 6 also over-sampled Black men, Hispanic men, and teenagers to provider better national estimates of factors associated with teen pregnancy. The average length of NSFG Cycle 6 interviews was 60 minutes for males and 85 minutes for females. The length differential reflects the difference in complexity and organization between the male and female questionnaires. Similar to previous NSFG Cycles, the CAPI technique was used for the first part of the NSFG Cycle 6 and the ACASI technique for the second part. The NSFG Cycle 6 ACASI for females was similar to the ACASI Cycle 5; however, the male ACASI section introduced new questions that asked about male sexual behaviors, STI/HIV risk behaviors, same-sex intercourse, number of male sex partners, sexual orientation and attraction, family income, drug and alcohol use, number of pregnancies, and non-voluntary sexual intercourse. Participants received an incentive of $40 before

starting the NSFG as a token of appreciation. The response rate was 79% overall, 80% for females, and 78% for males (see Table 3.2)

The sample design, estimation procedures, variance information, planning, and additional insight related to the NSFG Cycle 6 can be found elsewhere (Groves, Mosher, Lepkowski, & Kirgis, 2009).

Transition from Periodic Interviewing to Continuous Interviewing

The NSFG Cycles 1-6 were a part of a periodic interviewing design. The NSFG Cycle 6 interview results, survey implementation, and evaluation were used to inform a new design of the NSFG, which was termed the "continuous interviewing design." The new continuous interviewing design simply implies that NSFG fieldwork and interviews are to be conducted every year if funding is readily available and national circumstances allow for NSFG implementation. Thus, the NSFG data collected are produced in continuous time periods rather than each individual year (i.e., the previous periodic interviewing design). The shift from a periodic interviewing design to a continuous interviewing design was a result of the NSFG and other national survey leadership having a difficult time predicting the number of interview hours required to screen, select, and inform households and participants. In addition, the previous NSFG Cycles had a difficult time acquiring large samples and identifying how many interviewers were needed to conduct the fieldwork. Thus, the continuous interviewing design allowed the NSFG to produce larger sample sizes, limit costs of fieldwork, and buffer against the effects of not knowing eligibility rates in random samples of persons in U.S. households. However, the most pressing problem was that the previous NSFG cycles required survey development, interviews (i.e. CAPI and ACASI), interviewer training, and large numbers of contact

hours with households to be completed in one year or less. Thus, a new continuous interviewing design was needed to increase control of field management, improve time-efficiency, lower the overall costs associated with the NSFG, and improve quality control since the original design used a large number of interviewers.

Brief History of the NSFG Continuous Interviewing Periods

The 2006-2010 NSFG was the first version of the NSFG to employ the continuous interviewing design. Instead of using a large amount of interviewers, the new 2006-2010 NSFG used approximately 40 interviewers. Similar to many of the past NSFG Cycles, the target population for the 2006-2010 NSFG was non-institutionalized men and women aged 15-44 years in households in any of the 50 United States or District of Columbia. Eligible men and women were identified using a multi-stage area probability sample. Once a household was randomly selected, a screening interview was conducted to determine if anyone aged 15-44 years lived there. If one or more individuals aged 15-44 years resided in the household, one was randomly selected to participate in the NSFG study. The multi-stage area probability sampling design is explained in a later section of the current thesis.

The 2006-2010 NSFG male and female questionnaires did not contain any major revisions and remained very similar to the NSFG Cycle 6 questionnaires. Thus, the interviewers still asked questions about fertility, contraceptive use, adoption, use of family planning services, pregnancy, and HIV-related behaviors. The sample size for 2006-2010 NSFG (n=22,682) was larger than all previous NSFG Cycles due to the new continuous interviewing design and the four-year timespan. All women aged 15-44 years (n=12,279) represented a larger portion of the sample size while all males aged 15-44

years (n=10,403) represented a smaller portion. In addition, Black men and women, Hispanic men and women, and teenagers were strategically oversampled in the 2006-2010 NSFG. The average length of 2006-2010 NSFG interviews was 60 minutes for males and 80 minutes for females. Participants received an incentive of $40 before starting the NSFG as a token of appreciation. The response rate was 77% overall, 78% for females, and 75% for males. Detailed information about the 2006-2010 sample design, estimation procedures, variance information, planning, and additional information can be found in supplemental NSFG documentation (Groves et al., 2009; Lepkowski et al., 2010).

The sample size for 2011-2013 NSFG (n=10,416) was smaller than the 2006-2010 NSFG due to a shorter interviewing timespan (i.e. three years). All women aged 15-44 years (n=5,601) represented a larger portion of the sample size while all males aged 15-44 years (n=4,815) represented a smaller portion. The 2011-2013 NSFG oversampled Black men and women, Hispanic men and women, and teenagers. The average length of 2011-2013 NSFG interviews was 60 minutes for males and 80 minutes for females. Participants received an incentive of $40 before starting the NSFG as a token of appreciation. All interviews were conducted using the CAPI and ACASI procedures. The response rate for the 2011-2013 NSFG was 72.8% overall, 73.4% for females, and 72.1% for males (see Table 3.3).

The sample size for 2013-2015 NSFG (n=10,205) was smaller than the 2013-2015 NSFG; however, the sample was similar as women aged 15-44 years (n=5,601) represented a larger portion of the sample size while all males aged 15-44 years (n=4,815) represented a smaller portion. The 2013-2015 NSFG oversampled Black men

and women, Hispanic men and women, and teenagers. The average length of 2013-2015 NSFG interviews was 60 minutes for males and 80 minutes for females. Participants received an incentive of $40 before starting the NSFG as a token of appreciation. All interviews were conducted using the CAPI procedure and the ACASI procedure. The response rate for the 2013-2015 NSFG was 69.3% overall, 71.2% for females, and 67.1% for males (see Table 3.3).

Summary of the NSFG Sampling Design

For the current research study, we will be combining male respondent data from the 2006-2010, 2011-2013, and 2013-2015 NSFG. Each independent NSFG has an independent sample design; however, the sample designs for the 2011-2013 and 2013-2015 NSFG are analogous to the 2006-2010 NSFG (Lepkowski et al., 2013). The 2006-2010, 2011-2013, and 2013-2015 NSFG samples were conceived using a continuous interviewing design with samples released over various periods of time. As a result, the samples formed can be combined together at various periods of time to form nationally representative samples. Since the NSFG Cycles 1-6 employed a periodic interviewing design, the 2006-2010 NSFG was the first NSFG to employ the continuous interviewing design (Groves et al., 2009; Lepkowski et al., 2013).

The 2006-2010, 2011-2013, and 2013-2015 NSFG each had goals and objectives that needed to be completed within a predetermined time period. For example, the 2006-2010 NSFG goals included completing a minimum of 5,000 interviews per year in four-year NSFG time period. The objectives consisted of completing 45% of the interviews with males and 55% with females. Furthermore, the NSFG also required at least 20% of interviews to be conducted with Hispanics, 20% with blacks, and 20% with teens aged

15-19 years. In contrast to the 2006-2010 NSFG, the 2011-2013 and 2013-2015 NSFG were part of a larger sample design for the 2011-2019 NSFG time period. The overall sample design of the 2011-2019 NSFG time period remains analogous to the 2006-2010. In addition, the 2011-2019 goals were the same as the 2006-2010 NSFG; however, the predetermined time period was eight years instead of four years. The 2011-2013 and 2013-2015 NSFG achieved these objectives by strategically using a stratified multi-stage area probability sample, which is described in the paragraph below.

The 2006-2010, 2011-2013, 2013-2015 NSFG all formed a stratified multi-stage area probability-based, nationally representative sample of the household population aged 15-44 years to achieve the previously described goals and objectives. The sampling design consisted of five stages of selection: (1) selection of Primary Sampling Units (PSUs); (2) selection of blocks, segments, and neighborhoods within PSUs; (3) selection of housing units; (4) selection of one eligible person per housing unit; and (5) two-phase sampling approach. The five stages are briefly described below.

The first stage in the sampling design included selecting Primary Sampling Units (PSUs). These PSUs consisted of Metropolitan Statistical Areas (MSAs), counties, or groups of counties. MSAs are urban areas of the U.S. that may include several counties and have a population size of 50,000 persons or greater. To identify the PSUs in the U.S. that would be used to form the NSFG sample of men and women aged 15-44 years, the 50 United States and the District of Columbia were divided into a total of 2,402 PSUs for the 2006-2010 NSFG and 2,149 PSUs for the 2011-2019 NSFG. After the PSUs were created, a process called stratification was used to group the PSUs into three different strata according to Census Division, MSA status and size. The stratification process for

the 2006-2010 NSFG identified 28 self-representing PSUs or "strata," 290 MSA-based PSUs, and 2,084 non-MSAs. In the process of division for the 2011-2019 NSFG, 21 were self-representing PSUs, 366 were identified as MSA-based PSUs, and 1,783 were non-MSA.

To select PSUs, the self-representing strata had to remain separate; however, the non-self-representing PSUs (i.e. MSAs and non-MSAs) were grouped together into strata according similar PSU size. In the 2006-2010 NSFG, the 2,374 MSAs and non-MSAs were grouped into 82 total strata. Thus, these strata contained two or more PSUs, unlike the self-representing strata that contained only one PSU. The 2006-2010 NSFG had total of 28 self-representing strata and 82 other strata. Thus, resulting in 110 identified PSUs. In contrast, the 2011-2019 NSFG had 21 self-representing strata and 194 other strata. However, the 2011-2013 NSFG had a total of 65 PSUs (i.e., 17 self-representing PSUs and 48 non-self-representing PSUs). This result occurred because there are a total of 12 PSUs in the 2011-2019 NSFG that are self-representing every three years, but they only have a 2/3 chance of being selected in a two-year interval. In addition, there are 9 self-representing PSUs (3 included every year and 6 included every other year). As a result, the 2011-2013 NSFG had an additional 8 self-representing PSUs, for a grand total of 17 self-representing PSUs.

One or two PSUs in each stratum were selected using the Probability Proportionate to Size (PPS) selection method. In general, the PPS selection assigns higher probabilities to PSUs with more households. Large PSUs have lower within-PSU sampling rates while smaller PSUs have higher within-PSU sampling rates. Thus, households in a similar "domain" or category but are also in different PSUs have the

same probability of being randomly selected. The domains consisted of Census Block groups and were defined subgroups of persons by race and ethnicity. Four domains were generated to identify PSUs with the highest proportion of black and Hispanic persons aged 15-44 years. The three domains that contained the highest proportion of black and Hispanic persons were given a higher weight; thus, had a higher chance of being selected to meet the objectives set forth by the NSFG (e.g., 20% of interviews conducted with Hispanics, 20% with blacks, and 20% with teens aged 15-19 years). As a result of using the PPS selection method, 110 PSUs for the 2006-2010 NSFG, which were described in the paragraph above, were identified and used in stage 2. In addition, total of 65 PSUs for the 2011-2013 NSFG, which were described in the paragraph above, were identified. The 110 PSUs for the 2006-2010 NSFG were further divided into four parts to produce four national quarter samples. Detailed information related to the PSUs in each annual quarter sample is described in another NSFG supplemental document (Lepkowski et al., 2010).

The second stage consisted of identifying second-stage sampling units. From each unique PSU that was identified, second-stage units, called segments, were selected. The segments were termed second-stage sampling units (SSUs) in the 2011-2013 NSFG. In general, SSUs are Census blocks or combinations of Census blocks. These blocks were neighborhoods or groups of adjacent blocks. Within each sample PSU, SSUs were stratified by ordering the list of SSUs from high to low by the population density of black and Hispanic households (i.e. the list was created based on domains). Within each domain (i.e. domain 1 was non-minority; domain 2 was >10% Black; domain 3 >10% Hispanic; and Domain 4 was >10% Black and Hispanic), SSUs were sampled. Thus, Domains 2, 3, and 4 were weighted more heavily so that interviews with black and

Hispanic participants will be 20% of all NSFG interviews. For the 2006-2010 NSFG, approximately 12 SSUs or segments per each PSU were sampled; however, the smaller PSUs. In contrast, a total of 912 SSUs were selected in the 2011-2013 NSFG. Maps were created to guide female interviewers to the exact location of the blocks in the SSU or segment. These maps were created by using the Census Bureau's Topologically Integrated Geographic Encoding and Referencing system (TIGER). Interviewers used the maps to visit the addresses in order to check the accuracy of the list. In addition, interviewers updated the list and scratched addresses that were not households. After the interviewers checked each address in the SSU, the list is checked again for completeness before housing units are randomly selected.

The third stage of the stratified multi-stage area probability-based sample design consisted of randomly selecting housing units from the previously identified SSUs or segments. Since stage 2 eliminated all non-households or other buildings that were not eligible to be sampled, stage 3 focused only on screening for occupied households. The first step in this process was to prepare a list of housing units from each selected SSU or segment. The majority of the addresses were made available using a commercial vendor of the U.S. Postal Service's Delivery Sequence File. Once the housing list with addresses was constructed for each segment, a random sample of housing units from each SSU was generated. The housing units in SSUs or segments in which more than 10% of the residents were black or Hispanic were selected at higher rates. Once a sample of housing units from each SSU was generated, the housing units were contacted.

The fourth stage of the sample design consisted of conducting a screening interview with a member of the household to determine eligibility. The female

interviewer asked an adult member of the household to provide a list of all persons living in the household. During the screening procedure, the adult was asked to provide gender, age, race, and ethnicity of each person in the household. In addition, the interviewer asked about anyone else they may have missed, including college students living away from home. However, college students living in dormitories or their own apartment were excluded as they were already eligible to be included in the sampling frame. If no one in the household was between the ages of 15 and 44 years, then the household was not eligible to complete the NSFG. If more than one eligible person was found in the household, then a computer-assisted screening system made a random selection of one of the eligible persons in the household.

Data Collection and Fieldwork

Households were contacted after households were randomly selected during stage 3 of the sampling designs. An advance letter and brochure were sent to all sampled households. The advance letter and brochure explained who was sponsoring the NSFG survey, who was conducting it, why it was being completed, and that participation in the survey is completely voluntary and answers will be kept confidential. These letters were also provided in Spanish. The advance letter and brochure also linked potential participants to the NSFG website and provided phone numbers to contact members of the NSFG team for more information.

Sometimes the female interviewers were unable to connect with anyone from the household on the first visit. As a result, subsequent visits were needed until the household was contacted. If contact was made, but the household member did not have time to discuss the NSFG the interviewer said she would return at a later time. If the household

member had questions, the interviewer attempted to answer them. When a female interviewer contacted the sample household member, she introduced herself and mentioned that she was from the University of Michigan. All fieldwork was completed through the use of female interviewers from the University of Michigan's Institute for Social Research. The female interviewer then showed her badge and/or authorization letter, explained the purpose of the study, and showed the advance letter that the household had already received. If the household member has additional question, the interviewer may show them an easy to read question-and-answer brochure special tailored for the NSFG.

Once the interviewer introduced herself and explained the NSFG, then the fourth stage of the NSFG sample design was initiated to identify any eligible persons aged 15-44 years of age in the household. The interviewer conducted a short screening interview with the household member to determine if anyone was eligible. If no persons living in the household were eligible, then the address was removed from the list and no further contact was made. If one or more persons were age-eligible for the survey, a computer-assisted screening system made a random selection of one of the eligible persons in the household. As a result, only one person was selected per eligible household.

If the computer-assisted screening system made a random selection of a person aged 15-17 years, then the interviewer had to obtain signed parental consent before they could talk to the minor. A parental consent form was strategically designed to explain the NSFG survey to the parent or guardian. If the parent gave their consent, then the minor was also asked to provide their consent by signing a NSFG Minor's Assent Form. In contrast, if the participant was aged 18-44 years then the adult was provided with an

NSFG Adult Consent Form, which explained the NSFG survey. If the adult agreed to participate but refused to sign the form, the interviewer had the chance to offer to begin the NSFG survey and ask for the signature upon completion.

The interviewer gave the respondent, including minors, $40 in advance of taking the NSFG survey as a token of appreciation. After the token of appreciation was provided, the interview started with the interviewer reading questions from the laptop computer and entering the responses manually via keyboard. The interview was conducted in a private setting in the home to ensure confidentiality. If another member of the household walked in on the interview, the interviewer paused until the other household member left the setting. The entire first half of the interview was conducted using the CAPI technique in order to improve reliability and quality of the NSFG data. At the end of the CAPI section of the NSFG questionnaire, the interviewer gave the respondent headphones to compete the 10-20 minute ACASI section. The interviewer could not hear the questions or see the respondent's answers. At the end of the interview, the interviewer turned off the password-protected computer, thanked the respondent, and left the household.

The NSFG Cycle 5 used a computer-assisted personal interviewing (CAPI) technique in order to improve reliability and quality of the NSFG data. The interviewers that employed the CAPI technique used a password-protected laptop computer to conduct the NSFG interview. The new CAPI software system contained complex logic, which edits wording to questions, automatically skips questions based on participant responses to questions earlier in the survey, uses flow logic to alert the female interviewer of inconsistent responses. In general, the interviewer is able to read the instructions on the

laptop screen and then asks the corresponding question(s) to the participant. After the participant responds, the interviewers record the responses using the laptop keyboard. Built-in software manages the flow of the interview and directs the interviewer to each subsequent set of instructions and questions. The CAPI software also allowed NSFG researchers and translators to translate the male and female questionnaires to Spanish.

In addition to the CAPI technique, the NSFG Cycle 5 interviewers also employed the audio computer-assisted self-interviewing technique (ACASI). The ACASI interviewing technique allows the respondent to use the password-protected laptop computer to complete the most sensitive questions in the NSFG questionnaire. For example, the female ACASI section asks about sexual behaviors, STI/HIV risk behaviors with males, same-sex intercourse, number of male sex partners, sexual orientation and attraction, family income, STD experience, drug and alcohol use, number of pregnancies, and non-voluntary sexual intercourse. The respondent uses headphones to listen to NSFG audio recordings of questions. In addition, the respondent is also able to read the question and instructions on the laptop screen. The participant is able to use the laptop keyboard to select the appropriate responses to each NSFG question. Similar to the CAPI technique, built-in software directs the respondent to each subsequent set of instructions and questions. However, the interviewer is not present when the respondent is participating in the ACASI portion of the questionnaire. Thus, the ACASI technique reduces the amount of interviewer bias that can influence participant responses. The ACASI section of the interview can also be conducted in Spanish. Information on the development and use of the CAPI and ACASI techniques can be found in supplemental NSFG documentation

(Groves et al., 2009; Kelly et al., 1997; Lepkowski, Mosher, & Davis, 2006; Lepkowski et al., 2010; Lepkowski et al., 2013).

Formation of Study Sample

To identify eligible NSFG respondent ID numbers, the NSFG male respondent ID numbers were sorted based on predetermined inclusion criteria. A total of three unique criterion were used to determine participant eligibility for the study. For a male respondent ID number to have been included in the sample, the corresponding survey responses must have indicated that the participant: (1) was male, (2) was aged 15-24 years at the time of corresponding NSFG interview, and (3) had ever engaged in sexual intercourse with another male (e.g., receptive anal sex, insertive anal sex, and/or oral sex). These criteria were used to help form the representative sample of sexually active YMSM aged 15-44 years.

First, only male respondent ID numbers from the 2006-2010, 2011-2013, and 2013-2015 NSFG were used to determine participant eligibility. All female respondent ID numbers from each respective NSFG time period were not included in the final sample of YMSM. To determine the gender of participants during NSFG fieldwork, the female NSFG interviewers attempted a screener interview for each occupied housing unit that was identified in the independent multi-stage probability sample of women and men aged 15-44 years. The screening consisted of a short questionnaire that was administered at the door of each previously identified housing unit. The purpose of the questionnaire was to assess whether any persons aged 15-44 years resided in the occupied household. If there were one or more persons aged 15-44 years in the selected household, then one eligible person was randomly selected to be interviewed. The

interviewer worked directly with the randomly selected respondent to form a household roster that lists all persons who currently reside in the household. When constructing the household roster, genders of all persons, including the randomly selected respondent, were documented. The questionnaires and NSFG datasets found on the CDC website are gender-specific. As a result, male data from each NSFG cycle are already prepared for use and can be combined separately from female data.

Second, a male respondent ID was included if the corresponding survey responses indicated that the male was aged 15-24 years at the time of taking the NSFG. Thus, males under the age of 15 or older than the age of 24 will be excluded from the current study. These exclusions are necessary as males aged 15 years or younger are not eligible to take the NSFG questionnaire and males aged 25 and older were not asked the NSFG questions related to our independent variables of interest (i.e. formal sex education and sex education by parents). To assess age, the NSFG interviewers asked male respondents to provide their age in years. If a male responded with "26-44 years," then he was not included in any secondary data analysis. In addition, if the male respondent refused to respond, was younger than 15 years, or was older than 44 years, then the survey was terminated due to the NSFG interviewing guidelines. The AGESCRN variable corresponds to the initial inquiry of the female interviewers and was used in SAS version 9.4 to identify eligible respondent ID numbers.

Third, a male respondent ID number was included if the corresponding survey responses indicated that the male had ever engaged in sexual intercourse with another male (i.e., receptive anal sex, insertive anal sex, and/or oral sex). To determine if a male participant had ever engaged in sexual intercourse with another male he was asked a

series of sensitive questions in the ACASI section of the NSFG interview. The participant was first asked if he had ever performed oral sex on another male (i.e., had stimulated another males' penis with the mouth). Second, the respondent was asked if another male had ever performed oral sex on him (i.e. had his penis stimulated by another males' mouth). Third, the respondent was asked if another male had ever put his penis in the respondents' anus or butt (i.e. receptive anal sex). Fourth, the respondent was asked if he had ever put his penis in another male's anus or butt (i.e., insertive anal sex). If a male respondent responded "yes" to any of the four previous questions, then his corresponding ID number was eligible to be included in the sample.

To ensure consistent responses to each of these questions, the universe contained an additional variable that was used to determine if a male ever had same-sex intercourse (i.e., receptive anal sex, insertive anal sex, and/or oral sex). The variable of SAMESEXANY was calculated via flow-check of the previously described four questions in the universe. If the calculated response to this variable was "yes" (i.e., SAMSEXANY=1) then the corresponding respondent ID number was eligible to be included in the current study. In contrast, if a respondent responded "no" (i.e., SAMSEXANY=5), then the corresponding respondent ID number was not eligible to be included in the sample of YMSM aged 15-24 years.

The data analysis program SAS version 9.4 was used to combine the 2006-2010, 2011-2013, and 2013-2015 NSFG data. Information and steps related to combing the NSFG male data file releases can be found in appendix 2 of the 2013-2015 NSFG User's Guide (USDHHS, CDC, & NCHS, 2014). After combing the male NSFG data, SAS version 9.4 was then used to form the sample of YMSM based on the previously

discussed inclusion criteria. A dichotomous "include" variable was constructed in SAS to accurately identify respondent IDs that match the inclusion criteria. If the respondent ID number indicated that the age of the participant was less than 25 and that the participant had ever had same-sex intercourse with another male (i.e., oral or anal sex) then the "include" variable will be coded as "yes" (i.e., INCLUDE=1) In contrast, if the respondent ID number indicated that the age of the participant was 25 years or greater and/or the participant had never had same-sex intercourse with another male (i.e., oral or anal sex) then the "include" variable was coded as "no." (i.e., INCLUDE=0) .

The "include variable" is a necessary component as cases should never be deleted in national survey data. Typically, if data is from an experiment, quasi-experiment, or small scale cross-sectional survey and the planned analysis requires the use of a subpopulation (e.g., males, females, or YMSM) then a "by" statement can be used. However, survey data, especially national survey data, are very different and require specific steps to analyze data related to subpopulations. The use of a "by" statement to subset a population is problematic for two reasons. First, the use of a "by" statement in SAS version 9.4 means that the estimated number of elements in the population cannot be correctly calculated because some numbers in the sampling weight columns are missing. Second, all cases are required to be use in the calculation of standard errors. As a result, both the number of elements in the population and the standard errors cannot be correctly calculated. To avoid the use of a "by" statement when working with survey data, a DOMAIN statement can be used in SAS version 9.4. A DOMAIN statement is similar to a "by" statement in that there will be output/results for each level of the variable identified in the DOMAIN statement. However, when using *proc surveyfreq* procedures,

a DOMAIN statement should not be used as it is necessary to include the variables that you would have put into the DOMAIN statement into the tables statement of the *proc surveyfreq* procedure.

Data Analysis

The following sections outline the independent variables, dependent variables, demographic variables and covariates, and complex survey sampling weights. In addition, the following sections describe the analysis of all variables and the multivariate logistic models used to answer the research questions.

Independent Variables

Formal Sex Education. The questions related to formal sex education were first asked to males in the NSFG Cycle 6 since it was the first cycle to include an independent national sample of males aged 15-44 years. In the NSFG Cycle 6, the formal sex education questions were only asked to males aged 15-19 years; however, the 2006-2010 NSFG expanded the age range universe to include males aged 15-24 years.

To assess receipt of formal sex education, the 2006-2010, 2011-2013, and 2013-2015 male NSFG participants were asked, "before you were 18, did you ever have any formal instruction at school, church, a community center or some other place about" the following topics: "how to say no to sex," "methods of birth control," "sexually transmitted diseases," and "how to prevent HIV/AIDS?" In addition, the 2011-2013 and 2013-2015 NSFG male participants aged 15-24 years were also asked about formal sex education on "waiting until marriage to have sex," "where to get birth control," and "how to use a condom." If the respondent answered "yes" to any of the previously listed

formal sex education topics, then they were coded as "yes" to having received at least one formal sex-related topic, otherwise they were coded as "no."

Sex education by parents. Similar to the formal sex education questions and variables in the NSFG, the questions related to sex education by parents was only asked to male NSFG participants aged 15-24 years. Male NSFG participants were asked which, if any, sex education topics did they ever talk with a parent or guardian about. The participants asked to select which, if any, of following eight sex education topics were talked about with a parent or guardian: "how to say no sex;" "methods of birth control;" "where to get birth control;" "sexually transmitted diseases (STDs);" "how to prevent HIV/AIDS;" "how to use a condom;" "waiting until marriage to have sex;" and "none of the above." If male respondents answered "yes" to any of the previously listed topics then they were coded as "yes" to having communicated about at least one sex-related topic with a parent or guardian. In contrast, if respondents answered, "none of the above," then they were coded as "no" to having communicated about at least one sex-related topic.

Patient-provider sexual health communication. Patient-provider sexual health communication about HIV/AIDS was assessed by asking male NSFG participants if they have ever talked with a doctor about HIV. This question was asked of all male participants, regardless of age. If a male responded "yes," he was asked to identify which of the eleven following topics related to HIV/AIDS were covered in the patient-provider discussion: "how HIV/AIDS is transmitted;" "other sexually transmitted diseases (e.g., gonorrhea, herpes, and Hepatitis C);" "the correct use of condoms;" "needle

cleaning/using clean needles;" "dangers of needle sharing;" "abstinence from sex;" "reducing your number of sexual partners;" "condom use to prevent HIV or STD transmission;" "safe sex practices (e.g., abstinence, condom use, etc.);" "getting tested and knowing your HIV status;" and "other." The "getting tested and knowing your HIV status" option was added during the 2011-2015 interviewing period.

The 2006-2010 NSFG questions and variables related to patient-provider sexual health communication are part of a different universe than those questions and variables that correspond 2011-2015 NSFG. Although the variable names, codes, and variable types are the same, the context in which the question asked to participants was different. In the 2006-2010 NSFG, male participants were first asked, "did a doctor or other medical care provider talk with you about AIDS *after you had this last HIV test* (outside of blood donation)?" Thus, the questions related to patient-provider sexual health communication were contingent upon whether the participant was tested previously for HIV. If the participant responded "yes," then they were asked, "what topics related to HIV or AIDS were covered in the discussion you had with the doctor or other health professional?" In contrast, participants in the 2011-2015 NSFG interviewing period were first asked, "has a doctor or other medical care provider ever talked with you about HIV, the virus that causes AIDS?" Thus, the questions related to patient-provider sexual health communication were not contingent upon whether the participant was tested previously for HIV. If the participant responded "yes," then they were asked, what topics related to HIV or AIDS were covered in the discussion you had with the doctor or other health professional?"

Analysis of independent variables. For the independent variables of interest, *proc freq* procedures were used to calculate unweighted percentages for the 2006-2010, 2011-2015, and total samples for each independent variable of interest. The independent variables included sex education by parents, formal sex education, and patient-provider sexual health communication.

Similar to demographic variables, *proc surveyfreq* procedures that incorporated complex sampling weights were used to calculate weighted percentages. Unique sampling weights were used to calculate weighted percentages for each of the samples (i.e., 2006-2010, 2011-2015, and total study sample). Table 4.2 also shows weighted percentages for each independent variable in each NSFG interviewing period as well as the total sample. The only exception is the patient-provider sexual health communication variables. Weighted percentages were not reported for these variables as the variable universe was not the same for the 2006-2010 and the 2011-2015 interviewing periods.

Dependent Variables

The outcome variables for the current analysis include having ever been tested for HIV (excluding blood donation tests) and been tested for HIV in the last 12 months. Participants were asked a series of questions in part (I) of the male NSFG questionnaire (i.e. health conditions and health services) to assess the HIV testing variables of interest.

HIV Testing Behaviors. First, participants were asked a dichotomous question (yes/no), "not counting tests you may have had as part of blood donations, have you ever been tested for HIV?" This variable corresponds to ever tested for HIV variable, which was the main dependent variable of the study. If the participant responded "yes," he was

then asked if he was tested for HIV in the previous twelve months (i.e., within one year of the interview date). The tested for HIV in the previous twelve months was the second dependent variable of the study.

Analysis of Dependent Variables. For the dependent variables of interest, *proc freq* procedures were used to calculate unweighted percentages for the 2006-2010, 2011-2015, and total samples for each independent variable of interest. The dependent variables included ever tested for HIV and tested for HIV in previous 12 months.

Similar to demographic variables, *proc surveyfreq* procedures that incorporated complex sampling weights were used to calculate weighted percentages. Unique sampling weights were used to calculate weighted percentages for each of the samples (i.e., 2006-2010, 2011-2015, and total study sample). Table 4.2 also shows weighted percentages for each independent variable in each NSFG interviewing period as well as the total sample.

Demographic Variables and Covariates

Analysis of Demographic Variables and Covariates. All analyses were conducted using the statistical package SAS version 9.4 (SAS Institute Inc., 2014). First, *proc freq* procedures were used to calculate unweighted percentages for the 2006-2010, 2011-2015, and total samples for each demographic variable of interest. Demographic variables included age, race/ethnicity, mother's education level, family structure before age 18, income, health insurance, sexual orientation, sexual risk behaviors (e.g., number of sex partners, sex with HIV positive male, and exchange of money for sex), drug use, STD testing and treatment, attitudes toward same-sex relationships, and significant life events (e.g., jail or prison, use of shelters, and school suspensions). Table 4.2 shows unweighted

percentages for each demographic variable in each NSFG interviewing period as well as the total sample.

Next, *proc surveyfreq* procedures that incorporated complex sampling weights were used to calculate weighted percentages. A different sampling weight was used to calculate weighted percentages for each of the samples (i.e., 2006-2010, 2011-2015, and total study sample). Table 4.2 also shows weighted percentages for each demographic variable in each NSFG interviewing period as well as the total sample.

To identify covariates of interest, chi-squared statistics were computed to identify statistically significant differences ($p<.05$) in the distribution of the demographic variables in relation to ever having an HIV test. Those with a $p<.05$ were considered for inclusion in the logistic regression models that were used to calculate adjusted prevalence ratios (APR).

Logistic Regression Models

Multivariable logistic regression was used to calculate prevalence ratios (PRs) to examine the relationship between each intendent variable of interest and the identified HIV testing variables. In SAS version 9.4, *proc surveylogistic* procedures were used to calculate prevalence ratios (PRs) and adjusted prevalence ratios (APRs). In addition, 95% confidence intervals were computed for each prevalence ratio (PR) and adjusted prevalence ratio (APR). To calculate adjusted prevalence ratios (APRs), multivariable regression models were constructed to control for a variety of potential covariates. Covariates were previously identified via chi-squared statistics that were originally used to identify statistically significant differences ($p<.05$) in the distribution of the demographic variables in relation to ever having an HIV test(Petroll & Mosack, 2011).

Table 3.1

Research Questions and National Survey of Family Growth Male Questionnaire Items

Study Research Questions	*NSFG Questionnaire Items*	*Topics and Choices Presented*
1. Which formal sex education topics are associated with HIV testing behaviors (i.e. ever been tested for HIV and tested for HIV in the last 12 months) among sexually active YMSM aged 15-24 years?	(Before you were 18, did you ever/ Have you ever had) any formal instruction at school, church, a community center or some other place about each of the following…	Dichotomous item (0= No; 1=Yes) for each of the following formal sex education topics: how to say no to sex; methods of birth control; sexually transmitted diseases; how to prevent HIV/AIDS
2. Which parent-adolescent sex communication topics are associated with HIV testing behaviors (i.e. ever been tested for HIV and tested for HIV in the last 12 months) among sexually active YMSM aged 15-24 years?	(Before you were 18 years old,) which, if any, of the topics shown did you ever talk with a parent or guardian about?	Dichotomous item (0= No; 1=Yes) for each of the following parent-adolescent sex communication topics: how to say no to sex; methods of birth control; where to get birth control; sexually transmitted diseases; how to prevent HIV/AIDS; how to use a condom; none of the above
3. Which topics presented during patient-provider sexual health communication and education are associated with HIV testing behaviors (i.e. ever been tested for HIV and tested for HIV in the last 12 months) among sexually active YMSM aged 15-24 years?	Looking at the card, what topics related to HIV or AIDS were covered the discussion you had with the doctor other health professional?	Dichotomous item (0= No; 1=Yes) for each of the following sexual health communication topics: how HIV/AIDS is transmitted; other sexually transmitted diseases like gonorrhea, herpes, or Hepatitis C; the correct use of condoms; needle cleaning/ using clean needles; dangers of needle sharing; abstinence from sex (not having sex); reducing your number of sexual partners; condom use to prevent HIV or STD transmission; “safe sex” practices (abstinence, condom use, etc.); other
4. Are sexually active YMSM aged 15-24 years that self-identify as gay/homosexual more likely to have received sex education by parents on specific sexual health topics compared to other YMSM that did not identify as gay/homosexual?	[Sexual orientation] Do you think of yourself as…	Choices included: heterosexual or straight; homosexual or gay; bisexual

Table 3.2

National Survey of Family Growth Periodic Interviewing Cycles 1-6

NSFG Cycle	Cycle Year	Population of Interest	Sample Size	Over-Samples	Length of Interview (min)	Interview Technique	Incentive ($)	Response Rate (%)
Cycle 1	1973	Ever-married women aged 15-44 years	9,797	African American Women	60	Paper and Pencil	No	90.2
Cycle 2	1976	Ever-married women aged 15-44 years	8,611	African American Women	60	Paper and Pencil	No	82.7
Cycle 3	1982	All women aged 15-44 years	7,969	African American Women; Teens aged 15-19 years	60	Paper and Pencil	No	79.4
Cycle 4	1988	All women aged 15-44 years	8,450	African American Women	70	Paper and Pencil	No	82.5
Cycle 5	1995	All women aged 15-44 years	10,847	African American & Hispanic Women	100	CAPI; ACASI	20	78.7
Cycle 6	2002	All women & men aged 15-44 years	12,571 M = 7,643 W = 4,928	African Americans; Hispanics; Teens aged 15-19 years	W = 85 M = 60	CAPI; ACASI	40	79 M = 80 W = 78

Note. M = Men. W = Women. CAPI = Computer-Assisted Personal Interviewing technique. ACASI = Audio Computer-Assisted Self-Interviewing technique.

Table 3.3

National Survey of Family Growth Continues Interviewing 2006-2015

NSFG	Population of Interest	Sample Size	Over-Samples	Length of Interview (min)	Interview Technique	Incentive ($)	Response Rate (%)
2006-2010	All women & men aged 15-44 years	22,682 W = 12,279 M = 10,403	African Americans; Hispanics; Teens aged 15-19 years	W = 80 M = 60	CAPI; ACASI	40	77 M = 78 W = 75
2011-2013	All women & men aged 15-44 years	10,406 W = 5,601 M = 4,815	African Americans; Hispanics; Teens aged 15-19 years	W = 80 M = 60	CAPI; ACASI	40	72.8 M = 73.4 W = 72.1
2013-2015	All women & men aged 15-44 years	10,205 W = 5,699 M = 4,506	African Americans; Hispanics; Teens aged 15-19 years	W = 80 M = 60	CAPI; ACASI	40	69.3 M = 71.2 W = 67.1

Note. M = Men. W = Women. CAPI = Computer-Assisted Personal Interviewing technique. ACASI = Audio Computer-Assisted Self-Interviewing technique.

CHAPTER FOUR

Sex Education and HIV Testing Among Young Men Who Have Sex with Men: Findings From the 2006-2010 and 2011-2015 National Survey of Family Growth

Abstract

Background: Young men who have sex with men (YMSM) are disproportionally affected by HIV and exhibit low levels of HIV testing. The purpose of this study was to examine the relationship between sex education and subsequent HIV testing among YMSM.

Methods: Data from sexually active men aged 15-24 years at interview in the 2006-2010 or 2011-2015 National Survey of Family Growth. Sex education included three contexts (formal institutions [e.g., schools], parents, and healthcare providers) and specific topics. Outcome variables were ever- and recent- HIV testing. Multivariate models adjusted for sociodemographics and data were weighted to account for the complex survey sampling design.

Results: Overall, 42.4% had ever-tested for HIV and 16.9% tested in the previous 12 months. YMSM were more likely to have ever-tested for HIV if they talked with a parent/guardian about how to prevent HIV/AIDS (adjusted prevalence ratio[aPR]=1.48; 95% confidence interval [CI]:1.07-2.06), talked with a healthcare provider about how HIV/AIDs is transmitted (aPR=1.64; 95%CI:1.13-2.38), sexually transmitted diseases (aPR=1.49; 95%CI:1.02-2.19), condom use (aPR=1.61; 95%CI:1.13-2.30), and the importance of HIV testing (aPR=1.83; 95%CI:1.22-2.73).

Conclusions: Tailored sex education by parent(s) and healthcare providers related to HIV/AIDS appears to significantly increase the likelihood of HIV testing among YMSM.

Keywords: sex education; HIV/AIDS education; young men who have sex with men; HIV testing

Background

The HIV epidemic continues to receive attention from a variety of national directives, including *Healthy People 2020*.[1] Nevertheless, adolescent and young adult populations continue to be severely affected by HIV. In 2015, 22% of the 39,500 new HIV diagnoses in the United States occurred among those aged 13-24 years.[2-3]Approximately 51% of the 60,900 HIV seropositive adolescents and young adults aged 13-24 years were living undiagnosed in 2013, thus unaware of their serostatus and ability to transmit HIV

Among youth and young adult populations, HIV is more prevalent among gay and bisexual males.[2-3] In 2015, 81% of the 8,807 adolescents and young adults aged 15-24 years diagnosed with HIV were gay and bisexual males.[3] Although self-identification of sexual orientation is one way to categorize high-risk populations, HIV transmission is not dependent on sexual orientation, but rather on the high-risk behaviors such as unprotected same-sex intercourse.[6-5]As such, national HIV surveillance began to collect data in the early 1990s using survey questions specifically designed to capture information about high-risk populations, such as men who have sex with men (MSM) and more recently young MSM (YMSM), regardless of self-identified sexual orientation.[6]

The Centers for Disease Control and Prevention (CDC) recommends annual HIV testing for sexually active MSM,[7] and HIV testing every three to six months for persons with multiple sex partners and YMSM.[7-8] Furthermore, the CDC recommends that HIV tests be a part of routine health care for all adolescents and be employed in all health care settings, unless the patient opts-out of screening.[7,8] Despite national testing recommendations, research suggests that HIV testing among YMSM remains sub-optimal.[1,9-14] To improve HIV testing behaviors among YMSM, *Healthy People 2020* now includes the objectives of increasing the proportion of adolescents and adults who have ever been tested for HIV from 66.9% to 73.6%, and increasing the proportion of MSM who report having been tested for HIV in the previous 12 months from 62.2% to 68.4%.[1]

Sex education in a variety of settings may increase youth engagement in HIV testing.[16-18] Formal sex education is instruction that takes place in a school, youth center, church, or other community setting,[19] and has been shown to influence adolescent sexual health behaviors, such as condom use.[15] In contrast, informal sex education refers to instruction that takes place outside of a classroom setting via various interpersonal relationships. Parents/guardians are a crucial informal source of knowledge and support for adolescents and can shape their sexual attitudes and behaviors during the early life course.[20-22] Patient-healthcare provider communication, such as provider recommendations for HIV testing,[23-24] sexual orientation disclosure to a provider,[25] and discussion about HIV prevention and behaviors in the healthcare setting is another form of informal sex education.[12,26] Both formal and informal sex education have been

recognized by *Healthy People 2020* as a tool to target adolescent decision-making, sexual risk behaviors, and engagement in prevention and testing behaviors.[1]

Little research has examined the relationship between sex education and HIV testing specifically among YMSM populations. The purpose of this study is to examine the association between sex education and HIV testing in a nationally-representative sample of sexually active YMSM aged 15-24 years. We hypothesized that YMSM who received formal or informal sex education on how to use a condom, sexually transmitted diseases (STDs), and/or HIV/AIDS will be more likely to have ever been tested for HIV than those who did not receive education, and that YMSM who had discussed HIV/AIDS transmission and/or getting tested for HIV with a health care provider will be more likely to have ever been tested for HIV than those who did not have these discussions with a provider.

Methods

The National Survey of Family Growth (NSFG) is designed to collect information related to marriage, divorce, pregnancy, use of reproductive health care/services, and the general health of U.S. men and women.[27,28] NSFG began in 1973 and is ongoing.[28] The 2006-2010 and 2011-2015 NSFG were conducted using a multi-stage, stratified, clustered sampling design to survey a nationally representative household sample population of non-institutionalized men and women aged 15-44 years that reside in the United States and District of Columbia.[27,28] A total of 10,403 males completed interviews during the 2006-2010 NSFG, resulting in a 75% response rate.[27] After a 15-month gap in interviewing, 4,815 males completed the 2011-2013 NSFG and 4,506 males completed the 2013-2015 NSFG, with response rates of 72.1% and 67.1%, respectively.[27] As

recommended by the CDC, we used caution when combining the 2006-2010 and 2011-2015 data files, as weighted estimates derived from the combined data file may be misleading if estimates from the separate data files vary significantly.27 Additional information related to the NSFG sampling design and methodology is described elsewhere.[27,28]

For this study, we included 2006-2010 and 2011-2015 NSFG participants that were male, aged 15-24 years at the time of the interview, and had ever engaged in sexual intercourse with another male (e.g., receptive anal sex, insertive anal sex, or oral sex). The primary outcome of interest was ever-tested for HIV, measured by the question, "not counting tests you may have had as part of blood donations, have you ever been tested for HIV (yes/no)?"

Participants were asked seven yes/no questions related to formal sex education before the age of 18 years on the following seven sex-related topics: (1) how to say no to sex; (2) methods of birth control; (3) where to get birth control; (4) STDs; (5) how to prevent HIV/AIDS; (6) how to use a condom; (7) waiting until marriage to have sex. Participants were also asked if they have ever talked to a parent or guardian before the age of 18 years about each of those seven topics. We created a summary variable to categorize sex education topics as *any* vs. *none*. If participants responded "yes" to any of the formal sex education topics then they classified as *any*; if the respondent said "no" to all topics, then they were classified as *none*. This procedure was also used to create a new variable for sex education by parents. Patient-provider HIV/AIDS communication was assessed by asking participants, "has a doctor or other medical care provider ever talked with you about HIV, the virus that causes AIDS (yes/no)." If "yes," then participants

were asked to identify which of the ten following topics were covered in past discussions: (1) how HIV/AIDS is transmitted; (2) STDs; (3) the correct use of condoms; (4) needle cleaning/using clean needles; (5) dangers of needle sharing; (6) abstinence from sex; (7) reducing the number of sexual partners; (8) condom use to prevent HIV or STD transmission; (9) safe sex practices; and (10) getting tested and knowing your HIV status.

Sociodemographic variables included age, race/ethnicity, mother's education, income as percent of poverty level, health insurance status during past 12 months, sexual orientation, and family environment. Health behavior included STD testing during past 12 months.

Data were managed and analyzed using SAS v9.4 (SAS Institute Inc., Cary, NC, USA). First, we determined the unweighted sample size and frequency of all variables. The estimates for all variables from the two separate survey cycles did not vary significantly (Table 4.1 and Table 4.2); as a result, we combined 2006-2010 and 2011-2015 data into a total population and calculated weighted estimates for each variable of interest.[27] Then, we then compared the distribution of all variables in the total population by HIV testing (ever vs. never) using chi-square statistics.

We generated unadjusted and adjusted prevalence ratios (PR) and corresponding 95% confidence intervals (CI) for the total sample using PROC GENMOD with Poisson error distributions and log link functions. The GENMOD procedure was selected because logistic regression models and odds ratios are poor approximations of the prevalence ratio when the outcome is not sufficiently rare.[29] Adjusted regression models assessed the relationship between each individual sex education/communication variable of interest and ever-tested for HIV, adjusting for sociodemographic and health variables. Covariates

were determined using the results of chi-square tests ($p<.05$) and forward selection. Unless otherwise noted, all analyses were weighted to account for the complex multi-stage, stratified, clustered sampling of NSFG data.

Results

A total of 323 YMSM aged 15-24 years met the inclusion criteria from the 2006-2010 and 2011-2015 NSFG. During 2006-2010 and 2011-2015, 42.39% of YMSM aged 15-24 years had ever-tested for HIV and only 16.89% had tested for HIV in the previous 12 months (Table 6). Over three-fifths of YMSM were non-Hispanic White (61.29%), 41.13% self-identified as heterosexual, and 32.44% self-identified as homosexual.

Almost all had received formal sex education on at least one sex-related topic. The majority of YMSM received formal sex education on how to say no to sex (76.08%), methods of birth control (66.46%), STDs (91.67%), how to prevent HIV/AIDS (86.88%), and how to use a condom (2011-2015 estimate: 52.39%). In contrast, only 69.45% of YMSM had talked to a parent/guardian about at least one sex-related topic. Less than half reported sex education by parents on how to say no to sex (36.20%), methods of birth control (38.36%), STDs (48.89%), how to use a condom (40.06%), and how to prevent HIV/AIDS (42.11%; Table 4.2).

Patient-healthcare provider conversations about sexual health was the least common method of sex education, as only 34.70% of YMSM had discussed an HIV/AIDS-related topic with a provider. The most common patient-provider discussion topics were how HIV/AIDS is transmitted (27.30%), STDs (26.54%), “safer sex practices” (25.46%), and condom use (23.28%; Table 2). Only 23.45% of YMSM during

the 2011-2015 NSFG time period discussed the topic of getting tested and the importance of knowing your HIV status with a provider.

In the total sample, YMSM who received formal sex education on the topics of how to prevent HIV/AIDS (PR=1.27; 95%CI: 0.69-2.35) and how to use a condom (PR=1.19; 95%CI: 0.70-2.04) were more likely to have ever-tested for HIV (Table 4.3). However, after adjusting for age, race/ethnicity, sexual orientation, total number of sexual partners in entire life, and family income, the associations were not statistically significant at the α=0.05 level.

YMSM who talked with a parent/guardian about how to prevent HIV/AIDS (aPR=1.48; 95%CI: 1.07-2.06) were significantly more likely to have ever-tested for HIV. Discussions about where to get birth control (aPR=1.22; 95%CI: 0.97-1.71), STDs (aPR=1.30; 95%CI: 0.91-1.88), and how to use a condom (aPR=1.29; 95%CI: 0.90-1.83) were not significantly associated with ever-testing for HIV.

YMSM were significantly more likely to have ever-tested for HIV if they had talked to a healthcare provider about at least one HIV/AIDS-related topic (aPR=1.85; 95%CI: 1.27-2.71), no matter which topic. Sex education from providers on how HIV/AIDs is transmitted (aPR=1.64; 95%CI: 1.13-2.38), STDs (aPR=1.49; 95%CI: 1.02-2.19), the correct use of condoms (aPR=1.63; 95%CI: 1.14-2.34), dangers of needle sharing (aPR=1.67; 95%CI: 1.16-2.39), abstinence from sex (aPR=1.54; 95%CI: 1.10-2.15), condom use to prevent HIV or STD transmission (aPR=1.61; 95%CI: 1.13-2.30), and "safer sex" practices (e.g., abstinence, condom use, etc.) (aPR=1.86; 95%CI: 1.33-2.61) were all associated with HIV testing. The topic of getting tested and knowing your

HIV status appeared to have one of the strongest associations with HIV testing (aPR=1.83; 95%CI: 1.22-2.73).

Discussion

The purpose of the present study was to determine the relationship between sex education and HIV testing in a nationally representative sample of YMSM in the United States. Our findings suggest that the proportion of YMSM aged 15-24 who have ever-tested for HIV and tested for HIV in the previous 12 months fall well below the *Healthy People 2020* objectives of increasing the portion of youth and MSM who have been tested for HIV in the previous 12 months.[1] This finding is a major public health concern because over half of the adolescents and young adults aged 13-24 living with HIV are living undiagnosed and, as a result, are unaware of their ability to transmit HIV.[3]

The CDC suggests that educating students about HIV/AIDS and other STDs in a formal setting could increase adolescents' likelihood of being tested for HIV and STDs.[4] A 2014 Youth Risk Behavioral Surveillance System (YRBSS) study found that adolescents that received HIV/AIDS education were 1.5 times more likely to have ever been tested for HIV.[17] Similar findings have been reported by other investigators, but all published studies used samples containing both genders.[15,17] As a result, it has not been clear if these results are generalizable to marginalized populations like YMSM. In our study, we found that the majority of YMSM received formal sex education on methods of birth control, STDs, and how to prevent HIV/AIDs, but there was no association between sex education in formal contexts and HIV testing after controlling for confounding variables. Additional research is needed to examine the quality of formal sex education,

as quality may mediate and/or strengthen the relationship between receipt of formal sex education on HIV/AIDS prevention and HIV testing.[4]

Comprehensive sex education may be proxied by total number of topics. In a sensitivity analysis for our study, we summed the total of number of sex education topics for both formal sex education and sex education by parents separately to determine if the quantity of topics would influence likelihood of HIV testing. We found that almost 90% YMSM had discussed at least 3 topics and over 60% discussed four or more in a formal setting. Sex education by parents was not as common; only one-third had never discussed a sex-topic with a parent. We did not find any associations between number of topics received and HIV testing for both formal sex education and sex education by parents (results not shown). More work is needed to determine if the quantity or comprehensiveness of the sex education impacts HIV testing among YMSM.

Families, and in particular parents and guardians, are integral in the delivery of sexual health messages and interventions to adolescents and young adults, including YMSM.[20,22] In previous research, the most common topics discussed with parents among male adolescents were abstinence, STDs, condom use, and HIV/AIDS.[1,18] YMSM who had talked with a parent/guardian about how to prevent HIV/AIDS were approximately 50% more likely to have ever-tested for HIV. These findings suggest that parent-based sex education does play a role in increasing adolescent engagement in HIV testing and that the topics that directly impact the YMSM population, such as HIV/AIDS prevention and condom use, are linked to HIV testing. Additional research is needed to examine specific sub-topics of HIV/AIDS prevention to determine which pieces of information are linked to HIV testing. Moreover, additional information is needed to assess strength of

parent-adolescent connection and perceptions of parental warmth/care. Strength of parent-child relationship and warmth/care may mediate the relationship between HIV/AIDS discussions and youth engagement in prevention measures, such as HIV testing.[30-31] It is also recommended that additional topics previously linked to HIV testing, such as parent-child discussions about same-sex intercourse behavior,[32] also be assessed in large population-based survey efforts. These findings suggest the need for innovative family-based HIV prevention strategies and interventions.

Patient-provider sexual health communication has been linked to variety of positive health behaviors, including HIV testing.[26] Past research has shown that providers who feel comfortable discussing sexual orientation and sexual behaviors are more likely to recommend HIV tests to YMSM.[24,26] However, many YMSM believe that provider conversations lack inclusive language and do not contain the right questions about sexual health issues impacting YMSM.[33] Although visits to a provider in the previous 12 months has been linked to HIV testing,[34-35] MSM/YMSM rarely receive recommendations for HIV tests from a provider (<60% of the time).[13,23-24,26] The sexual health topics discussed during these visits may mediate the relationships between visits to a health care provider, receiving an HIV testing recommendation, and actual engagement in HIV testing.[12,26] Although these previous studies revealed a connection between discussions about general HIV/AIDS prevention and HIV testing among MSM/YMSM, the relationship for specific topics, such as condom use and the importance being tested for HIV, remain under-examined.

Patient-healthcare provider conversations about sexual health was the least common sex education context reported by YMSM in our study. We found that less than

40% of respondents had ever talked to a provider about HIV/AIDS prevention, which is consistent with findings from pervious MSM/YMSM studies in which less than 30% had ever discussed getting tested for HIV with a provider.[12,26] In our study, YMSM were significantly more likely to have ever-tested for HIV if they talked to a provider about how HIV/AIDs is transmitted, STDs, the correct use of condoms, dangers of needle sharing, abstinence, condom use to prevent HIV or STD transmission, "safer sex" practices (e.g., abstinence, condom use, etc.), and getting tested and knowing your HIV status. Our findings suggest that health care providers can influence YMSM engagement in HIV testing behavior by discussing health topics that directly impact YMSM. The results emphasize the need for opt-out HIV testing strategies for adolescents and young adults, especially YMSM.[12,23,25] In addition, our findings support the need for educating providers about how to tailor education for YMSM patients on sexual risk behaviors, and creating strategies that will help facilitate the patient-provider discussions about HIV/AIDS prevention, including HIV testing.[26]

The present study has several limitations. First, data from the 2006-2010 and 2011-2015 NSFG are self-reported and, as a result, are subject to recall bias. It is possible that participants who have ever had an HIV test were more likely to recall sex education experiences. Although NSFG uses age restrictions to limit the threat of recall bias (e.g., the questions related to sex education were only asked to participants aged 15-24 years), participants still may have been misclassified based on their own recall of exposure. National surveys that use self-reported data, such as the NSFG, may underestimate the prevalence of adolescent sexual health discussions. In addition, the cross-sectional study design could not adequately assess the temporal relationship between the exposure of

interest (i.e., sex education/communication) and the outcome of interest (i.e., HIV testing). As a result, we cannot determine whether receipt of sex education/communication preceded the HIV testing behavior(s) in question.

Additional unmeasured confounders in the multivariable analysis are also possible as the number of variables in the NSFG are solely based on occurrence/receipt of sex education and communication. We were unable to determine the information source (e.g., mother, father, or another guardian) for the sex education by parent(s) variables and the location where formal sex education was received (e.g., church, community center, and school-based sex education). These factors may influence the relationship between the independent variables of interest and health/behavioral outcomes. Other work has shown that sex education by mothers may impact offspring health and behavior differently than sex education by fathers.[16,30] The results of this study cannot be reported as "2006-2015" since there is a 15-month gap in interviewing between the 2006-2010 and 2011-2015 survey periods.[27] The 2013-2015 NSFG guide indicates that the survey weights were not designed or adjusted for the purpose of accounting for the 15-month gap and reporting total findings from the two NSFG periods.[27] In addition, the names for the patient-provider sexual health communication questions in 2006-2010 were only asked to persons who had ever-tested for HIV; however, the corresponding questions were asked to all participants in the 2011-2015 NSFG, regardless of HIV testing experience. As a result, prevalence ratios for all patient-provider variables were calculated using data only from the 2011-2015 NSFG.

Our study has important implications for HIV/AIDS prevention in the United States. Sex education on specific topics, such as condom use and HIV testing, both by

parents and by health providers increased the likelihood of HIV testing among YMSM. Parents and healthcare providers should tailor sex education discussions with youth to promote healthy behaviors and to stress the importance of HIV testing. Public health professionals should equip parents and healthcare providers with strategies to initiate HIV/AIDS-related conversations with YMSM.

Acknowledgements

The authors thank the National Center for Health Statistics and the CDC for approving and facilitating our use of the NSFG restricted data files

Table 4.1

Descriptive characteristics of YMSM aged 15-24 years who have ever had same-sex intercourse[a].

Item	2006-2010 (No.)[e] w%[c]	2011-2015 (No.)[e] w%[c]	Total w%[c]	Ever HIV Test w%[c]	Never HIV Test w%[c]	*p*[d]
Age (yr)						0.02
15-17	(28) 16.49	(28) 9.39	12.86	5.17	18.57	
18-21	(70) 34.61	(66) 42.41	38.60	36.88	39.59	
22-24	(59) 48.90	(72) 48.20	48.54	57.96	41.83	
Race/ethnicity						<0.01
Non-Hispanic white	(91) 64.26	(80) 58.45	61.29	57.52	64.33	
Non-Hispanic black	(31) 12.92	(35) 21.35	17.24	25.70	11.09	
Hispanic or Latino	(23) 11.72	(43) 13.58	12.67	14.84	10.68	
Other	(12) 11.10	(8) 6.62	8.80	1.93	13.90	
Income as % of poverty level						
<100%	(41) 33.90	(57) 29.15	31.47	30.53	31.85	0.86
>100%	(116) 66.10	(109) 70.85	68.53	69.48	68.15	
Health insurance, previous 12 months	(71) 44.01	(54) 37.53	40.68	37.46	42.79	0.54
Sexual Orientation						0.04
Heterosexual	(70) 52.76	(54) 30.20	41.13	29.73	49.31	
Homosexual	(50) 28.12	(61) 36.50	32.44	40.47	26.63	
Bisexual	(32) 19.13	(51) 33.30	26.43	29.80	24.06	
Number of male sex partners, ever						<0.01
1-3	(102) 69.28	(100) 65.71	67.42	44.87	83.83	
4-6	(23) 16.80	(30) 17.48	17.15	27.25	9.82	
7-9	(7) 7.88	(8) 4.14	5.94	10.97	2.27	
≥10	(15) 4.36	(23) 12.03	8.34	16.54	2.37	
Don't know	(2) 1.68	(3) 0.63	1.14	0.38	1.70	
Tested for STDs	(47) 32.59	(62) 37.88	35.30	67.41	11.82	<0.01
Ever tested for HIV	(75) 40.36	(78) 44.32	42.39	-	-	
Tested for HIV in previous 12 months	(2) 23.75	(2) 13.37	16.89	-	-	

Note: YMSM = young men who have sex with men; AIDS = acquired immunodeficiency syndrome; HIV = Human immunodeficiency virus; STD = sexually transmitted disease.

[a]Reported ever having oral or anal sex with another male.

[b]Unweighted percentage of sample.[c]Weighted percentage of sample.

[d]*p*-values measure weighted differences between YMSM who have ever tested for HIV and YMSM who have never tested for HIV. Values obtained from Chi-square tests.

[e]Unweighted sample size.

Table 4.2

Receipt of formal and informal sex education among men aged 15-24 years who have ever had same-sex intercourse[a].

Item	2006-2010 w%[b]	2011-2015 w%[b]	Total w%[b]
Formal sex education			
Received sex education on at least one sex-related topic	98.10	95.08	96.56
How to say no to sex	82.58	69.88	76.08
Methods of birth control	72.94	60.32	66.46
Where to get birth control[c]	-	43.98	-
STDs	95.80	87.73	91.67
How to use a condom[c]	-	52.39	-
How to prevent HIV/AIDS	93.35	80.71	86.88
Abstinence[c]	-	57.15	-
Sex education by parents			
Talked to parent about at least one sex-related topic	67.88	70.94	69.45
How to say no to sex	35.95	36.43	36.20
Methods of birth control	42.46	34.44	38.36
Where to get birth control	32.23	24.29	28.17
STDs	46.94	50.75	48.89
How to use a condom	39.93	44.19	40.06
How to prevent HIV/AIDS	37.46	42.53	42.11
Abstinence[c]	-	19.31	-
Patient-provider sexual health communication			
Talked to provider about at least one HIV/AIDS-related topic	24.45	34.70	-
How HIV/AIDS is transmitted	19.73	27.30	-
STDs	18.23	26.54	-
The correct use of condoms	13.50	20.12	-
Needle cleaning/using clean needles	6.18	13.19	-
Dangers of needle sharing	9.32	16.29	-
Abstinence from sex (not having sex)	10.61	16.14	-
Reducing your number of sexual partners	11.65	15.80	-
Condom use to prevent HIV or STD transmission	16.47	23.28	-
"Safer sex" practices (abstinence, condom use, etc.)	14.77	25.46	-
Getting tested and knowing your HIV status[c]	-	23.45	-
Some other topic	1.25	1.03	-

Note: AIDS = acquired immunodeficiency syndrome; HIV = Human immunodeficiency virus; STD = sexually transmitted disease.

[a]Reported ever having oral or anal sex with another male.

[b]Weighted sample size.

[c]Topic only assessed in the 2013-2015 National Survey of family Growth.

Table 4.3

Associations between sex education and ever being tested for HIV among men aged 15-24 years who have ever had same-sex intercourse[a].

Item	Ever-tested for HIV	
	PR (95%CI)	aPR[b] (95%CI)
Formal sex education[d,f]		
Received sex education on at least one sex-related topic	1.14 (0.38-3.46)	0.87 (0.32-2.37)
How to say no to sex	0.91 (0.60-1.38)	1.00 (0.69-1.44)
Methods of birth control	1.04 (0.70-1.55)	0.94 (0.65-1.35)
Where to get birth control[c]	0.90 (0.54-1.51)	1.00 (0.65-1.56)
STDs	0.94 (0.50-1.74)	0.88 (0.51-1.54)
How to use a condom[c]	1.19 (0.70-2.04)	1.18 (0.77-1.80)
How to prevent HIV/AIDS	1.27 (0.69-2.35)	1.31 (0.81-2.14)
Abstinence[c]	0.72 (0.47-1.12)	0.69 (0.46-1.04)
Sex education by parents[d,g]		
Talked to parent about at least one sex-related topic	1.04 (0.67-1.62)	1.02 (0.67-1.56)
How to say no to sex	1.05 (0.71-1.55)	1.01 (0.71-1.43)
Methods of birth control	0.88 (0.70-1.07)	0.92 (0.76-1.11)
Where to get birth control	1.31 (0.88-1.94)	1.22 (0.87-1.71)
STDs	1.39 (0.92-2.09)	1.30 (0.91-1.88)
How to use a condom	1.25 (0.84-1.85)	1.29 (0.90-1.83)
How to prevent HIV/AIDS	1.42 (0.97-2.07)	1.48 (1.07-2.06)
Abstinence[c]	1.41 (0.93-2.13)	1.16 (0.80-1.68)
Patient-provider sexual health communication[d,e,h]		
Talked to provider about at least one HIV/AIDS-related topic	2.06 (1.33-3.20)	1.85 (1.27-2.71)
How HIV/AIDS is transmitted	1.86 (1.20-2.90)	1.64 (1.13-2.38)
STDs	1.65 (1.04-2.61)	1.49 (1.02-2.19)
The correct use of condoms	1.71 (1.12-2.57)	1.63 (1.14-2.34)
Needle cleaning/using clean needles	1.52 (0.97-2.37)	1.49 (1.00-2.20)
Dangers of needle sharing	1.61 (1.05-2.47)	1.67 (1.16-2.39)
Abstinence from sex (not having sex)	1.80 (1.20-2.70)	1.54 (1.10-2.15)
Reducing your number of sexual partners	1.86 (1.24-2.79)	1.08 (0.83-1.39)
Condom use to prevent HIV or STD transmission	1.88 (1.24-2.84)	1.61 (1.13-2.30)
"Safer sex" practices (abstinence, condom use, etc.)	2.05 (1.37-3.06)	1.86 (1.33-2.61)
Getting tested and knowing your HIV status[c]	2.31 (1.51-3.54)	1.83 (1.22-2.73)

Note: PR = prevalence ratio; aPR = adjusted prevalence ratio; CI = confidence interval AIDS = acquired immunodeficiency syndrome; HIV = Human immunodeficiency virus; ref = reference; STD = sexually transmitted disease.

[a]Reported ever having oral or anal sex with another male.

[b]Model is adjusted for age, race/ethnicity, sexual orientation, total number of sexual partners in entire life, and family income as percent of poverty level.

[c]Topic only assessed in the 2011-2015 National Survey of family Growth.

[d]All topics were compared using "yes" and "no" responses.

[e]Prevalence ratios for all patient-provider sexual health communication variables were calculated using only 2011-2015 National Survey of Family Growth data.

[f]The "no" category includes participants who did not receive formal sex education about any sex topic

[g]The "no" category includes participants who did not talk to a parent about any sex-related topic.

[h]The "no" category includes participants who did not talk to a provider about any HIV/AIDS-related topic.

References

1. Office of Disease Prevention and Health Promotion. Healthy People 2020. 2017; https://www.healthypeople.gov/2020topics-objectives/topic/hiv. Accessed June 17, 2017.

2. Centers for Disease Control and Prevention. Monitoring selected national HIV prevention and care objectives by using HIV surveillance data: United States and 6 dependent areas. *MMWR Morb Mortal Wkly Rep.* 2014(21):1-87.

3. Centers for Disease Control Prevention [CDC]. CDC fact sheet: HIV among youth. 2017; https://www.cdc.gov/hiv/pdf/group/age/youth/cdc-hiv-youth.pdf. Accessed June 10, 2017.

4. Centers for Disease Control Prevention. CDC fact sheet: HIV and young men who have sex with men. 2014; https://www.cdc.gov/healthyyouth/sexualbehaviors/pdf/hiv_factsheet_ymsm.pdf. Accessed June 14, 2017.

5. Young RM, Meyer IH. The trouble with "MSM" and "WSW": Erasure of the sexual-minority person in public health discourse. *Am J Public Health.* 2005;95(7):1144-1149.

6. Mustanski BS, Newcomb ME, Du Bois SN, et al. HIV in young men who have sex with men: a review of epidemiology, risk and protective factors, and interventions. *J Sex Res.* 2011;48(2-3):218-253.

7. Branson BM, Handsfield HH, Lampe MA, et al. Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *Morb Mortal Wkly Rep.* 2006;55(14):1-CE-4.

8. Workowski KA, Berman S. Sexually transmitted diseases treatment guidelines, 2010. *MMWR Morb Mortal Wkly Rep.* 2010.

9. Leonard NR, Rajan S, Gwadz MV, et al. HIV testing patterns among urban YMSM of color. *Health Educ Behav.* 2014;41(6):673-681.

10. Finlayson TJ, Le B, Smith A, et al. HIV risk, prevention, and testing behaviors among men who have sex with men—National HIV Behavioral Surveillance System, 21 US cities, United States, 2008. *MMWR Surveill Summ.* 2011;60(14):1-34.

11. Centers for Disease Control Prevention. HIV testing and risk behaviors among gay, bisexual, and other men who have sex with men-United States. *MMWR Morb Mortal Wkly Rep.* 2013;62(47):958.

12. MacKellar DA, Valleroy LA, Anderson JE, et al. Recent HIV testing among young men who have sex with men: correlates, contexts, and HIV seroconversion. *Sex Transm Dis.* 2006;33(3):183-192.

13. Phillips G, Ybarra ML, Prescott TL, et al. Low rates of human immunodeficiency virus testing among adolescent gay, bisexual, and queer men. *J Adolesc Health.* 2015;57(4):407-412.

14. Sumartojo E, Lyles C, Choi K, et al. Prevalence and correlates of HIV testing in a multi-site sample of young men who have sex with men. *AIDS Care.* 2008;20(1):1-14.

15. Voetsch A, Balaji A, Heffelfinger J, et al. HIV testing among high school students-United States, 2007. *MMWR Morb Mortal Wkly Rep.* 2009;58(24):665-668.

16. Clawson CL, Reese- Weber M. The amount and timing of parent- adolescent sexual communication as predictors of late adolescent sexual risk- taking behaviors. *J Sex Res.* 2003;40(3):256-265.

17. Ma Z-q, Fisher MA, Kuller LH. School-based HIV/AIDS education is associated with reduced risky sexual behaviors and better grades with gender and race/ethnicity differences. *Health Educ Res.* 2014;29(2):330-339.

18. Balaji AB, Oraka E, Fasula AM, et al. Association between parent–adolescent communication about sex-related topics and HIV testing, United States. 2006–2013. *AIDS Care.* 2017;29(3):344-349.

19. Lindberg LD, Maddow-Zimet I, Boonstra H. Changes in adolescents' receipt of sex education, 2006–2013. *J Adolesc Health.* 2016;58(6):621-627.

20. Aspy CB, Vesely SK, Oman RF, et al. Parental communication and youth sexual behaviour. *J Adolesc.* 2007;30(3):449-466.

21. Marcell AV, Ford CA, Pleck JH, et al. Masculine beliefs, parental communication, and male adolescents' health care use. *Pediatrics.* 2007;119(4):e966-e975.

22. Widman L, Choukas-Bradley S, Noar SM, et al. Parent-adolescent sexual communication and adolescent safer sex behavior: a meta-analysis. *JAMA Pediatr.* 2016;170(1):52-61.

23. Owczarzak J, Lechuga J, Petroll A. HIV testing as a standard of care for men who have sex with men: Patient and provider perspectives. *J Prim Care Community Health.* 2011;2(2):116-121.

24. Wall KM, Khosropour CM, Sullivan PS. Offering of HIV screening to men who have sex with men by their health care providers and associated factors. *J Int Assoc Physicians AIDS Care.* 2010;9(5):284-288.

25. Vincent W, McFarland W, Raymond HF. What factors are associated with receiving a recommendation to get tested for HIV by health care providers among men who have sex with wen? *J Acquir Immune Defic Syndr.* 2017;75:S357-S362.

26. Meanley S, Gale A, Harmell C, et al. The role of provider interactions on comprehensive sexual healthcare among young men who have sex with men. *AIDS Educ Prev.* 2015;27(1):15-26.

27. Public Use Data File Documentation: 2013-2015 National Survey of Family Growth User's Guide U.S. Department of Health and Human Services & National Center for Health Statistics 2016. https://www.cdc.gov/nchs/nsfg/nsfg_2013_2015_puf.htm. Accessed June 17, 2017.

28. Lepkowski JM, Mosher WD, Davis KE, et al. The 2006-2010 National Survey of Family Growth: Sample design and analysis of a continuous survey. *Vital and health statistics Series 2, Data evaluation and methods research.* 2010(150):1-36.

29. Spiegelman D, Hertzmark E. Easy SAS calculations for risk or prevalence ratios and differences. *Am J Epidemiol.* 2005;162(3):199-200.

30. Whitaker DJ, Miller KS, May DC, et al. Teenage partners' communication about sexual risk and condom use: the importance of parent-teenager discussions. *Fam Plann Perspect.* 1999:117-121.

31. Garofalo R, Mustanski B, Donenberg G. Parents know and parents matter; is it time to develop family-based HIV prevention programs for young men who have sex with men? *J Adolesc Health.* 2008;43(2):201-204.

32. Bouris A, Hill BJ, Fisher K, et al. Mother–son communication about sex and routine human immunodeficiency virus testing among younger men of color who have sex with men. *J Adolesc Health.* 2015;57(5):515-522.

33. Fuzzell L, Fedesco HN, Alexander SC, et al. "I just think that doctors need to ask more questions": Sexual minority and majority adolescents' experiences talking about sexuality with healthcare providers. *Patient Educ Couns.* 2016;99(9):1467-1472.

34. Lo Y-C, Turabelidze G, Lin M, et al. Prevalence and determinants of recent HIV testing among sexually active men who have sex with men in the St. Louis Metropolitan Area, Missouri, 2008. *Sex Transm Dis.* 2012;39(4):306-311.

35. Phillips G, Magnus M, Kuo I, et al. Correlates of frequency of HIV testing among men who have sex with men in Washington, DC. *AIDS Care.* 2013;25(12):1481-1484.

CHAPTER FIVE

Conclusions

The purpose of the present thesis was to assess associations between three distinct contexts of sex education (i.e., formal institutions, parents, and healthcare providers) and HIV testing in a nationally representative sample of YMSM in the United States. National and federal directives (e.g., *Healthy People 2020* and ONAP) have stressed the importance of identifying additional correlates of HIV testing, such as sex education, to improve HIV testing and prevention strategies for populations at the highest risk for acquiring HIV (ONAP, 2015; USDHHS, 2017). The identification of additional correlates of HIV testing can lead to enhancement of interventions and the creation of tailored HIV prevention strategies to increase HIV testing uptake among high-risk populations, such as YMSM.

For this thesis, the outcome variables of interest were ever-tested for HIV and HIV testing in the past 12 months. Like findings of other studies (Finlayson et al., 2011; Phillips et al., 2015), our findings also suggest that the proportion of YMSM aged 15-24 who have ever-tested for HIV and tested for HIV in the previous 12 months fall below the *Healthy People 2020* objectives of increasing the portion of youth and MSM who have been tested for HIV in the previous 12 months. This finding is a major public health concern as over half of the adolescents and young adults aged 13-24 living with HIV are living undiagnosed and, as a result, are unaware of their ability to transmit HIV (Duncan MacKellar et al., 2005).

The approach of identifying additional correlates of HIV testing and uses of sex education/communication is needed since gay/homosexual men accounted for approximately 55% of the 1.2 million people living with HIV in the U.S. and 83% of all new HIV diagnoses among U.S. males aged 13 years and older in 2015 (CDC, 2017a). Furthermore, gay/homosexual men and other MSM account for a 15.3% of all undiagnosed HIV infections in the United States, with young gay/homosexual men and other young MSM aged 13-24 years bearing the greatest health and social burden (Bradley et al., 2014; CDC, 2014a). The sex education topics that are associated with HIV testing among YMSM can be used to create inclusive and tailored intervention strategies that can be implemented by formal institutions, parents/guardians, and healthcare providers.

The CDC suggests that educating students about HIV/AIDS and other STDs in a formal setting could increase adolescents' likelihood of being tested for HIV and STDs (CDC, 2014a). A 2014 YRBSS study found that adolescents that received HIV/AIDS education in school were 1.5 times more likely to have ever been tested for HIV (Ma et al., 2014). Similar findings have been reported by other large-scale survey efforts, but all published studies used samples containing both genders and/or did not report on specific HIV/AIDS prevention topics (Ma et al., 2014; Voetsch et al., 2009). As a result, it is not clear if these results are generalizable to marginalized populations and populations that are at the highest risk for acquiring HIV, such as YMSM.

In the present thesis, we found that the majority of YMSM received formal sex education on methods of birth control, STDs, and how to prevent HIV/AIDs, but there was no association between sex education in formal contexts and HIV testing after

controlling for confounding variables. Additional research is needed to examine the quality of formal sex education, as the quality of sex education may mediate and/or strengthen the relationship between receipt of formal sex education on HIV/AIDS prevention and HIV testing.

Comprehensive sex education may be proxied by total number of topics received. In a sensitivity analysis for our study (see Table A.6), we summed the total of number of sex education topics for both formal sex education and sex education by parents separately to create a "quantity" variable. The creation of the "quantity" variable helped us to determine if the quantity of topics would influence likelihood of HIV testing. We found that almost 90% YMSM had discussed at least 3 topics and over 60% discussed four or more in a formal setting. Sex education by parents was not as common; only one-third had never discussed a sex-topic with a parent. We did not find any associations between number of topics received and HIV testing for both formal sex education and sex education by parents (see Table A.6). Additional work is needed to determine if the quantity or "comprehensiveness" of sex education impacts HIV testing among YMSM.

Families, and in particular parents and guardians, are integral in the delivery of sexual health messages and interventions to adolescents and young adults, including YMSM (Aspy et al., 2007; Widman, Choukas-Bradley, Noar, Nesi, & Garrett, 2016). In previous research, the most common topics discussed with parents among male adolescents were abstinence, STDs, condom use, and HIV/AIDS (Balaji et al., 2017; ODPHP, 2017). In our study, YMSM who had talked with a parent/guardian about how to prevent HIV/AIDS were approximately 50% more likely to have ever-tested for HIV. These findings suggest that parent-based sex education does play a role in increasing

adolescent engagement in HIV testing and that the topics that directly impact the YMSM population, such as HIV/AIDS prevention and condom use, are associated with HIV testing.

Additional research is needed to examine specific sub-topics of HIV/AIDS prevention to determine which pieces of information are linked to HIV testing. Moreover, additional information is needed to assess strength of parent-adolescent connection and perceptions of parental warmth/care. Strength of parent-child relationship and warmth/care may mediate the relationship between HIV/AIDS discussions and youth engagement in prevention measures, such as HIV testing (Garofalo et al., 1998; Whitaker et al., 1999). It is also recommended that additional topics previously associated with745 HIV testing, such as parent-child discussions about same-sex intercourse behavior (Bouris et al., 2015), also be assessed in large population-based survey efforts. These findings suggest the need for innovative family-based HIV prevention strategies and interventions.

Patient-provider sexual health communication has been linked to variety of positive health behaviors, including HIV testing (Meanley et al., 2015) Past research has shown that providers who feel comfortable discussing sexual orientation and sexual behaviors are more likely to recommend HIV tests to YMSM (Meanley et al., 2015; Wall et al., 2010) Although previous studies have shown that discussing HIV prevention and behaviors with YMSM is positively associated with HIV testing (Duncan MacKellar et al., 2006; Meanley et al., 2015), the relationship between various prevention topics discussed during patient-provider discussions and HIV testing among YMSM remains under-examined and represents a major gap in the research literature.

Many YMSM believe that provider conversations lack inclusive language and do not contain the right questions about sexual health issues impacting YMSM (Fuzzell et al., 2016). Although visits to a provider in the previous 12 months has been linked to HIV testing (Lo et al., 2012; Phillips et al., 2013), MSM/YMSM rarely receive recommendations for HIV tests from a provider (<60% of the time).The sexual health topics discussed during these visits may mediate the relationships between visits to a health care provider, receiving an HIV testing recommendation, and actual engagement in HIV testing. Although these previous studies revealed a connection between discussions about general HIV/AIDS prevention and HIV testing among MSM/YMSM, the relationship for specific topics, such as condom use and the importance being tested for HIV, remain under-examined.

Patient-healthcare provider conversations about sexual health was the least common sex education context reported by YMSM in our study. We found that less than 40% of respondents had ever talked to a provider about HIV/AIDS prevention, which is consistent with findings from pervious MSM/YMSM studies in which less than 30% had ever discussed getting tested for HIV with a provider (Duncan MacKellar et al., 2006; Meanley et al., 2015). In our study, YMSM were significantly more likely to have ever-tested for HIV if they talked to a provider about how HIV/AIDs is transmitted, STDs, the correct use of condoms, dangers of needle sharing, abstinence, condom use to prevent HIV or STD transmission, “safer sex” practices (e.g., abstinence, condom use, etc.), and getting tested and knowing your HIV status. Our findings suggest that health care providers can influence YMSM engagement in HIV testing behavior by discussing health topics that directly impact YMSM. The results emphasize the need for opt-out HIV

testing strategies for adolescents and young adults, especially YMSM (Duncan MacKellar et al., 2006; Owczarzak et al., 2011; Vincent et al., 2017).In addition, our findings support the need for educating providers about how to tailor education for YMSM patients on sexual risk behaviors and creating strategies that will help facilitate the patient-provider discussions about HIV/AIDS prevention, including HIV testing (Meanley et al., 2015)

The present study has several limitations. First, data from the 2006-2010 and 2011-2015 NSFG are self-reported and, as a result, are subject to recall bias. It is possible that participants who have ever had an HIV test were more likely to recall sex education experiences. Although NSFG uses age restrictions to limit the threat of recall bias (e.g., the questions related to sex education were only asked to participants aged 15-24 years), participants still may have been misclassified based on their own recall of exposure. National surveys that use self-reported data, such as the NSFG, may underestimate the prevalence of adolescent sexual health discussions. In addition, the cross-sectional study design could not adequately assess the temporal relationship between the exposure of interest (i.e., sex education/communication) and the outcome of interest (i.e., HIV testing). As a result, we cannot determine whether receipt of sex education/communication preceded the HIV testing behavior(s) in question.

Additional unmeasured confounders in the multivariable analysis are also possible as the number of variables in the NSFG are solely based on occurrence/receipt of sex education and communication. We were unable to determine the information source (e.g., mother, father, or another guardian) for the sex education by parent(s) variables and the location where formal sex education was received (e.g., church, community center, and

school-based sex education). These factors may influence the relationship between the independent variables of interest and health/behavioral outcomes Furthermore, these factors may influence the relationship between the independent variables of interest and health/behavioral outcomes. For example, the receipt of sex education by mothers may impact health and behavior of adolescents differently than the receipt of sex education by fathers (Clawson & Reese- Weber, 2003; Fasula & Miller, 2006; Whitaker et al., 1999). The results of this study cannot be reported as "2006-2015" since there is a 15-month gap in interviewing between the 2006-2010 and 2011-2015 survey periods (NCHS, 2016). The 2013-2015 NSFG user's guide indicates that the complex survey sampling weights were not designed or adjusted for the purpose of accounting for the 15-month gap and reporting total findings from the two NSFG periods (NCHS, 2016) In addition, the names for the patient-provider sexual health communication questions in 2006-2010 were only asked to persons who had ever-tested for HIV; however, the corresponding questions were asked to all participants in the 2011-2015 NSFG, regardless of HIV testing experience. As a result, the adjusted and unadjusted prevalence ratios for all patient-provider variables were calculated using data only from the 2011-2015 NSFG.

Our study has important implications for HIV/AIDS prevention in the United States. Sex education on specific topics, such as condom use and HIV testing, both by parents and by health providers increased the likelihood of HIV testing among YMSM. Parents and healthcare providers should consider tailoring sex education discussions with youth to promote healthy behaviors and to stress the importance of HIV testing. In addition, workshops or trainings could be created to help equip healthcare providers with the knowledge and skills necessary talk with gay/homosexual males and other YMSM

(Fuzzell et al., 2016). Furthermore, public health professionals should equip parents and healthcare providers with strategies to initiate HIV/AIDS-related conversations with YMSM

BIBLIOGRAPHY

Abma, J., & Martinez, G. (2017). Sexual Activity and Contraceptive Use Among Teenagers in the United States, 2011-2015. *National health statistics reports*(104), 1-23.

Alimonti, J. B., Ball, T. B., & Fowke, K. R. (2003). Mechanisms of CD4+ T lymphocyte cell death in human immunodeficiency virus infection and AIDS. *Journal of general Virology, 84*(7), 1649-1661.

American College of Obstetricians and Gynecologists. (2016). Comprehensive sexuality education, Committee Opinion No. 678, 2016. *24*.

American Public Health Association. (2005). Sexuality education as part of a comprehensive health education program in K-12 schools. *Washington, DC: Author. Retrieved July, 24*, 2008.

Ammann, A., Cowan, M., Wara, D., Goldman, H., Perkins, H., Lanzerotti, R., . . . Chin, J. (1982). Possible transfusion-associated acquired immune deficiency syndrome (AIDS)--California. *MMWR. Morbidity and mortality weekly report, 31*(48), 652-654.

Arnett, J. J. (2000). Emerging adulthood: A theory of development from the late teens through the twenties. *American psychologist, 55*(5), 469.

Aschengrau, A., & Seage, G. R. (2013). *Essentials of epidemiology in public health*: Jones & Bartlett Publishers.

Aspy, C. B., Vesely, S. K., Oman, R. F., Rodine, S., Marshall, L., & McLeroy, K. (2007). Parental communication and youth sexual behaviour. *J Adolesc, 30*(3), 449-466.

Bachrach, C. A., Horn, M. C., Mosher, W. D., & Shimizu, I. (1985). National Survey of Family Growth Cycle III. Sample design weighting and variance estimation.

Balaji, A. B., Oraka, E., Fasula, A. M., Jayne, P. E., Carry, M. G., & Raiford, J. L. (2017). Association between parent–adolescent communication about sex-related topics and HIV testing, United States. 2006–2013. *AIDS care, 29*(3), 344-349.

Barré-Sinoussi, F., Chermann, J.-C., Rey, F., Nugeyre, M. T., Chamaret, S., Gruest, J., . . . Rouzioux, C. (1983). Isolation of a T-lymphotropic retrovirus from a patient at risk for acquired immune deficiency syndrome (AIDS). *Science, 220*(4599), 868-871.

Bernstein, K. T., Liu, K.-L., Begier, E. M., Koblin, B., Karpati, A., & Murrill, C. (2008). Same-sex attraction disclosure to health care providers among New York City men who have sex with men: implications for HIV testing approaches. *Archives of internal medicine, 168*(13), 1458-1464.

Blake, S. M., Ledsky, R., Lehman, T., Goodenow, C., Sawyer, R., & Hack, T. (2001). Preventing sexual risk behaviors among gay, lesbian, and bisexual adolescents: the benefits of gay-sensitive HIV instruction in schools. *American journal of public health, 91*(6), 940.

Bouris, A., Guilamo-Ramos, V., Pickard, A., Shiu, C., Loosier, P. S., Dittus, P., . . . Waldmiller, J. M. (2010). A systematic review of parental influences on the health and well-being of lesbian, gay, and bisexual youth: Time for a new public health research and practice agenda. *The journal of primary prevention, 31*(5-6), 273-309.

Bouris, A., Hill, B. J., Fisher, K., Erickson, G., & Schneider, J. A. (2015). Mother–son communication about sex and routine human immunodeficiency virus testing among younger men of color who have sex with men. *J Adolesc Health, 57*(5), 515-522.

Bradley, H., Hall, H. I., Wolitski, R. J., Van Handel, M. M., Stone, A. E., LaFlam, M., . . . Frazier, E. L. (2014). Vital signs: HIV diagnosis, care, and treatment among persons living with HIV—United States, 2011. *Morbidity and Mortality Weekly Report, 63*(47), 1113-1117.

Branson, B. M., Handsfield, H. H., Lampe, M. A., Janssen, R. S., Taylor, A. W., Lyss, S. B., & Clark, J. E. (2006). Revised recommendations for HIV testing of adults, adolescents, and pregnant women in health-care settings. *Morb Mortal Wkly Rep, 55*(14), 1-CE-4.

Breuner, C. C., Mattson, G., Child, C. o. P. A. o., & Health, f. (2016). Sexuality education for children and adolescents. *Pediatrics, 138*(2), e20161348.

Buhi, E. R., & Goodson, P. (2007). Predictors of adolescent sexual behavior and intention: A theory-guided systematic review. *Journal of Adolescent Health, 40*(1), 4-21.

Campsmith, M. L., Rhodes, P. H., Hall, H. I., & Green, T. A. (2010). Undiagnosed HIV prevalence among adults and adolescents in the United States at the end of 2006. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 53*(5), 619-624.

Carnelley, K. B., Hepper, E. G., Hicks, C., & Turner, W. (2011). Perceived parental reactions to coming out, attachment, and romantic relationship views. *Attachment & Human Development, 13*(3), 217-236.

CDC. (1981a). Kaposi's sarcoma and Pneumocystis pneumonia among homosexual men--New York City and California. *MMWR. Morbidity and mortality weekly report, 30*(25), 305.

CDC. (1981b). Pneumocystis pneumonia--Los Angeles. *MMWR. Morbidity and mortality weekly report, 30*(21), 250.

CDC. (1982a). Opportunistic infections and Kaposi's sarcoma among Haitians in the United States. *MMWR. Morbidity and mortality weekly report, 31*(26), 353.

CDC. (1982b). Unexplained immunodeficiency and opportunistic infections in infants--New York, New Jersey, California. *MMWR. Morbidity and mortality weekly report, 31*(49), 665.

CDC. (1983). Immunodeficiency among female sexual partners of males with acquired immune deficiency syndrome (AIDS)-New York. *MMWR. Morbidity and mortality weekly report, 31*(52), 697.

CDC. (2013). HIV testing and risk behaviors among gay, bisexual, and other men who have sex with men-United States. *MMWR Morb Mortal Wkly Rep, 62*(47), 958.

CDC. (2014a). CDC fact sheet HIV and young men who have sex with men. Retrieved from https://www.cdc.gov/healthyyouth/sexualbehaviors/pdf/hiv_factsheet_ymsm.pdf

CDC. (2014b). CDC fact sheet: HIV and young men who have sex with men. Retrieved from https://www.cdc.gov/healthyyouth/sexualbehaviors/pdf/hiv_factsheet_ymsm.pdf

CDC. (2014c). Monitoring selected national HIV prevention and care objectives by using HIV surveillance data: United States and 6 dependent areas. *MMWR Morb Mortal Wkly Rep*(21), 1-87.

CDC. (2015). Diagnoses of HIV infection in the United States and dependent areas, 2013. *HIV surveillance report, 25*, 1-82.

CDC. (2016a). CDC fact sheet HIV and AIDS in America. Retrieved from https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/hiv-and-aids-in-america-a-snapshot-508.pdf

CDC. (2016b). CDC fact sheet: New HIV infections in the United States. *Atlanta.* Retrieved from https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/new-hiv-infections-508.pdf

CDC. (2016c). Sexually Transmitted Disease Surveillance 2014. Atlanta: US Department of Health and Human Services; 2015. In.

CDC. (2017a). CDC fact sheet HIV among gay and bisexual men. Retrieved from https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/cdc-msm-508.pdf

CDC. (2017b). CDC fact sheet: HIV among Latinos. Retrieved from https://www.cdc.gov/nchhstp/newsroom/docs/factsheets/cdc-hiv-latinos-508.pdf

CDC. (2017c). CDC fact sheet: HIV among youth. Retrieved from https://www.cdc.gov/hiv/pdf/group/age/youth/cdc-hiv-youth.pdf

Chapin-Bardales, J., Sanchez, T., Paz-Bailey, G., Hageman, K., Spiller, M. W., Rolon-Colon, Y., & de Leon, S. M. (2016). Factors associated with recent human immunodeficiency virus testing among men who have sex with men in Puerto Rico, national human immunodeficiency virus behavioral surveillance system, 2011. *Sexually transmitted diseases, 43*(6), 346.

Clawson, C. L., & Reese- Weber, M. (2003). The amount and timing of parent-adolescent sexual communication as predictors of late adolescent sexual risk-taking behaviors. *J Sex Res, 40*(3), 256-265.

Committee on Psychosocial Aspects of Child Family Health. (2001). Sexuality education for children and adolescents. *Pediatrics, 108*(2), 498-502.

Copen, C. E., Chandra, A., & Febo-Vazquez, I. (2016). Sexual behavior, sexual attraction, and sexual orientation among adults aged 18-44in the United States: data from the 2011-2003 National Survey of Family Growth.

Coyle, K., Basen-Engquist, K., Kirby, D., Parcel, G., Banspach, S., Collins, J., . . . Harrist, R. (2016). Safer choices: reducing teen pregnancy, HIV, and STDs. *Public health reports*.

Curran, J. W., & Jaffe, H. W. (2011). AIDS: the early years and CDC's response. *MMWR Surveill Summ, 60*(Suppl 4), 64-69.

D'augelli, A. R., Hershberger, S. L., & Pilkington, N. W. (1998). Lesbian, gay, and bisexual youth and their families: disclosure of sexual orientation and its consequences. *American journal of orthopsychiatry, 68*(3), 361.

Dalgleish, A. G., Beverley, P. C., Clapham, P. R., Crawford, D. H., Greaves, M. F., & Weiss, R. A. (1984). The CD4 (T4) antigen is an essential component of the receptor for the AIDS retrovirus. *Nature, 312*(5996), 763.

Dean, H. D., & Fenton, K. A. (2010). Addressing social determinants of health in the prevention and control of HIV/AIDS, viral hepatitis, sexually transmitted infections, and tuberculosis. In: SAGE Publications Sage CA: Los Angeles, CA.

DiClemente, R. J., Lodico, M., Grinstead, O. A., Harper, G., Rickman, R. L., Evans, P. E., & Coates, T. J. (1996). African-American adolescents residing in high-risk urban environments do use condoms: Correlates and predictors of condom use among adolescents in public housing developments. *Pediatrics, 98*(2), 269-278.

DiClemente, R. J., Wingood, G. M., Crosby, R., Cobb, B. K., Harrington, K., & Davies, S. L. (2001). Parent-adolescent communication and sexual risk behaviors among African American adolescent females. *The Journal of pediatrics, 139*(3), 407-412.

Donaldson, A. A., Lindberg, L. D., Ellen, J. M., & Marcell, A. V. (2013). Receipt of sexual health information from parents, teachers, and healthcare providers by sexually experienced US adolescents. *Journal of Adolescent Health, 53*(2), 235-240.

Dudley, M. G., Rostosky, S. S., Korfhage, B. A., & Zimmerman, R. S. (2004). Correlates of high-risk sexual behavior among young men who have sex with men. *AIDS Education and Prevention, 16*(4), 328-340.

Eaton, D. K., Kann, L., Kinchen, S., Shanklin, S., Ross, J., Hawkins, J., . . . Chyen, D. (2008). Youth risk behavior surveillance--United States, 2007. *Morbidity and mortality weekly report. Surveillance summaries (Washington, DC: 2002), 57*(4), 1-131.

Eisenberg, M. E., Bernat, D. H., Bearinger, L. H., & Resnick, M. D. (2008). Support for comprehensive sexuality education: Perspectives from parents of school-age youth. *Journal of Adolescent Health, 42*(4), 352-359.

Ekstrand, M. L., Stall, R. D., Paul, J. P., Osmond, D. H., & Coates, T. J. (1999). Gay men report high rates of unprotected anal sex with partners of unknown or discordant HIV status. *Aids, 13*(12), 1525-1533.

Erikson, E. H. (1968). Identity: Youth and crisis. New York, NY: WW North &Company. In: Inc.

Farnham, P. G., Gopalappa, C., Sansom, S. L., Hutchinson, A. B., Brooks, J. T., Weidle, P. J., . . . Rimland, D. (2013). Updates of lifetime costs of care and quality-of-life estimates for HIV-infected persons in the United States: late versus early diagnosis and entry into care. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 64*(2), 183-189.

Fasula, A. M., & Miller, K. S. (2006). African-American and Hispanic adolescents' intentions to delay first intercourse: Parental communication as a buffer for sexually active peers. *Journal of Adolescent Health, 38*(3), 193-200.

Fergus, S., Zimmerman, M. A., & Caldwell, C. H. (2007). Growth trajectories of sexual risk behavior in adolescence and young adulthood. *American journal of public health, 97*(6), 1096-1101.

Finlayson, T. J., Le, B., Smith, A., Bowles, K., Cribbin, M., Miles, I., . . . DiNenno, E. (2011). HIV risk, prevention, and testing behaviors among men who have sex with men—National HIV Behavioral Surveillance System, 21 US cities, United States, 2008. *MMWR Surveill Summ, 60*(14), 1-34.

Fisher, T. D. (1989). An extension of the findings of Moore, Peterson, and Furstenberg (1986) regarding family sexual communication and adolescent sexual behavior. *Journal of Marriage and the Family*, 637-639.

Fortenberry, J. D., Schick, V., Herbenick, D., Sanders, S. A., Dodge, B., & Reece, M. (2010). Sexual behaviors and condom use at last vaginal intercourse: A national sample of adolescents ages 14 to 17 years. *The journal of sexual medicine, 7*(s5), 305-314.

Frasca, T., Balan, I., Ibitoye, M., Valladares, J., Dolezal, C., & Carballo-Diéguez, A. (2014). Attitude and behavior changes among gay and bisexual men after use of rapid home HIV tests to screen sexual partners. *AIDS and Behavior, 18*(5), 950-957.

Freedman, R. (1959). *Family planning, sterility and population growth*: MacGraw-Hill.

French, D. K. (1978). National survey of family growth, cycle I; sample design, estimation procedures, and variance estimation.

Fuzzell, L., Fedesco, H. N., Alexander, S. C., Fortenberry, J. D., & Shields, C. G. (2016). "I just think that doctors need to ask more questions": Sexual minority and majority adolescents' experiences talking about sexuality with healthcare providers. *Patient Educ Couns, 99*(9), 1467-1472.

Gardner, E. M., McLees, M. P., Steiner, J. F., Del Rio, C., & Burman, W. J. (2011). The spectrum of engagement in HIV care and its relevance to test-and-treat strategies for prevention of HIV infection. *Clinical infectious diseases, 52*(6), 793-800.

Garofalo, R., Deleon, J., Osmer, E., Doll, M., & Harper, G. W. (2006). Overlooked, misunderstood and at-risk: Exploring the lives and HIV risk of ethnic minority male-to-female transgender youth. *Journal of Adolescent Health, 38*(3), 230-236.

Garofalo, R., Mustanski, B., & Donenberg, G. (2008). Parents know and parents matter; is it time to develop family-based HIV prevention programs for young men who have sex with men? *J Adolesc Health, 43*(2), 201-204.

Garofalo, R., Wolf, R. C., Kessel, S., Palfrey, J., & DuRant, R. H. (1998). The association between health risk behaviors and sexual orientation among a school-based sample of adolescents. *Pediatrics, 101*(5), 895-902.

Glick, M., Muzyka, B. C., Salkin, L. M., & Lurie, D. (1994). Necrotizing ulcerative periodontitis: a marker for immune deterioration and a predictor for the diagnosis of AIDS. *Journal of periodontology, 65*(5), 393-397.

Glick, S. N., & Golden, M. R. (2014). Early male partnership patterns, social support, and sexual risk behavior among young men who have sex with men. *AIDS and Behavior, 18*(8), 1466-1475.

Grady, W. R. (1981). National Survey of Family Growth Cycle II: sample design estimation procedures and variance estimation. *Vital and Health Statistics. Series 2. Data evaluation and methods research*(87).

Groves, R. M., Mosher, W. D., Lepkowski, J. M., & Kirgis, N. G. (2009). Planning and development of the continuous National Survey of Family Growth. *Vital and health statistics. Ser. 1, Programs and collection procedures*(48), 1-64.

Guilamo-Ramos, V., Bouris, A., Jaccard, J., Gonzalez, B., McCoy, W., & Aranda, D. (2011). A parent-based intervention to reduce sexual risk behavior in early adolescence: Building alliances between physicians, social workers, and parents. *Journal of Adolescent Health, 48*(2), 159-163.

Gullón, A., Verdejo, J., de Miguel, R., Gómez, A., & Sanz, J. (2016). Factors associated with late diagnosis of HIV infection and missed opportunities for earlier testing. *AIDS care, 28*(10), 1296-1300.

Hadley, W., Brown, L. K., Lescano, C. M., Kell, H., Spalding, K., DiClemente, R., . . . Group, P. S. S. (2009). Parent–adolescent sexual communication: Associations of condom use with condom discussions. *AIDS and Behavior, 13*(5), 997-1004.

Hall, H. I., Byers, R. H., Ling, Q., & Espinoza, L. (2007). Racial/ethnic and age disparities in HIV prevalence and disease progression among men who have sex with men in the United States. *American journal of public health, 97*(6), 1060-1066.

Hays, R. B., Paul, J., Ekstrand, M., Kegeles, S. M., Stall, R., & Coates, T. J. (1997). Actual versus perceived HIV status, sexual behaviors and predictors of unprotected sex among young gay and bisexual men who identify as HIV-negative, HIV- positive and untested. *Aids, 11*(12), 1495-1502.

Higginbotham, S., Holmes, R., Stone, H., Beil, J., Datu, G., Costa, S., & Paul, S. (2000). Adoption of protective behaviors among persons with recent HIV infection and diagnosis-Alabama, New Jersey, and Tennessee, 1997-1998. *Morbidity and Mortality Weekly Report, 49*(23), 512-515.

Hinchliff, S., Gott, M., & Galena, E. (2005). 'I daresay I might find it embarrassing': general practitioners' perspectives on discussing sexual health issues with lesbian and gay patients. *Health & social care in the community, 13*(4), 345-353.

Joseph, H. A., Belcher, L., O'Donnell, L., Fernandez, M. I., Spikes, P. S., & Flores, S. A. (2014). HIV testing among sexually active hispanic/latino MSM in Miami-Dade county and New York City: opportunities for increasing acceptance and frequency of testing. *Health promotion practice, 15*(6), 867-880.

Judkins, D. R., Mosher, W. D., & Botman, S. (1991). National Survey of Family Growth: design, estimation, and inference. *Vital and health statistics. Series 2, Data evaluation and methods research*(109), 1-52.

Kann, L. (2016). Sexual identity, sex of sexual contacts, and health-related behaviors among students in grades 9–12—United States and selected sites, 2015. *MMWR. Surveillance Summaries, 65*.

Kann, L., Kinchen, S. A., Williams, B. I., Ross, J. G., Lowry, R., Hill, C. V., . . . Kolbe, L. J. (1998). Youth risk behavior surveillance—United States, 1997. *Journal of school health, 68*(9), 355-369.

Kann, L., Telljohann, S. K., & Wooley, S. F. (2007). Health education: Results from the school health policies and programs study 2006. *Journal of school health, 77*(8), 408-434.

Katz, D. A., Swanson, F., & Stekler, J. D. (2013). Why do men who have sex with men test for HIV infection? Results from a community-based testing program in Seattle. *Sexually transmitted diseases, 40*(9), 724.

Kelly, J., Mosher, W., Duffer, A., & Kinsey, S. (1997). Plan and operation of the 1995 National Survey of Family Growth. Vital and Health Statistics. *National Center for Health Statistics, Hyattsville, MD*.

Khan, S., & Khan, O. A. (2006). The trouble with MSM. *American journal of public health, 96*(5), 765-a-766.

Klitzman, R. L., & Greenberg, J. D. (2002). Patterns of communication between gay and lesbian patients and their health care providers. *Journal of homosexuality, 42*(4), 65-75.

Koblin, B. A., Husnik, M. J., Colfax, G., Huang, Y., Madison, M., Mayer, K., . . . Buchbinder, S. (2006). Risk factors for HIV infection among men who have sex with men. *Aids, 20*(5), 731-739.

Koenig, L. J., Hoyer, D., Purcell, D. W., Zaza, S., & Mermin, J. (2016). Young people and HIV: a call to action. *American journal of public health, 106*(3), 402-405.

Lackritz, E. M., Satten, G. A., Aberle-Grasse, J., Dodd, R. Y., Raimondi, V. P., Janssen, R. S., . . . Petersen, L. R. (1995). Estimated risk of transmission of the human immunodeficiency virus by screened blood in the United States. *New England Journal of Medicine, 333*(26), 1721-1725.

Lawrence, K. A. (1982). New homosexual disorder worries health officials. *The New York Times*.

Leonard, N. R., Rajan, S., Gwadz, M. V., & Aregbesola, T. (2014). HIV testing patterns among urban YMSM of color. *Health Educ Behav, 41*(6), 673-681.

Lepkowski, J. M., Mosher, W. D., & Davis, K. E. (2006). National Survey of Family Growth, cycle 6; sample design, weighting, imputation and variance estimation.

Lepkowski, J. M., Mosher, W. D., Davis, K. E., Groves, R. M., & Van Hoewyk, J. (2010). The 2006-2010 National Survey of Family Growth: Sample design and analysis of a continuous survey. *Vital and health statistics. Series 2, Data evaluation and methods research*(150), 1-36.

Lepkowski, J. M., Mosher, W. D., Groves, R. M., West, B. T., Wagner, J., & Gu, H. (2013). Responsive Design, Weighting, andVariance Estimation in the 2006-2010 National Survey of Family Growth. *Vital and health statistics. Series 2, Data evaluation and methods research*(158), 1-52.

Lindberg, L. D., Maddow-Zimet, I., & Boonstra, H. (2016). Changes in adolescents' receipt of sex education, 2006–2013. *J Adolesc Health, 58*(6), 621-627.

Lo, Y.-C., Turabelidze, G., Lin, M., & Friedberg, Y. (2012). Prevalence and determinants of recent HIV testing among sexually active men who have sex with men in the St. Louis Metropolitan Area, Missouri, 2008. *Sex Transm Dis, 39*(4), 306-311.

Ma, Z.-q., Fisher, M. A., & Kuller, L. H. (2014). School-based HIV/AIDS education is associated with reduced risky sexual behaviors and better grades with gender and race/ethnicity differences. *Health Educ Res, 29*(2), 330-339.

MacKellar, D., Valleroy, L., Anderson, J., Behel, S., Secura, G., Bingham, T., . . . Shehan, D., ,. (2006). Recent HIV testing among young men who have sex with men: correlates, contexts, and HIV seroconversion. *Sex Transm Dis, 33*(3), 183-192.

MacKellar, D., Valleroy, L., Karon, J., Lemp, G., & Janssen, R. (1996). The Young Men's Survey: methods for estimating HIV seroprevalence and risk factors among young men who have sex with men. *Public health reports, 111*(Suppl 1), 138.

MacKellar, D., Valleroy, L., Secura, G., Behel, S., Bingham, T., Celentano, D., . . . Shehan, D. (2005). Unrecognized HIV infection, risk behaviors, and perceptions of risk among young men who have sex with men: opportunities for advancing HIV prevention in the third decade of HIV/AIDS. *JAIDS Journal of Acquired Immune Deficiency Syndromes, 38*(5), 603-614.

Maguen, S., Armistead, L. P., & Kalichman, S. (2000). Predictors of HIV antibody testing among gay, lesbian, and bisexual youth. *Journal of Adolescent Health, 26*(4), 252-257.

Mansergh, G., Marks, G., & Simoni, J. M. (1995). Self-disclosure of HIV infection among men who vary in time since seropositive diagnosis and symptomatic status.

Marcell, A. V., Ford, C. A., Pleck, J. H., & Sonenstein, F. L. (2007). Masculine beliefs, parental communication, and male adolescents' health care use. *Pediatrics, 119*(4), e966-e975.

Margolis, A. D., Wolitski, R. J., Parsons, J. T., & Gómez, C. A. (2001). Are healthcare providers talking to HIV-seropositive patients about safer sex? *Aids, 15*(17), 2335-2337.

Markham, C. M., Lormand, D., Gloppen, K. M., Peskin, M. F., Flores, B., Low, B., & House, L. D. (2010). Connectedness as a predictor of sexual and reproductive health outcomes for youth. *Journal of Adolescent Health, 46*(3), S23-S41.

Marks, G., Richardson, J. L., Crepaz, N., Stoyanoff, S., Milam, J., Kemper, C., . . . Hollander, H. (2002). Are HIV care providers talking with patients about safer sex and disclosure?: A multi-clinic assessment. *Aids, 16*(14), 1953-1957.

Marks, G., Ruiz, M. S., Richardson, J. L., Reed, D., Mason, H., Sotelo, M., & Turner, P. A. (1994). Anal intercourse and disclosure of HIV infection among seropositive gay and bisexual men. *Journal of Acquired Immune Deficiency Syndromes, 7*(8), 866-869.

Masur, H., Michelis, M. A., Greene, J. B., Onorato, I., Vande Stouwe, R. A., Holzman, R. S., . . . Murray, H. W. (1981). An outbreak of community-acquired Pneumocystis carinii pneumonia: initial manifestation of cellular immune dysfunction. *New England Journal of Medicine, 305*(24), 1431-1438.

May, M. T., Gompels, M., Delpech, V., Porter, K., Orkin, C., Kegg, S., . . . Gilson, R. (2014). Impact on life expectancy of HIV-1 positive individuals of CD4+ cell count and viral load response to antiretroviral therapy. *AIDS (London, England), 28*(8), 1193.

McCune, J. M. (2001). The dynamics of CD4+ T-cell depletion in HIV disease. *Nature, 410*(6831), 974.

Meanley, S., Gale, A., Harmell, C., Jadwin-Cakmak, L., Pingel, E., & Bauermeister, J. A. (2015). The role of provider interactions on comprehensive sexual healthcare among young men who have sex with men. *AIDS Educ Prev, 27*(1), 15-26.

Miller, K. S., Levin, M. L., Whitaker, D. J., & Xu, X. (1998). Patterns of condom use among adolescents: the impact of mother-adolescent communication. *American journal of public health, 88*(10), 1542-1544.

Mimiaga, M. J., Goldhammer, H., Belanoff, C., Tetu, A. M., & Mayer, K. H. (2007). Men who have sex with men: perceptions about sexual risk, HIV and sexually transmitted disease testing, and provider communication. *Sexually transmitted diseases, 34*(2), 113-119.

Moore, K. A., Peterson, J. L., & Furstenberg, F. F. (1986). Parental attitudes and the occurrence of early sexual activity. *Journal of Marriage and the Family*, 777-782.

Mosher, W. D. (1982). Fertility and family planning in the 1970s: The National Survey of Family Growth. *Family planning perspectives, 14*(6), 314-320.

Mosher, W. D., & Bachrach, C. A. (1996). Understanding US fertility: continuity and change in the National Survey of Family Growth, 1988-1995. *Family planning perspectives*, 4-12.

Moyer, V. A. (2013). Screening for HIV: US preventive services task force recommendation statement. *Annals of internal medicine, 159*(1), 51-60.

Mustanski, B. S., Newcomb, M. E., Du Bois, S. N., Garcia, S. C., & Grov, C. (2011). HIV in young men who have sex with men: a review of epidemiology, risk and protective factors, and interventions. *J Sex Res, 48*(2-3), 218-253.

Naidoo, K., Naidoo, K., Padayatchi, N., & Abdool Karim, Q. (2010). HIV-associated tuberculosis. *Clinical and Developmental Immunology, 2011*.

NCHS. (2014). Public Use Data File Documentation: 2011-2013 National Survey of Family Growth User's Guide Retrieved June 17, 2017, from U.S. Department of Health and Human Services & National Center for Health Statistics https://www.cdc.gov/nchs/nsfg/nsfg_2013_2015_puf.htm

NCHS. (2016). Public Use Data File Documentation: 2013-2015 National Survey of Family Growth User's Guide Retrieved June 17, 2017, from U.S. Department of Health and Human Services & National Center for Health Statistics https://www.cdc.gov/nchs/nsfg/nsfg_2013_2015_puf.htm

Noble, M., Jones, A. M., Bowles, K., DiNenno, E. A., & Tregear, S. J. (2017). HIV Testing Among Internet-Using MSM in the United States: Systematic Review. *AIDS and Behavior, 21*(2), 561-575.

ODPHP. (2017). Healthy People 2020. Retrieved from https://www.healthypeople.gov/2020topics-objectives/topic/hiv

ONAP. (2015). National HIV/AIDS Strategy for the United States: updated to 2020. *Washington, DC Available at www. hiv. gov/sites/default/files/nhas-update. pdf*.

Owczarzak, J., Lechuga, J., & Petroll, A. (2011). HIV testing as a standard of care for men who have sex with men: Patient and provider perspectives. *J Prim Care Community Health, 2*(2), 116-121.

Palella Jr, F. J., Delaney, K. M., Moorman, A. C., Loveless, M. O., Fuhrer, J., Satten, G. A., . . . Investigators, H. O. S. (1998). Declining morbidity and mortality among patients with advanced human immunodeficiency virus infection. *New England Journal of Medicine, 338*(13), 853-860.

Pantalone, D. W., Tomassilli, J. C., Starks, T. J., Golub, S. A., & Parsons, J. T. (2015). Unprotected anal intercourse with casual male partners in urban gay, bisexual, and other men who have sex with men. *American journal of public health, 105*(1), 103-110.

Perrino, T., González-Soldevilla, A., Pantin, H., & Szapocznik, J. (2000). The role of families in adolescent HIV prevention: A review. *Clinical child and family psychology review, 3*(2), 81-96.

Petroll, A. E., & Mosack, K. E. (2011). Physician awareness of sexual orientation and preventive health recommendations to men who have sex with men. *Sexually transmitted diseases, 38*(1), 63.

Phillips, G., Magnus, M., Kuo, I., Shelley, K. D., Rawls, A., West-Ojo, T., . . . Greenberg, A. E. (2013). Correlates of frequency of HIV testing among men who have sex with men in Washington, DC. *AIDS care, 25*(12), 1481-1484.

Phillips, G., Ybarra, M. L., Prescott, T. L., Parsons, J. T., & Mustanski, B. (2015). Low rates of human immunodeficiency virus testing among adolescent gay, bisexual, and queer men. *J Adolesc Health, 57*(4), 407-412.

Povinelli, M., Remafedi, G., & Tao, G. (1996). Trends and predictors of human immunodeficiency virus antibody testing by homosexual and bisexual adolescent males, 1989-1994. *Archives of pediatrics & adolescent medicine, 150*(1), 33-38.

Prestage, G. P., Hudson, J., Jin, F., Corrigan, N., Martin, P., Grulich, A. E., & McInnes, D. (2009). Testing for HIV and sexually transmissible infections within a mainly online sample of gay men who engage in group sex. *Sexually transmitted infections, 85*(1), 70-74.

Reilly, K., Neaigus, A., Jenness, S., Wendel, T., Marshall, D. t., & Hagan, H. (2014). Factors associated with recent HIV testing among men who have sex with men in New York City. *AIDS and Behavior, 18*(3), 297-304.

Rodgers, K. B. (1999). Parenting processes related to sexual risk-taking behaviors of adolescent males and females. *Journal of Marriage and the Family*, 99-109.

Rothman, E. F., Sullivan, M., Keyes, S., & Boehmer, U. (2012). Parents' supportive reactions to sexual orientation disclosure associated with better health: Results from a population-based survey of LGB adults in Massachusetts. *Journal of homosexuality, 59*(2), 186-200.

Ryan, C., Russell, S. T., Huebner, D., Diaz, R., & Sanchez, J. (2010). Family acceptance in adolescence and the health of LGBT young adults. *Journal of Child and Adolescent Psychiatric Nursing, 23*(4), 205-213.

Santa Maria, D., Markham, C., Bluethmann, S., & Mullen, P. D. (2015). Parent- based adolescent sexual health interventions and effect on communication outcomes: a systematic review and meta- analyses. *Perspectives on sexual and reproductive health, 47*(1), 37-50.

Schneider, E., Whitmore, S., Glynn, M. K., Dominguez, K., Mitsch, A., & McKenna, M. T. (2008). Revised surveillance case definitions for HIV infection among adults, adolescents, and children aged< 18 months and for HIV infection and AIDS among children aged 18 months to< 13 years—United States, 2008. *Morbidity and Mortality Weekly Report: Recommendations and Reports, 57*(10), 1-12.

Schwartz, S. J., Côté, J. E., & Arnett, J. J. (2005). Identity and agency in emerging adulthood: Two developmental routes in the individualization process. *Youth & Society, 37*(2), 201-229.

Selik, R. M., Mokotoff, E. D., Branson, B., Owen, S. M., Whitmore, S., & Hall, H. I. (2014). Revised surveillance case definition for HIV infection—United States, 2014. *Morbidity and Mortality Weekly Report: Recommendations and Reports, 63*(3), 1-10.

Skarbinski, J., Rosenberg, E., Paz-Bailey, G., Hall, H. I., Rose, C. E., Viall, A. H., . . . Mermin, J. H. (2015). Human immunodeficiency virus transmission at each step of the care continuum in the United States. *JAMA internal medicine, 175*(4), 588-596.

Smith, A., Le, B., Finlayson, T., Oster, A., & DiNenno, E. (2010). Prevalence and awareness of HIV infection among men who have sex with men-21 cities, United States, 2008. *Morbidity and Mortality Weekly Report, 59*(37), 1201-1207.

Steinberg, L., & Morris, A. S. (2001). Adolescent development. *Annual review of psychology, 52*(1), 83-110.

Sumartojo, E., Lyles, C., Choi, K., Clark, L., Collins, C., Guenther Grey, C., . . . Team, C. S. (2008). Prevalence and correlates of HIV testing in a multi-site sample of young men who have sex with men. *AIDS care, 20*(1), 1-14.

Thoma, B. C., & Huebner, D. M. (2014). Parental monitoring, parent–adolescent communication about sex, and sexual risk among young men who have sex with men. *AIDS and Behavior, 18*(8), 1604-1614.

Tortorella, D., Gewurz, B. E., Furman, M. H., Schust, D. J., & Ploegh, H. L. (2000). Viral subversion of the immune system. *Annual review of immunology, 18*(1), 861-926.

UNAIDS. (2014). The gap report. *Geneva: UNAIDS, 3*.

USDHHS. (2017). Office of Disease Prevention and Health Promotion: Healthy People 2020. Retrieved from https://www.healthypeople.gov/2020/topics-objectives/topic/hiv

Valdiserri, R. O., Holtgrave, D. R., & West, G. R. (1999). Promoting early HIV diagnosis and entry into care. *Aids, 13*(17), 2317-2330.

Valleroy, L. A., MacKellar, D. A., Karon, J. M., Rosen, D. H., McFarland, W., Shehan, D. A., . . . Koblin, B. A. (2000). HIV prevalence and associated risks in young men who have sex with men. *Jama, 284*(2), 198-204.

Vincent, W., McFarland, W., & Raymond, H. F. (2017). What factors are associated with receiving a recommendation to get tested for HIV by health care providers among men who have sex with wen? *J Acquir Immune Defic Syndr, 75*, S357-S362.

Voetsch, A., Balaji, A., Heffelfinger, J., Miller, K., Branson, B., Eaton, D., & Kann, L. (2009). HIV testing among high school students-United States, 2007. *MMWR Morb Mortal Wkly Rep, 58*(24), 665-668.

Wall, K. M., Khosropour, C. M., & Sullivan, P. S. (2010). Offering of HIV screening to men who have sex with men by their health care providers and associated factors. *J Int Assoc Physicians AIDS Care, 9*(5), 284-288.

Warren, J. C., Fernández, M. I., Harper, G. W., Hidalgo, M. A., Jamil, O. B., & Torres, R. S. (2008). Predictors of unprotected sex among young sexually active African American, Hispanic, and White MSM: the importance of ethnicity and culture. *AIDS and Behavior, 12*(3), 459-468.

Westoff, C. F. (1975). The yield of the imperfect: the 1970 National Fertility Study. *Demography, 12*(4), 573-580.

Whitaker, D. J., Miller, K. S., May, D. C., & Levin, M. L. (1999). Teenage partners' communication about sexual risk and condom use: the importance of parent-teenager discussions. *Fam Plann Perspect*, 117-121.

WHO. (1995). *The use and interpretation of anthropometry. Geneva CH*. Retrieved from

WHO. (2016). World Health Organization HIV/AIDS fact sheet. Retrieved from http://www.who.int/mediacentre/factsheets/fs360/en

Widman, L., Choukas-Bradley, S., Noar, S. M., Nesi, J., & Garrett, K. (2016). Parent-adolescent sexual communication and adolescent safer sex behavior: a meta-analysis. *JAMA Pediatr, 170*(1), 52-61.

Wilkerson, J. M., Fuchs, E. L., Brady, S. S., Jones-Webb, R., & Rosser, B. S. (2014). Correlates of HIV/STI Testing and Disclosure Among HIV-Negative Collegiate Men Who Have Sex With Men. *Journal of American college health: J of ACH, 62*(7), 450.

Workowski, K. A., & Berman, S. (2010). Sexually transmitted diseases treatment guidelines, 2010. *MMWR Morb Mortal Wkly Rep*.

Workowski, K. A., & Bolan, G. A. (2015). Sexually transmitted diseases treatment guidelines (2015). *Reproductive Endocrinology*(24), 51-56.

Young, R. M., & Meyer, I. H. (2005). The trouble with "MSM" and "WSW": Erasure of the sexual-minority person in public health discourse. *Am J Public Health, 95*(7), 1144-1149.