January 2010

# Racial Disparities in HIV Seroprevalence Among Male Street Sex Workers

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# RACIAL DISPARITIES IN HIV SEROPREVALENCE AMONG MALE STREET SEX WORKERS

by

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A dissertation presented to the
Graduate School of Arts and Sciences
of Washington University in
partial fulfillment of the
requirements for the degree
of Doctor of Philosophy

August 2010

Saint Louis, Missouri

ABSTRACT OF THE DISSERTATION

Racial Disparities in HIV Seroprevalence

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This dissertation examined whether racial disparities in HIV/AIDS between African American and Caucasian male street sex workers (MSSWs) existed and, if so, what were the possible reasons for these disparities. African American MSSWs were significantly more likely to report being HIV/AIDS-positive. However, when included in binary logistic models, the relationship between HIV risk factors (of syphilis and sexual assault) and HIV status did not significantly vary between African American and Caucasian MSSWs. Mediation of sexual assault and/or syphilis between race and HIV/AIDS could not be tested due to not meeting the assumptions for mediation. African American MSSWs are over twice as likely to be HIV/AIDS infected when compared to Caucasian MSSWs, but the reasons for these racial disparities in HIV seroprevalence remain unclear. Future research should focus less on individual-level risk factors and more on population-level risk factors when examining HIV seroprevalence in low-income African American men, such as MSSWs. Social work practitioners need to be aware of these potential racial disparities in HIV/AIDS, and should work toward innovative prevention interventions for these men.

## Acknowledgements

I would like to acknowledge the members of by dissertation committee, especially Dr. Wendy Auslander, whose commitment to my doctoral education gave me the perseverance to move forward when it would have been much easier to wave the white flag of surrender. I would also like to acknowledge the informal mentorship and inspiration of four scholars: Dr. Linda B. Cottler, Dr. Kirk Elifson, Dr. Robert E. Fullilove, and Dr. Jerome Schiele. Their writings and passion for their research areas helped stoke and ignite my own fervor for research and social justice.

## Dedication

This dissertation is dedicated to Gary and to my parents. They made isolation of doctoral studies bearable, along with the music of Minnie Riperton.

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## Introduction

Although African Americans make up approximately 13% of the United States population, they represent 49% of HIV/AIDS diagnoses, the highest rate for all ethnic and racial groups in the United States (CDC, 2008). African Americans are ten times more likely to acquire HIV/AIDS than Caucasians. African American men are diagnosed at eight times the rate of Caucasian men. African American men are also the largest group living with HIV/AIDS, as compared to other racial/ethnic and gender groups (CDC, 2008). An estimated one in sixteen African American men will be diagnosed with HIV/AIDS in their lifetime (Hall, An, Hutchison, & Sanson, 2008). This dissertation will use the terms Black/African American and White/Caucasian interchangeably to describe its sample of male street sex workers (MSSWs).

It is unknown whether these racial disparities in HIV seroprevalence will persist in a group of men such as MSSWs who are vulnerable to HIV infection. Moreover, it is unknown how HIV risk factors such as substance abuse, violence, and sexually transmitted infections (STIs) differ among White and Black MSSWs. Nor is it known whether these risk factors interact in different ways or have differential effects on the HIV rates among White and Black MSSWs. What is clear is that MSSWs, as a group, have alarmingly high rates of HIV (e.g., Elifson, Boles, & Sweat, 1993; Williams, Bowen, Timpson, & Keel, 2003; Williams, Timpson, Klovdal, Bowen, Ross, & Keel, 2003) and are potential vectors of transmission for HIV infection in the general population (Morse, Simon, Osofsky, Balson, & Gaumer, 1991).

Understanding whether racial disparities exist among MSSWs and what accounts for these disparities is important information for the design, implementation, and

evaluation of future HIV prevention programs for this hidden group of men. Hidden populations can be defined as those who (1) seldom utilize social and health services, (2) often have unrecognized medical needs, (3) are victims of stigmas and exploitation, and (4) find intervention and prevention programs mostly ineffective (Watters & Biernacki, 1989). These men also constitute a hidden group because they generally attempt to hide their sex work from police, co-workers, family, and friends. They usually are dealing with problems that may not be obvious such as drug addiction, mental illness, homelessness, HIV, and other disorders.

MSSWs face multiple risk factors in common with other low-income African American males in the general population (e.g., Fullilove, 2006; Millett et al., 2006). These risk factors include substance abuse, violence, and STIs.

Injection drug use (IDU) is extremely high among MSSWs (Elifson et al., 1993; Morse et al., 1991; Williams, Bowen et al., 2003; Williams, Timpson, et al., 2003). While IDU can lead directly to HIV infection, substance abuse, dependence and addiction also increase the frequency of sexual encounters in order to obtain desired drugs (Morse et al., 1992). In addition, the crack cocaine epidemic and polysubstance use have increased sexual disinhibition and impulsiveness (Inciardi, 1995).

The incidence of violence, including street-level violence and childhood abuse, is high among MSSWs (Elifson et al., 1993). Assaults on MSSWs by both customers and non-paying partners occur frequently (Williams et al., 2003). Elifson et al. (1993) found that sexual abuse was prevalent among MSSWs. The same study also found that childhood physical abuse was significantly associated with HIV seroprevalence.

STIs occur at phenomenally high rates in this population (Elifson, 1993). These infections facilitate the acquisition and transmission of HIV/AIDS. When STIs go untreated for extended periods of time can increase the rate of HIV, which is the case for many low-income men (e.g., Millett, Peterson, Wolitski, & Stall, 2006). The multiple epidemics intersecting with HIV infection and transmission make MSSWs, and possible racial disparities in HIV seroprevalence, an important area of inquiry.

The tripartite model of HIV risk postulates that factors such as substance use, violence, and STIs profoundly influence HIV seroprevalence (e.g., Johnson, Cunningham-Williams, & Cottler, 2003). The model may also account for the racial disparities in HIV/AIDS between Caucasian and African American MSSWs. The multiple epidemics facing MSSWs and African American males suggest that many pathways intersect in leading to HIV infection (e.g., Breslaau, Davis, & Andreski, 1995; Levenson, 2004).

In order to understand the interconnections among drug use, violence, STIs, and HIV/AIDS risk in ethnic minorities, Singer (1996) conceptualized SAVA (Substance Abuse, Violence, and AIDS), which utilizes the tripartite model. The inclusion of violence as a risk category allows for the pattern of victimization that is common among African American and Latino female street-level sex workers, which represents the population studied by Singer (Romerro-Daza, Weeks, & Singer, 2003). This qualitative study provided support for the SAVA syndemic but to date has not been used to explore HIV risk and seroprevalence in minority MSSWs.

This dissertation uses the tripartite model of HIV risk to explore the influence of substance use, violence, and STIs on HIV seroprevalence in MSSWs, focusing

particularly on racial disparities between Caucasian and African American MSSWs. The dissertation examines secondary data from a sample of African American (n=100) and Caucasian (n=108) MSSWs in Houston, Texas, collected from 2003 to 2006 (Williams, Bowen et al., 2003; Williams, Timpson et al., 2003). The following aims and hypotheses guided this study:

**Aim 1: To examine the relationship between HIV risk factors (substance use, violence [victimization], and STIs) and HIV status (positive or negative) in MSSWs.**

**Hypothesis 1.1.:** *HIV risk (such as substance use, violence, and/or STIs) increases the likelihood of HIV seroprevalence in the total MSSW sample.*

**Hypothesis 1.2:** *Combinations of HIV-risk variables (combinations of the factors of substance abuse, violence, and/or STIs) increases the likelihood of HIV seroprevalence in the total MSSW sample.*

**Aim 2: To explore whether the relationship between HIV risk factors (substance use, violence, and STIs) and HIV status differs between African American and Caucasian MSSWs.**

**Hypothesis 2.1:** *Substance use, violence, and STIs will have more influence on HIV seroprevalence for African American MSSWs than Caucasian MSSWs.*

**Hypothesis 2.2.:** *Substance use, violence, and STIs as combined risk factors will have more influence on HIV seroprevalence for African American MSSWs than Caucasian MSSWs.*

**Aim 3: To identify the existence of racial disparities in HIV seroprevalence between African-American and Caucasian MSSWs and explore what may account for them.**

**Hypothesis 3.1:** *African American MSSWs will have higher rates of HIV seroprevalence than Caucasian MSSWs.*

**Hypothesis 3.2:** *African-American MSSWs will have higher rates of HIV-risk factors (substance abuse, violence, and STIs) than Caucasian MSSWs.*

**Hypothesis 3.3**: HIV-*risk factors (substance abuse, violence, and/or STIs) that vary by African-American race will account for some of the HIV/AIDS racial disparity.*

**Hypothesis 3.4:** *African American MSSWs will have higher rates of combined HIV-risk factors (e.g., substance abuse and violence, substance abuse and STIs, violence and STIs, and substance abuse/violence/STIs) than Caucasian MSSWs.*

In order to determine racial disparities in HIV/AIDS risk factors and seroprevalence among MSSWs, it is essential to understand individual-level HIV-risk factors that are pervasive among MSSWs but may occur at disparate rates based on race (e.g., Elifson et al., 1993; Morse et al., 1991; 1992). While high-risk sexual behaviors and IDU may explain HIV seroprevalence in Caucasian men, African American men are at increased risk for HIV seroprevalence even when their risk behaviors are not correspondingly high (Halifors, Iritani, Miller, & Bauer, 2007). This suggests that individual risk behaviors combined with environmental contexts may lead to higher rates of HIV seroprevalence in African American men (Fullilove, 2006). However, there is a

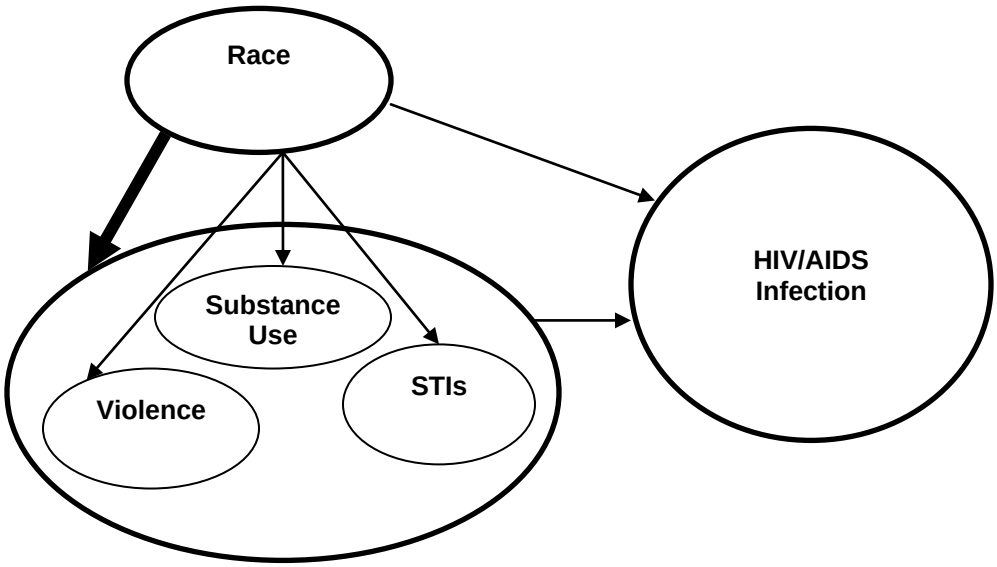
need to better understand disparities that may exist on an individual level within such a hidden population.

## Background and Critical Overview of the Literature

This dissertation uses the tripartite model of HIV risk to explore and examine the effect of a combination of risk factors occurring cross-sectionally (see Figure 1). These factors are represented by categories of risk (substance use, violence, STIs) that influence HIV/AIDS seroprevalence in MSSWs. Research has demonstrated that these factors contribute to high rates of HIV/AIDS in African American men in the general population as well (e.g., Fullilove et al., 1990; Fullilove, 2006, Millett et al., 2006). The complexity of the environments surrounding MSSWs requires the use of a theoretical model broad enough to encompass the numerous and wide-ranging risk categories that may be attributable to HIV/AIDS in MSSWs. Individual-level HIV-risk factors are normative for these men, but it is also important to understand racial disparities that may exist in this population and that the tripartite model of HIV best explains.

The following discussion examines the most relevant studies of MSSWs in the southern United States and explores the HIV/AIDS risk categories of substance use, violence, and STIs, and their potential for affecting HIV seroprevalence, individually and in combination, in both MSSWs and African American MSSWs. Southern United States is focused on because the primary empirical studies on MSSWs have occurred in this region: Georgia, Louisiana, and Houston (e.g., Elifson et al., 1993; Morse et al., 1991; Williams et al., 2003).

Figure 1. The Tripartite Model of HIV Infection in MSSWs. The risk factors may occur simultaneously, which makes it difficult to address one risk factor without addressing the other factors (Adapted from: Johnson, Cunningham-Williams, & Cottler, 2003)




*Male Street Sex Workers (MSSWs)*

The scientific examination of MSSWs has been nominal. Elifson and colleagues' study of male prostitutes in Atlanta (e.g., 1993), Morse and associates' in New Orleans (e.g., 1991; 1992), and, more recently, Williams and colleagues' study in Houston (e.g., 2003) are at the forefront in the study of MSSWs in the United States. These studies are homogeneous in that they reflect MSSWs in major southern cities and primarily examine Caucasian and African American MSSWs. However, heterogeneity is apparent in the cities where the studies occurred (i.e., New Orleans is much more a tourist destination than are Atlanta and Houston). Summaries of these key studies of MSSWs will be discussed next.

*MSSWs in Atlanta*. Elifson and colleagues' CDC-funded study in Atlanta (1988-1991) is the most comprehensive examination of MSSWs to date. They interviewed

MSSWs and then tested for HIV/AIDS, hepatitis B, and syphilis. HIV seroprevalence was 29.4%. In addition, 25.1% were positive for syphilis and 58.3% for hepatitis B. This outcome supports the inclusion of STIs in the tripartite model of HIV risk prior to formation of the actual theory for studying HIV risk. Other indicators of this MSSW sample's high-risk status were significant histories of anal sex with non-paying partners, serologic histories of syphilis and hepatitis B, and childhood physical and sexual abuse among those men who were HIV-positive. Further, MSSWs identifying themselves as homosexual were most likely to be HIV-positive (43.9%). Bisexuals were 35.3% HIV-seroprevalent, while those who identified themselves as heterosexual were HIV-positive at the significantly lower rate of 17.9%. The potentially protective nature of heterosexual identification was explained by the heterosexual MSSWs' lower risk behaviors, especially in terms of receptive anal intercourse.

Though not significant, African American MSSWs' HIV seroprevalence was 33.9% as compared to Caucasians' rate of 24.8%. Elifson and colleagues (1993) also examined HIV seroprevalence in a subsample of male transvestite street sex workers. They found an alarming HIV-seroprevalence rate of 68%. Moreover, 79% had a seromarker for syphilis and 76% for hepatitis B. The researchers found transvestite male street sex workers to be a more homogeneous group than other male sex workers because more than 80% were African American and uniformly engaged in high-risk sexual activity. This study concluded that, while IDU was high among these men, risky sexual behaviors placed MSSWs at a higher risk for HIV infection. The study did not significantly associate IDU with HIV seroprevalence.

*MSSWs in New Orleans*. Morse and associates' (1991; 1992) study of MSSWs in New Orleans (1988-1989), funded by the National Institute of Mental Health, also involved cross-sectional interviews with men as well as serologic laboratory testing for HIV seroprevalence. The rate of HIV/AIDS was lower (17.5%) in the New Orleans sample than in the Atlanta sample (29.4%). Non-whites were slightly higher in HIV seroprevalence (18.9%) than their Caucasian counterparts (16.2%). Consistent with Elifson and colleagues' 1993 study, those MSSWs identifying themselves as heterosexual or bisexual were significantly less likely to be HIV-positive, again suggesting a potentially protective factor due to their engaging in less risky sexual activity. As in the previous study, IDU was high in this sample but was not associated with HIV seroprevalence. Further complicating the issue of safe-sex practices among MSSWs is that customers in New Orleans often demanded unsafe sex and looked elsewhere if a MSSW insisted on condom use during an encounter. Sexual violence also occurred in many of these street transactions (Morse et al., 1992).

Because the studies by Elifson et al. (1993) and Morse et al. (1991; 1992) were completed at the height of the AIDS crisis in two major southern cities, there was a need to understand the lower overall HIV/AIDS rate in New Orleans (17.5%) as compared to Atlanta (29.4%) and the lower rate of New Orleans' African American MSSWs (18.9%) as compared to Atlanta (33.9%). Adimora, Schoenbach, and Doherty (2006) found racial disparities among African Americans due to higher rates of concurrent sexual partners, along with disparities in poverty, income, segregated sexual networks, and socioeconomic status. Racial segregation in housing concentrates poverty and other negative influences within these communities. Because of that pattern, diffusion of the

HIV/AIDS virus is low and, therefore, mostly contained within segregated boundaries (e.g., Heckman et al., 1999). The fact that New Orleans in the late 1980s was a greater tourist attraction than Atlanta suggests the possibility that many of its MSSW customers were tourists, therefore allowing for wider diffusion of the virus beyond New Orleans' boundaries than may have occurred in Atlanta.

*MSSWs in Houston*. Williams and associates (2003) completed the most recent study of MSSWs in Houston, Texas (2003-2006). These National Institute of Mental Health studies examine the spatial bridging and sexual networks of MSSWs while also attempting to find effective HIV/AIDS interventions for this hidden population (Williams et al., 2003; Williams, Atkinson, Klovdahl, Ross, & Timpson, 2005; Williams, Bowen, Timpson, Ross, & Atkinson, 2006). Table 1 (p. 27) offers details of the parent study. Table 2 (pp. 29-30) gives the sample characteristics of these MSSWs. Twenty-four percent of the sample self-reported an HIV-positive status. There was no examination of racial disparities in HIV seroprevalence or sexual orientation. It is also worth noting that almost 100% of the sample had been detained or incarcerated. The Atlanta and New Orleans studies did not examine incarceration as a possible risk factor for HIV seroprevalence. The Williams study, which is the data source for this dissertation, will be discussed at length in the methodology section.

Rates of STIs and HIV/AIDS are high among MSSWs when compared to the general population due to high-risk sexual behaviors likely to occur in this context (Elifson, 1993; Morse et al., 1991; Simon et al., 1993; Williams et al., 2003). Racial disparities in HIV seroprevalence among MSSWs have not yet been examined in depth.

What follows is an explanation of the HIV/AIDS risk categories (substance abuse, violence, and STIs) that can interact synergistically and contribute to the prevalence of HIV/AIDS in MSSWs and, potentially, the HIV/AIDS disparity among African American MSSWs.

*Substance Use*

The full spectrum of substance-use disorders are elevated in MSSWs and are often the precursor for involvement in sex work (e.g., Elifson et al., 1993; Morse et al., 1991; Williams et al., 2003). Research has shown that most MSSWs engage in various stages of substance use such as experimentation, abuse, dependence, and addiction (e.g., Williams et al., 2003). Further, the street-level nature of their activities can lead to polysubstance addictions (e.g., Fullilove, Fullilove, Bowser, & Gross, 1990; Hoffer, 2006).

IDU involves the introduction of drugs directly into veins. IDU has been examined as a risk factor in all of the MSSW studies reviewed here (Elifson et al., 1993; Morse et al., 1991). Substance use can also contribute to disinhibition and impaired judgment, thus increasing the likelihood that one will engage in unsafe sexual activity (Fullilove et al., 1990). Nonetheless, the only direct route for transmission of HIV with substances is through IDU and unclean-needle sharing, which contributes to a reported 23% of HIV cases in African American men (CDC, 2008). IDU is especially relevant in many urban African American communities, along with risk factors like shared drug paraphernalia.

Methamphetamine use (IDU or non-IDU) has risen in recent years (Molitor, Truax, Ruiz, & Sun, 1998). Methamphetamines are related to unprotected and risky sexual behaviors (Molitor et al., 1998). These behaviors are more likely to be associated with methamphetamine use than heroin use (Klee, 1993). Heroin use is not consistently found to be associated with HIV seroprevalence among MSSWs (e.g., Weber et al., 2001).

Multiple roads lead to substance use, abuse, and addiction among both MSSWs and disadvantaged African American men. Poverty often fosters a substance-using environment due to frequent contact with dealers and users, the need for money earned through the drug trade, and traumatic life events. Substance use can lead to abuse and dependence; it also may result in high-risk sexual activity through impulsivity, disinhibition, and impaired judgment. This is the case with crack cocaine, which research has shown to be as reliable a predictor of HIV risk as IDU (Inciardi, 1995). Furthermore, substance use often precedes trauma, which suggests that the substance-using environment may be filled with opportunities for traumatic exposure (Cottler et al., 1992).

*Violence*

MSSWs are often low-income persons, though this state may be transitory (e.g., recently released from prison or evicted from an apartment) or long-standing (e.g., chronically homeless or addicted). Both MSSWs generally and African American men living in urban poverty are prone to experiencing trauma, due to their living in communities that are oftentimes violent. Violence in these communities may be an

everyday occurrence. It is especially prevalent for those who are homeless, sex workers, or substance abusers (Goodman, Saxe, & Harvey, 1991). Cottler, Nishith, and Compton (2001) found that the most prevalent traumatic exposures among urban, mostly African American, substance abusers involved witnessing a killing or injury, physical assault, rape, or sudden accident. Morton and Pollio (unpublished) found in their primarily African American male sample of homeless and developmentally disabled persons that virtually all had experienced multiple traumatic life events, including a majority who had been injured with a weapon or experienced sexual assault. Brief and associates (2004) verified that trauma usually precedes HIV infection. Some who experience such trauma are eventually diagnosed with post-traumatic stress disorder (PTSD), though this diagnosis is less common among low-income people (Breslau, Davis, & Andreski, 1995). If no treatment is available, victims may resort to substance abuse in order to numb PTSD symptoms, potentially leading to more HIV-risk behaviors.

For all these reasons, victimization may lead to a higher likelihood of HIV-risk seroprevalence among MSSWs in general and Black MSSWs in particular. Violence plays an important role in the lives of MSSWs and African American men living in poverty. The potential effects of STIs will now be discussed.

*Sexually Transmitted Infections*

STIs are prevalent among MSSWs. This is understandable due to the high-risk sexual activity in which these men are involved. STIs are very important in understanding racial differences in HIV/AIDS (Adimora & Schoenbach, 2005). STIs and HIV/AIDS infections often have delayed treatment in low-income African American

communities due to the inaccessibility of healthcare or fear of the medical establishment. Consequently people can be infected longer and unknowingly transmit infections to their sexual partners (Millett et al., 2006). This is likely the case with MSSWs as well. Because healthcare is poor among low-income African American men, it is reasonable to assume that healthcare is deficient among MSSWs also. Moreover, sexual networks of African American men living in poverty are often segregated, with older persons often having sexual encounters with younger partners and with monogamous individuals in relationships with promiscuous partners (Adimora, Schoenbach, & Doherty, 2006; Laumann & Youm, 1999; Whitehead, 1997). These conditions lead to a higher incidence of STIs, which facilitates the acquisition and transmission of HIV/AIDS (Millett et al., 2006).

Clearly there is a relationship between STIs and HIV/AIDS among low-income African American men and MSSWs in general (e.g., Elifson, 1993). The relationship with the risk categories of substance abuse and violence warrants investigation in order to delineate how these risk categories interact with HIV seroprevalence. This dissertation examines intersections in the risk categories of STIs, substance abuse, and violence.

*HIV/AIDS*

Extant studies of MSSWs have demonstrated that HIV seroprevalence is an epidemic among this population (Elifson et al., 1993; Morse et al., 1991, 1992; Williams et al., 2003). What remains unclear, though it has been suggested, is that African American and Caucasian disparities may exist in a population as vulnerable to HIV infection as MSSWs (Elifson et al., 1993). There is indisputable evidence that African

American men in the general population face an undue burden of HIV seroprevalence (CDC, 2008).

An unprecedented one in sixteen (6.2%) African American men will be diagnosed with HIV/AIDS in their lifetime (Hall et al., 2008). What remains unclear is why African American men have such disparate rates of HIV/AIDS. The evidence suggests that individual risk factors may explain why Caucasians are at-risk for HIV infection, but those same risk factors do not clarify why African American men become infected (Halifors et al., 2007; Millett et al., 2007). Information on the intersection of HIV-risk factors among MSSWs could assist in the design and implementation of effective HIV/AIDS intervention strategies for both MSSWs and low-income African American men.

This dissertation assumes the need to garner more information on MSSWs and HIV seroprevalence, as well as racial disparities that may exist in HIV/AIDS among these men. MSSWs are a high-risk group for HIV seroprevalence, but subgroups are more susceptible based on sexual orientation and practices (Elifson et al., 1993; Morse et al., 1991). This study goes a step further by examining whether African American MSSWs are at higher risk for HIV seroprevalence as compared to their Caucasian counterparts. If racial disparities do exist, it is important to attempt to discover what factors make African American MSSWs more vulnerable to HIV/AIDS infection.

Considering the public-health consequences of MSSWs in the acquisition and transmission of STIs and HIV/AIDS infection, risk factors must be targeted for future intervention and prevention strategies. This dissertation will encourage clinicians and researchers to increase awareness, outreach, and services to these vulnerable men.

## Theoretical Framework

*Theoretical Perspective and Theory*

The theoretical perspectives that guided this dissertation were those of the systems perspective (Engel, 1977) and the political economy-of-health theory (Morgan, 1987; Morsy, 1990). The first examines human behavior as the outcome of reciprocal interactions of people operating within linked social systems (Hutchison, 2008). George Engel (1977) used this perspective in place of the unideminsional medical model to develop a bio-psycho-social model of disease, which was a radical step forward in understanding the complexity of disease. Second, according to political economy-of-health theory, an individual's health is inherently related to social, economic, and political realities, in addition to ecological contexts that induce risks. On the basis of this theory, street-level prostitution can be seen as one of the last alternatives available to men living in poverty with pressing needs, all of which may result in STIs and violence (Maslow, 1962; Romero-Daza et al., 2003). That is, these men find themselves in an environment where there are few, if any, other options for economic survival (Romero-Daza et al., 2003). This emphasis on environment, however, does not minimize the importance of individual risk behaviors (Bronfrenbrenner, 1977, 1979).

This dissertation will utilize the tripartite model of HIV risk (Boyd, Henderson, Ross-Durow, & Aspen, 1997; Johnson et al., 2003; Kalichman, Williams, Cherry, Belcher, & Nachimson, 1998; Vlahoz Wienge, Moore, & Flynn, 1998). Though the model has most often been used with samples of low-income African American women,

it also is relevant for other hidden populations that face environments saturated with HIV/AIDS infection.

*The Tripartite Mode*

The tripartite model originated with Sigmund Freud's paradigm of the psyche (Freud, 1921; 1923). The model's popularity derives from its ability to allow for the examination of diseases and behaviors along with an investigation of risk factors (King, Eleonora, & Ollendick, 1998). Rachman (1977; 1978) adapted the model for cases in which risk factors influence mental health and other diseases. Johnson and colleagues (2003) were thus able to adapt the model for HIV risk.

Until the twenty-first century the tripartite model was not often applied to hidden populations. Elifson and associates (1993) were front-runners in understanding how the model could be used with MSSWs by observing the combination effect of hepatitis B, syphilis, and HIV infection. Although Information Motivation Behavior (IMB) and the health, stress, and coping model (Cannon, 1932) have elements of the tripartite model, these models emphasize behaviors as the result of rational choices made by clear-thinking people. Men involved in street sex are primarily drug-addicted and living in poverty. Sex for them represents survival, and therefore behaviors are likely the result of impulsivity, which marginalizes rational-choice models.

*The Tripartite Model with Hidden Populations*

As mentioned earlier, Elifson and colleagues (1993) used a form of the tripartite model in order to demonstrate the combined effect of hepatitis B, syphilis, and

HIV/AIDS among MSSWs. This was one of the first uses of biological risk factors to explain HIV infection in a hidden group of men during the height of the AIDS crisis. Johnson and associates (2003) used the tripartite model with a group of low-income African American women, about half of whom traded sex for money or drugs. These risk factors were examined demographically. It was found that women who had STI histories were more likely to experience depression and violence. Women with early alcohol use, and those who had two or more sexual partners in the past 30 days, were at increased risk for the full tripartite of substance use, violence, and depression. As hypothesized, these women had more risk factors than those with only one or two of the factors (Johnson et al., 2003).

Singer (1996) then proposed the concept of SAVA syndemics, which applied elements of the tripartite model. This dissertation adapts the tripartite and SAVA models to include the risk factor of STIs. STIs have long been known to facilitate the acquisition and transmission of HIV/AIDS (e.g., Elifson et al., 1993; Millett et al., 2006), and they are especially relevant in MSSWs and low-income African American populations (e.g., Elifson et al., 1993; Millett et al., 2006; Morse et al., 1991, 1992).

Figure 1 (p. 11) depicts the tripartite model with the risk factors used in this dissertation. The relationship of HIV-risk factors is complex and involves the combination of each factor with the others (see Johnson et al., 2003). The tripartite model allows for the examination of HIV-risk factors, singularly and in combination, and HIV seroprevalence in a hidden population without attempting to resolve the issue of motivation.

Although the tripartite model has not been applied with hidden populations such as MSSWs, there are justifications for its consideration. When utilized in the manner of research by Elifson and associates (1993) and Johnson and colleagues (2003), the model allows for HIV-risk factors that may not be direct routes for infection.

By applying the systems perspective and the tripartite model, this dissertation examines the combined effects of substance abuse, violence, STIs, and HIV/AIDS seroprevalence among a vulnerable sample of MSSWs. The study also examines whether these combinations influence disparities in HIV/AIDS among African American MSSWs.

# Methodology

*Parent Study*

The parent study by Dr. Mark L. Williams is cross-sectional and uses socio-demographic data along with the Risk Behavior Assessment (RBA) to determine substance use and sexual behaviors (Needle et al., 1995). To date Williams and his colleagues have published two articles related to this sample of MSSWs (Timpson, Ross, Williams, & Atkinson, 2007; Williams et al., 2006). While their purpose was to examine sexual networks and spatial bridging in MSSWs, this dissertation examines racial disparities in HIV seroprevalence among these men. Table 1 below summarizes previous studies of Houston MSSWs by Williams and colleagues. This dissertation adds the dimension of examining racial disparities in an already oppressed group of men.

A review of the articles related to these data reveals that there has been no examination of racial disparities in HIV seroprevalence with this sample and that there are no plans for such an examination (Timpson et al., 2007; Williams et al., 2003; Williams et al., 2005; Williams et al., 2006; Williams, per communication, 2008).

Table 1. Parent Study by Dr. Mark L Williams and Colleagues, and Design, Sample Size, and Aims of this Dissertation Study.

| Study | Sample Size | Design | Aims | Findings |
|---|---|---|---|---|
| Williams et al., 2005 | N=42 (collected 2003-2004) | Cross-sectional | Examine sexual bridging from another city prior to trading sex in Houston. | Those bridging cities were sig. more likely to be gay, have more sex partners, and be HIV+. |
| Timpson, Ross, Williams et al., 2007 | N=179 (collected 2004-2005) | Cross-sectional | Examine the demographic characteristics of MSSWs in Houston. | 26% HIV+; in the past 30 days, MSSWs averaged 56 male partners and 5 female partners; 39% Black. |

| Dissertation Study | Sample Size | Design | Aims |
|---|---|---|---|
| Racial disparities in HIV seroprevalence in MSSWs in Houston. | N=181<br>86=Black<br>95=White | Cross-sectional | 1) To examine the relationship between HIV-risk factors and HIV seroprevalence in total MSSW sample.<br>2) To explore if the relationship between the combination of HIV-risk factors and HIV seroprevalence differs between Black and White MSSWs.<br>3) Explore for what may account for racial disparities in HIV. |

*Data Set and Sampling Strategy*

Data derive from the parent study collected by Dr. Mark L. Williams and colleagues, Center for Health Promotion and Prevention Research, University of Texas School of Public Health, with a grant provided by the National Institute on Drug Abuse (R01 DAO15026 of the National Institute of Health). A purposeful sample of 229 MSSWs was recruited from May 2003 to January 2006 in Houston, Texas, as part of a larger study examining the substance use, spatial bridging, and sexual networks of MSSWs (Timpson et al., 2007; Williams et al., 2005). Sample characteristics are

described in Table 2. For the original sample (n=197), 27.4% (n=54) self-reported being HIV-positive.

Recruitment of MSSWs required the development of a sampling plan using a combination of key informants, participant referral, and targeted sampling per the requirements for hidden populations (Carlson, Wang, Siegal, Falck, & Guo, 1994; Watters & Biernacki, 1989). Key informants familiar with male sex work in Houston were interviewed to ascertain locations where MSSWs solicit for sex. Researchers verified these areas through direct observation of sex-trade transactions. They then asked key informants to recruit MSSWs from these sites. These subjects became the focal (index) participants for the original study. For inclusion in the study, focal participants had to meet the following criteria: self-identification as male, 16 years of age or older (16 is the youngest age for consent to participate in a research project under Texas state law), and engagement in sex work in the past seven days. No participant was younger than 17, and no participant under the age of 20 reported HIV seroprevalence.

Data collection in the MSSW networks involved three levels. First, the initial person interviewed became the focal participant, who was then asked to identify social, sexual, and substance-using contacts in the last 48 hours. Second, the plan was weighted in order to recruit a focal participant's substance using and non-paying partners rather than social contacts or paying sex customers. These contacts became secondary participants. Third, secondary participants were requested to recruit their network associates (tertiary) per the same weighted sampling plan utilized with focal participants. Each key informant (focal and secondary participant) received $20 for each contact

successfully interviewed. All subjects received $30 for their participation in the study. There were 229 focal participants in the parent study.

Table 2. Characteristics of the Original Sample, Dissertation Sample, and White/Black Dissertation Participants

| | **Entire Sample (N=229) n (percentage)** | **Dissertation Sample (N=181) n (percentage)** | **White Participants (N=95) (52.5%) n (percentage)** | **Black Participants (N=86) (47.5%) n (percentage)** |
|---|---|---|---|---|
| ***MAIN EFFECT & MODERATING VARIABLE:*** | | | | |
| **Race** | | | | |
| White | 108 (47.2%) | 95 (52.5%) | | |
| Black | 100 (43.7%) | 86 (47.5%) | | |
| Hispanic | 18 (7.9%) | | | |
| American Indian, Alaska Native | 1 (0.4%) | | | |
| Other | 2 (0.9%) | | | |
| ***CONTROL VARIABLES:*** | | | | |
| **Age (years)** | Mean=31.93 | Mean=32.08 | Mean=29.39 | Mean=35.06 |
| **Education (years)** | Mean=11.06 | Mean=11.18 | Mean=10.82 | Mean=11.57 |
| **Sexual Orientation** | | | | |
| Gay | 88 (38.4%) | 68 (37.6%) | 28 (29.5%) | 40 (46.5%) |
| Straight | 21 (9.2%) | 19 (10.5%) | 10 (10.5%) | 9 (10.5%) |
| Bisexual | 120 (52.4) | 94 (51.9%) | 57 (60.0%) | 37 (43.0%) |
| **Income (last 30 days)** | | | | |
| Interpolated Median | | | $1260 | $498 |
| ***DEPENDENT VARIABLE:*** | | | | |
| **Self-Reported HIV Status** | n=197 | | | |
| HIV-Positive | 54 (27.4%) | 49 (27.1%) | 17 (17.9%) | 32 (37.2%) |
| HIV-Negative | 143 (72.6%) | 132 (72.9%) | 78 (82.1%) | 54 (62.8%) |

| | | | | |
|---|---|---|---|---|
| ***INDEPENDENT VARIABLES*:** | | | | |
| ***Substance Use (explored)*:** | | | | |
| **Crack Cocaine Use (lifetime)** | | | | |
| Yes | 223 (97.4%) | 175 (96.7%) | 93 (97.9%) | 82 (95.3%) |
| No | 6 (2.6%) | 6 (3.3%) | 2 (2.1%) | 4 (4.7%) |
| **Heroin Use (lifetime)** | | | | |
| Yes | 67 (29.3%) | 49 (27.1%) | 43 (45.3%) | 6 (7.0%) |
| No | 162 (70.7%) | 132 (72.9%) | 52 (54.7%) | 80 (93.0%) |
| **Methamphetamine (lifetime)** | | | | |
| Yes | 120 (52.4%) | 92 (50.8%) | 79 (83.2%) | 13 (15.1%) |
| No | 109 (47.6%) | 89 (49.2%) | 16 (16.8%) | 73 (84.9%) |
| **IDU (lifetime)** | | | | |
| Yes | 126 (55.0%) | 95 (52.5%) | 81 (85.3%) | 14 (16.3%) |
| No | 103 (45.0%) | 86 (47.5%) | 14 (14.7%) | 72 (83.7%) |
| ***Violence (explored)*:** | | | | |
| **Lifetime Sexual Assault** | | | | |
| Yes | 71 (31.0%) | 53 (29.3%) | 26 (27.4%) | 27 (31.4%) |
| No | 158 (69.0%) | 128 (70.7%) | 69 (72.6%) | 59 (68.6%) |
| **Lifetime Physical Assault** | | | | |
| Yes | 117 (51.1%) | 94 (51.9%) | 57 (60.0%) | 37 (43.0%) |
| No | 112 (48.9%) | 87 (48.1%) | 38 (40.0%) | 49 (57.0%) |
| ***STIs (explored)*:** | | | | |
| **Gonorrhea** | | | | |
| Yes | 42 (18.3%) | 36 (19.9%) | 13 (13.7%) | 23 (26.7%) |
| No | 187 (81.7%) | 145 (80.1%) | 82 (86.3%) | 63 (73.3%) |
| **Syphilis** | | | | |
| Yes | 29 (12.7%) | 23 (12.7%) | 7 (7.4%) | 16 (18.6%) |
| No | 200 (87.3%) | 158 (87.3%) | 88 (92.6%) | 70 (81.4%) |
| **Genital Warts** | | | | |
| Yes | 5 (2.2%) | 5 (2.8%) | 2 (2.1%) | 3 (3.5%) |
| No | 224 (97.8%) | 176 (97.2%) | 93 (97.9%) | 83 (96.5%) |
| **Genital Herpes** | | | | |
| Yes | 14 (6.1%) | 12 (6.6%) | 10 (10.5%) | 2 (2.3%) |
| No | 215 (93.9%) | 169 (93.4%) | 85 (89.5%) | 84 (97.7%) |
| **Chlamydia** | | | | |
| Yes | 18 (7.9%) | 14 (7.7%) | 7 (7.4%) | 7 (8.1%) |
| No | 211 (92.1%) | 167 (92.3%) | 88 (92.6%) | 79 (91.9%) |

This dissertation considered only White non-Hispanic (n=108) and Black non-Hispanic (n=100) focal participants (N=208). Because their small number would make comparisons in HIV seroprevalence challenging, it removed Hispanics (n=18), American Indian or Alaska Native (n=1), and those reporting other races (n=2) from the sample. Since network analysis is not its focus, this dissertation did not include secondary or tertiary respondents. Only those MSSWs who self-reported their HIV status were included in the final analysis (N=181; White non-Hispanic=95; Black non-Hispanic=86). Men who were unaware of their HIV status were excluded. Table 2 provides characteristics of the sample examined for this dissertation. Statistically, 27.1% of the sample reported having HIV or AIDS; 17.9% of the Caucasian participants reported being HIV-positive, whereas 37.2% of the Black participants did so. See Figure 2 for a flow chart from the original sample to that used for this dissertation. Study procedures and data-collection instruments were approved by the Committee for the Protection of Human Subjects, University of Texas Health Science Center at Houston, and were found exempt by the Human Rights Protection Office at Washington University in St. Louis.

Figure 2. Flow Chart of Original Sample to Dissertation Sample

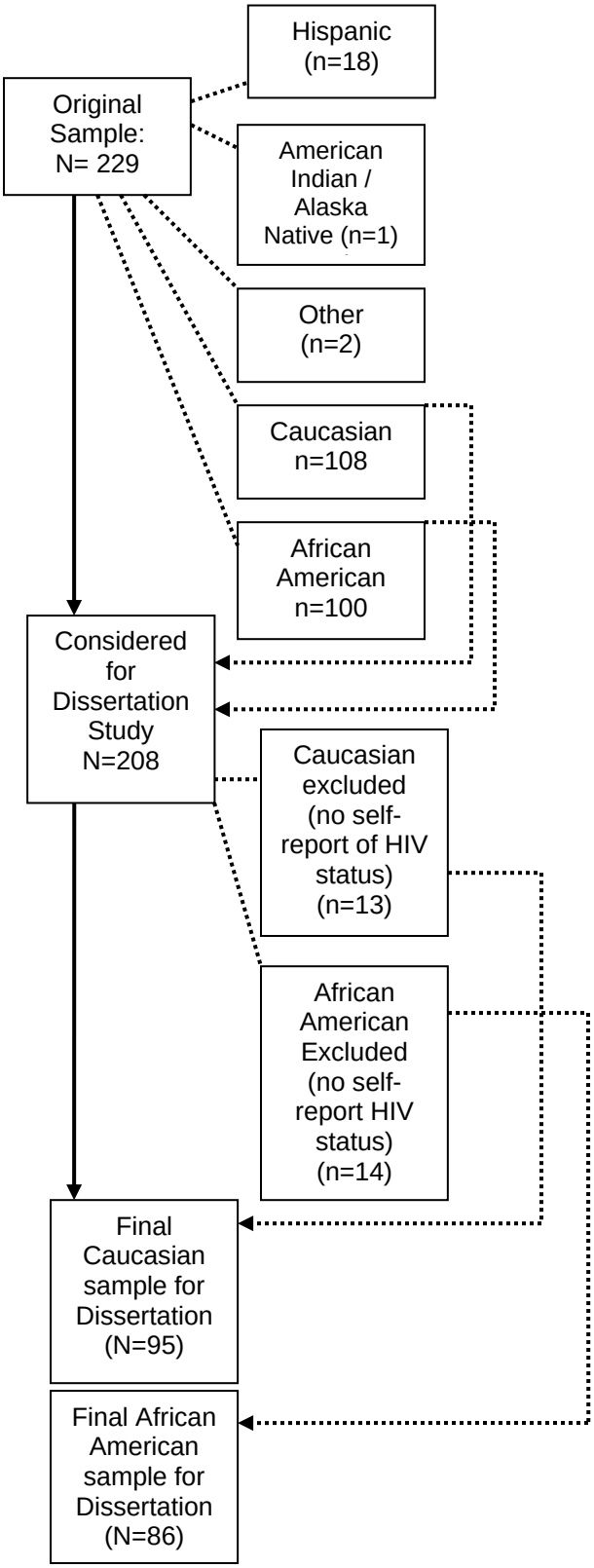


Table 3. Description of Dissertation Control Variables and Independent Variables

| **Dependent Variable** | **Level of Measurement** | **Value** |
|---|---|---|
| Self-reported HIV Status | Categorical | 0=Negative; 1=Positive |
| **Potential Moderating Variable** | **Level of Measurement** | **Value** |
| Race | Categorical | 0=Caucasian<br>1=African American |
| **Independent Variables** | **Level of Measurement** | **Values** |
| ***Substance Use (explored):*** | | |
| Crack cocaine (lifetime) | Categorical | 0=No<br>1=Yes |
| Heroin Use (lifetime) | Categorical | 0=No<br>1=Yes |
| Methamphetamine (lifetime) | Categorical | 0=No<br>1=yes |
| IDU (lifetime) | Categorical | 0=No<br>1=Yes |
| Drug Treatment (lifetime) | Categorical | 0=No<br>1=Yes |
| ***Violence (explored):*** | **Level of Measurement** | **Values** |
| Sexual Assault (lifetime) | Categorical | 0=No<br>1=Yes |
| Physical Assault (lifetime) | Categorical | 0=No<br>1=Yes |
| ***STIs (explored):*** | **Level of Measurement** | **Values** |
| Gonorrhea (lifetime) | Categorical | 0=No<br>1=Yes |
| Syphilis (lifetime) | Categorical) | 0=No<br>1=Yes |
| Genital herpes (lifetime) | Categorical | 0=No<br>1=Yes |
| Chlamydia (lifetime) | Categorical | 0=No<br>1=Yes |
| Genital Warts (lifetime) | Categorical | 0=No<br>1=Yes |
| Treatment received after last diagnosis (all STIs noted above) | Categorical | 0=No<br>1=Yes<br>7=don't know; 8=refused to answer; 9=not applicable |
| **Control Variables** | **Level of Measurement** | **Values** |
| Age | Continuous | 19-49 years old=Range |
| Education | Continuous | 4-18 years=Range |
| Sexual Orientation | Categorical | 1=Gay; 0=Straight/Bisexual |
| Income (past 30 days) | Categorical | 0=no income, 1=$1 to $99, 2=$100 to $399, 3=$400 to $599, 4=$600 to $1199, 5=1200 to $1799, 6=$1800 to $2399, and 7=$2400 or more |

*Measures*

Original data collection was completed by trained research assistants in a private office located in a Houston neighborhood where street prostitution was occurring. Demographic data was obtained via an adapted version of the RBA, which yielded the data for this dissertation. The RBA portion is included with the Sexual Network Questionnaire (SNQ) designed by Dr. Mark L. Williams and associates, and it is based on their prior work with substance-using populations (Bowen, Williams, & McCoy, 2001; Williams, Bowen, Timpson, & Keel, 2003). Measures comparable to those used in the RBA and SNQ have been found reliable and valid with substance users (Dowling-Guyer et al., 1994; Needle et al., 1995). The SNQ collected self-reported data on focal participants, secondary participants, and their substance-using and sexual contacts. This dissertation explored the following measures (see Table 3 for a summary):

*Control variables*. The interviewer verified age by asking respondents' dates of birth. Age is a continuous variable in this study, with a range of 19 to 49 years.

The interviewer verified educational attainment by asking, "What is the highest grade of school you completed (include post-secondary)?" This was a continuous variable, with a range of 4th grade to 18 years of education.

Sexual orientation was verified by asking, "Do you consider yourself to be gay, straight, bisexual?" (Category: 1=gay, 2=straight, 3=bisexual). This was a problematic variable for analysis because a high number of MSSWs identified themselves as gay and because no straight MSSW reported being HIV-positive. The variable was first recoded as 2=gay, 1=bisexual, and 0=straight. It remained problematic, however, and so was

recoded again as 1=gay and 0=bisexual or straight, because those who identified themselves as gay were most at risk for HIV infection in past studies of MSSWs (Elifson et al., 1993; Morse et al., 1991). This recoding eliminated problems in analysis.

Respondents' income was determined by asking, "In the past 30 days approximately how much money did you receive from all sources?" (Continuous: 0=none, 1=less than $50, 2=$50-$99, 3=$100-$199, 4=$200-$399, 5=$400-$599, 6=$600 or more; if greater than $600, 0=$600-$1,199, 1=$1,200-$1,799, 2=$1,800-$2,399, 3=$2400 or more). The income variable was recoded as follows: 0=no income, 1=$1-$99, 2=$100-$399, 3=$400-$599, 4=$600-$1,199, 5=$1,200-$1,799, 6=$1,800-$2,399, 7=$2,400 or more. This recoding was based on a median of $600-$1,199. Three MSSWs had no income in the past 30 days, signifying that sex was exchanged for drugs or other non-monetary payment. This distribution approximates a bell curve, with a high number at the positive end (7=$2,400 or more) (n=30).

The RBA, the format used for the SNQ's questions about sexual behavior and substance use, has good reliability. Its reliability for sexual behavior ranged from .66 to .83 (Needle et al., 1995).

*HIV/AIDS Seroprevalence (Dependent Variable)*. This is the outcome variable for this dissertation. The SNQ asks respondents, "What were the results of your last HIV test?" (1=positive, 2=negative, 3=indeterminate). Missing data included those men who had not been tested or did not know their test results (indeterminate). This variable was recoded as 0=negative and 1=positive. Those MSSWs with indeterminate HIV status were removed from analysis (n=45).

*African American and Caucasian Race of MSSWs (as Main Effect and Potential Moderating Variable)*. A total of 181 men (African American=86 and Caucasian=95) were the study's population for testing relationships with HIV seroprevalence as the dependent variable. African American MSSWs were coded as 1, Caucasian MSSWs as 0. The risk categories of substance abuse, violence, and STIs were explored as categories. Those subjects who were most significantly associated with HIV infection formed the basis for quantifying the categories (see Figure 3).

*Substance Use Construct*. This study included only "hard" substance use. These substances were crack cocaine, heroin, methamphetamine, and IDU use. Based on similar measures reported via the RBA (Needle et al., 1995), reliability was .91 at time 1 and .97 at time 2 for crack cocaine. For heroin internal consistency was .96 at time 1 and 1.00 at time 2.

The interviewer determined substance use by asking these questions: "Have you ever used crack cocaine?" "Have you ever used heroin?" "Have you ever used methamphetamine?" (0=no and 1=yes). Because IDU is a direct route for HIV/AIDS infection, the interviewer also asked, "Have you ever injected any drugs with a needle? (0=no and 1=yes).

Lack of drug treatment could contribute to HIV risk through unremitting drug consumption. The SNQ asked, "How many times have you been in treatment for drug use?" (Continuous: 0-10=range). This variable was reformulated as follows: "Have you ever been in drug treatment?" (0=no and 1=yes). All respondents who stating that they

had never received drug treatment were coded 0; those who had been in treatment one or more times were coded 1.

*Violence Construct*. The interviewer ascertained violence by the MSSWs' self-reported victimization. He verified sexual assault by asking, "Has a sexual partner you consider to be a lover, wife, or husband ever forced you to have sex when you did not want to have sex?" and "Has a sexual partner who was not a lover, wife, or husband ever forced you to have sex when you did not want to have sex?" (0=no and 1=yes). These questions were collapsed into one question concerning lifetime sexual assault. The interviewer verified physical assault by asking, "Has a sexual partner you consider to be a lover, wife, or husband ever hit you?" and "Has a sexual partner who was not a lover, wife, or husband ever hit you?" (0=no and 1=yes). These questions were collapsed into one question concerning lifetime physical assault.

*Sexually Transmitted Infections Construct*. STIs enhance the acquisition and transmission of HIV/AIDS; ineffective or delayed treatment can exacerbate the problem. The SNQ examined the incidence of gonorrhea, syphilis, genital herpes, chlamydia, and genital warts among MSSWs by asking, "Has a doctor, nurse, or other healthcare professional ever told you that you had STIs (gonorrhea/syphilis/genital herpes/chlamydia/genital warts)?" (0=no and 1=yes) and "Did you complete the treatment?" (0=no, 1=yes, 7=don't know, 8=refused to answer, 9=not applicable). These variables were left intact for this dissertation.

Determination of the factors' temporal order was not possible due to the data's cross-sectional nature. Nonetheless, it will be possible to understand whether the factors correlate with HIV seroprevalence in both the MSSW total sample and the African American MSSW sample.

*Analyses*

This section describes the dissertation's analyses. The section's format follows the analyses used for this dissertation.

1) *Descriptive Statistics*. Analysis commenced with exploration of the data through descriptive statistics. The categorical-control variable (sexual orientation), potential moderator (race) and main-effect variable, and HIV status were examined via frequencies and percentages. The continuous-control variables of age and educational status had range, median, mean, mode, and standard deviations examined. Descriptive statistics also applied to all of the variables falling under the risk categories of substance use, violence, and STIs (see Figure 3 for the variables explored under each category).

2) *Bivariate Differences*. Bivariate differences were examined in the control variables, race variable (main effect and moderating variable), HIV-status variable (dependent variable), and the variables falling under the risk categories. T-tests verified mean differences between a continuous variable and a categorical variable. Chi-square tests examined bivariate analyses of categorical variables. Rank-sum tests determined the relationship between income and other variables.

3) *Diagnostics and the Meeting of Assumptions*. Regression diagnostics ensured that the assumptions for regression were met (Fox, 1991). The researcher addressed issues of multicollinearity by using zero-order correlations and tests for tolerance. This process is described below.

Multicollinearity may not be present when the tolerance values are above .50 and when variance-inflation factors (VIF) are below 10. Tolerance indicates how much of the variability of the included factors is not explained by other factors (1 minus R-square). However, serious concerns about multicollinearity may be evident when tolerance values are less than .10 (Mertler, Vannatta, & Meyers, 2005; Gamst & Guarino, 2006) or .10 to .17 (Keith, 2006). It is important to look at VIFs that are 6 or 7 and compare them with other measures of multicollinearity to see whether there are problems. Keith (2006) states, "Values for the VIF of 6 or 7 may be more reasonable as flags for excessive multicollinearity. These values of the VIF correspond to tolerances of .10 (for a VIF of 10), .14 (VIF of 7), and .17 (VIF of 6), respectively" (p. 1999). VIF is related to inflated standard errors (VIF = 1/TOL). Tabachnick and Fidell (2001) warn that high correlation of variables (over .7) may suggest the need to omit one of them. The Cook's Distance residual statistic should have values less than 1.0; values over this threshold indicate problem cases (Tabachink & Fidell, 2001).

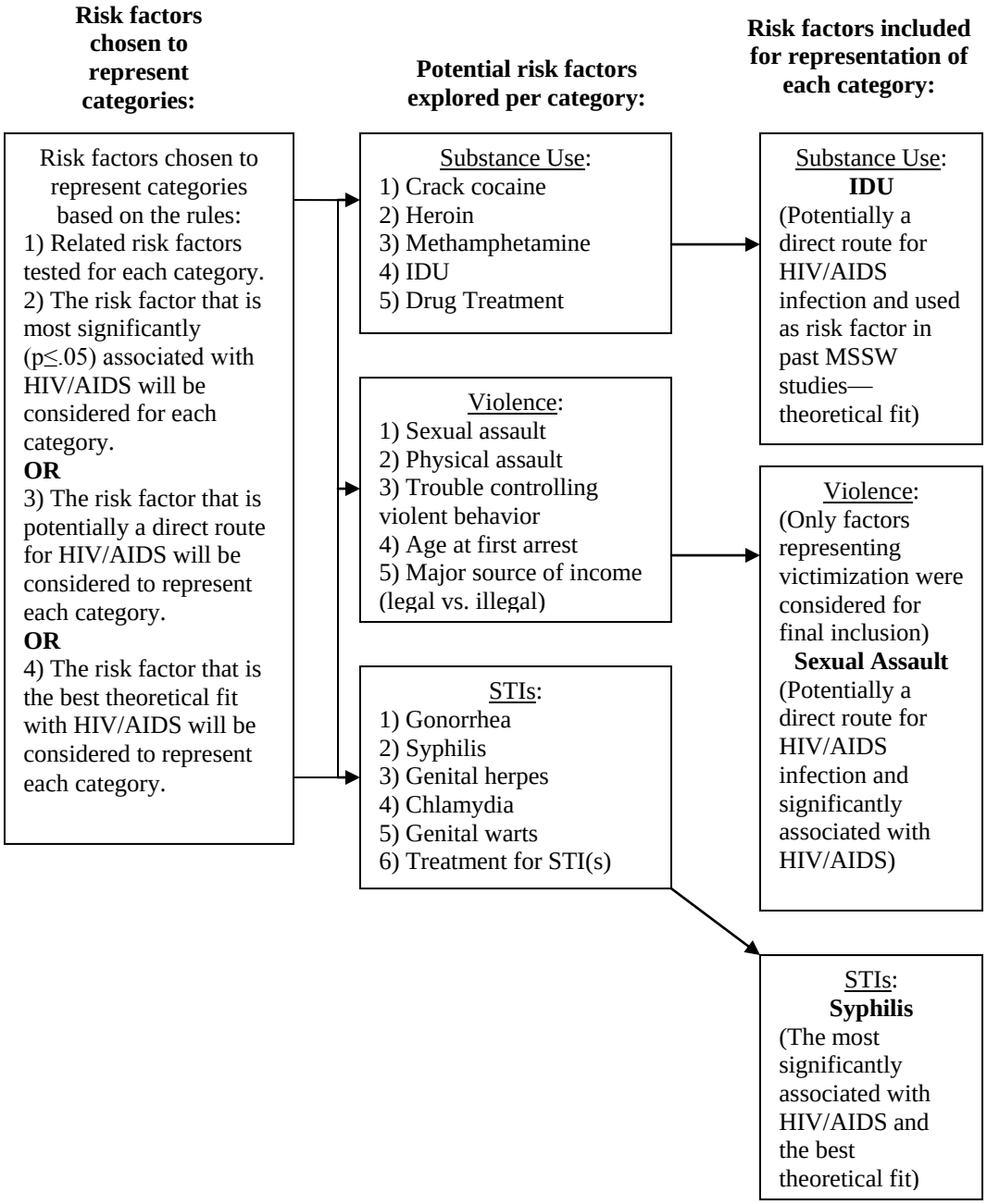
The Pearson correlations should be between .3 and .7. The restricted range of the correlations is not unusual in studies involving extreme groups. Therefore, the correlations cannot be generalized beyond the range of data used in this study (Pallant, 2004). Homoscedasticity occurs when the variance of the residuals involving the variables' predicted scores are the same for all those predicted (Pallant, 2005).

4) *Risk Factors Chosen to Represent HIV-Risk Categories*. Risk factors were chosen to represent the categories of substance use, violence, and STIs. These risk factors became the study's variables representing the risk categories of substance use, violence, and STIs.. See Figure 3 for a flow chart of the methods used for inclusion in each risk category.

These models fit the probability of a positive response to being HIV-positive given the values of the other variables, with all categorical covariates matching the lowest level of each factor as a reference group.

The Omnibus Tests for Model Coefficients were examined for high significance. Coefficients of concordance determine paired agreement between those HIV-positive and those HIV-negative. The Hosmer and Lemeshow goodness-of-fit test inspects for insignificance of the overall model. When the overall model was significant, independent variables were examined to see whether transformation would improve the model and make the Hosmer and Lemeshow test non-significant.

Figure 3. Flow Chart for Inclusion of Risk-Factor Variables in the Categories of Substance Use, Violence, and STIs



Output from the analyses was correlated with the classification table, which shows the stated HIV seroprevalence and predicted HIV seroprevalence. The parameters and standard error of the estimates and confidence limits were used for analysis. Estimates of the parameters represent the change in HIV seroprevalence when the explanatory variables' values change from the reference level to the level specified. Odds ratios measure the extent to which the likelihood in favor of HIV seroprevalence increases when independent variables are raised from the reference level to the highest level. The p-value demonstrates which independent variables significantly influence HIV seroprevalence.

5) *Binary Logistic Regression with Backward Elimination*. Binary logistic-regression models were developed for examining HIV seroprevalence in the total sample of MSSWs and for determining racial differences in HIV seroprevalence among MSSWs.

Backward elimination creates a model in which only the variables having a significant effect on HIV seroprevalence predominate. Starting with the paradigm containing all of the risk and control variables, backward elimination removes any terms that are not significant, starting with the largest p-value. This procedure is repeated until a parsimonious model is developed.

With combined variables such as Race*Syphilis, it is essential that one remove main effects before removing interactions involving these main effects. In other words, do not remove any term that is included in a larger term (e.g., do not remove the X1*X3 before the X1*X2*X3 interaction). After each removal the model should be retested and reexamined. Non-significant protected terms may remain in the final model because they may be significant for purposes of interpretation.

For aim 2 the race variable became the moderator. Each factor representing the risk categories was examined against race. Backward elimination was again used to develop a parsimonious model.

For aim 3 (Hypotheses 3.1 and 3.2), the researcher examined bivariate association between race, sexual assault, syphilis and HIV seroprevalence to determine whether there was an association between African American and Caucasian MSSWs in HIV seroprevalence, and the risk factors and HIV seroprevalence. He compared these results to the previous omnibus (parsimonious) models from hypotheses 2.1 and 2.2 to determine whether this significance persists when the factors for the categories of substance use, violence, and STIs are added to the binary-logistic regression models. The following conditions must be met for mediation (Hypotheses 3.3 and 3.4):

a) Race (predictor) is significantly associated with HIV seroprevalence.

b) Race (predictor) is significantly associated with both sexual assault and/or syphilis.

c) Sexual assault and/or syphilis are significantly associated with HIV seroprevalence (after controlling for race).

d) The impact of race on HIV seroprevalence is significantly less after controlling for sexual assault and/or syphilis (Baron & Kenny, 1986; Robins & Greenland, 1992).

If these conditions are not met, examination will terminate. If the conditions are met, general log-linear modeling will commence, as described below.

7) *Predicted Probabilities*. For hypothesis 3.4, predicted probabilities examine the likelihood of HIV seroprevalence as risk factors (singular and combined). Predicted

probabilities illustrate the individual and combined probability of HIV seroprevalence when considered in relation to each risk factor. They also illustrate racial disparities that may occur between HIV-positive African American and Caucasian MSSWs. Predicted probabilities are derived from the logistic-regression coefficients. See Figures 4a-c for models derived from this plan.

Figure 4a: Aim 1 and Models for Hypotheses 1.1. and 1.2

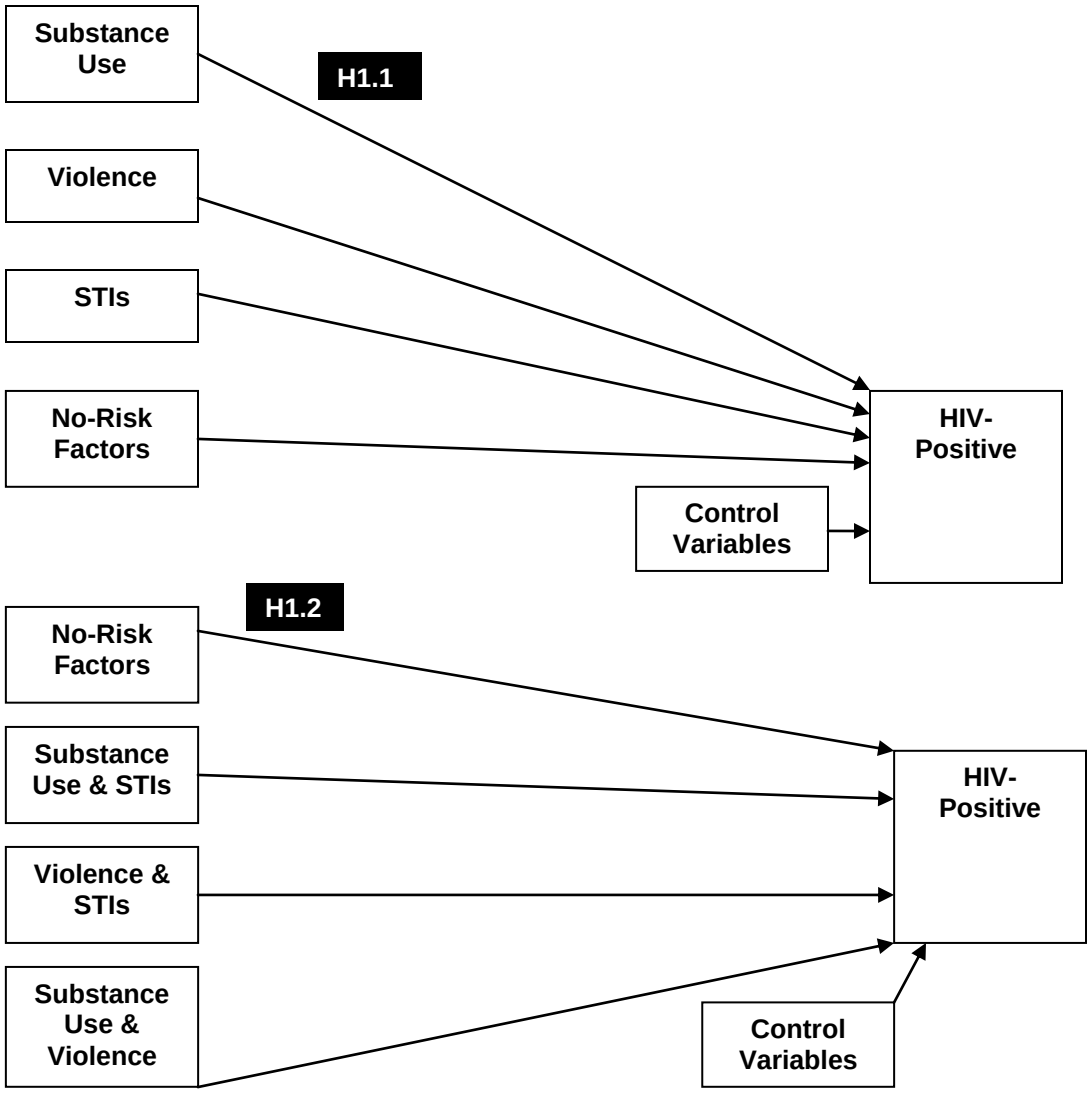
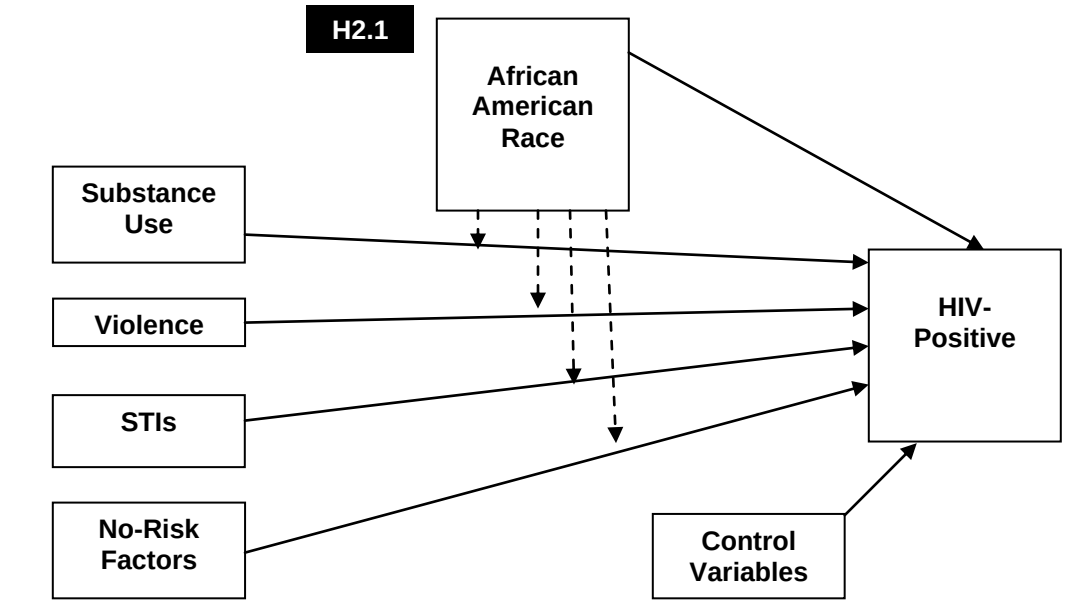


Figure 4b: Aim 2 and Models for Hypotheses 2.1 and 2.2



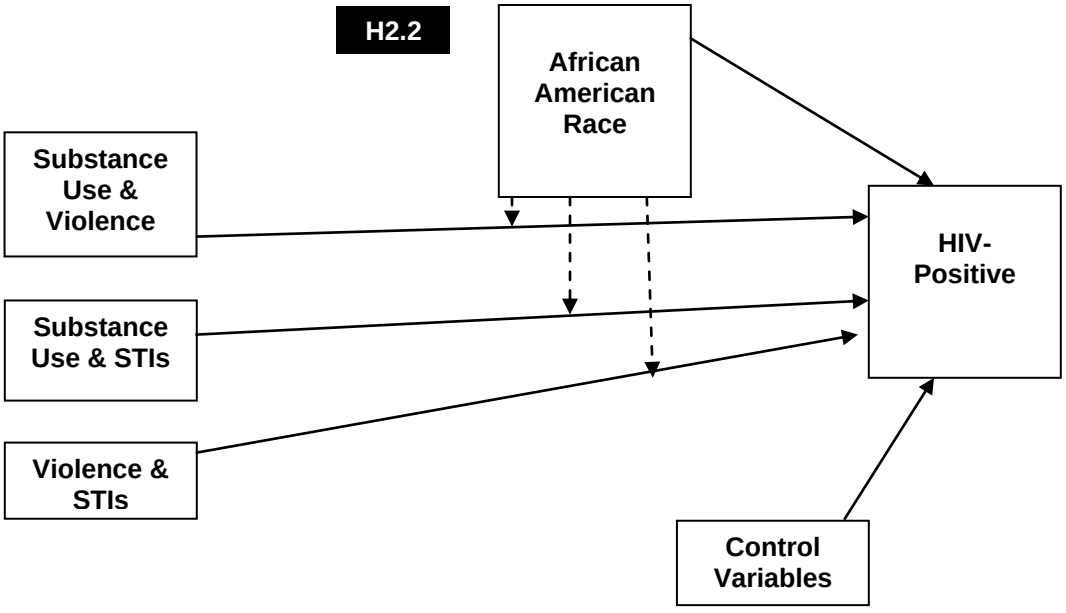
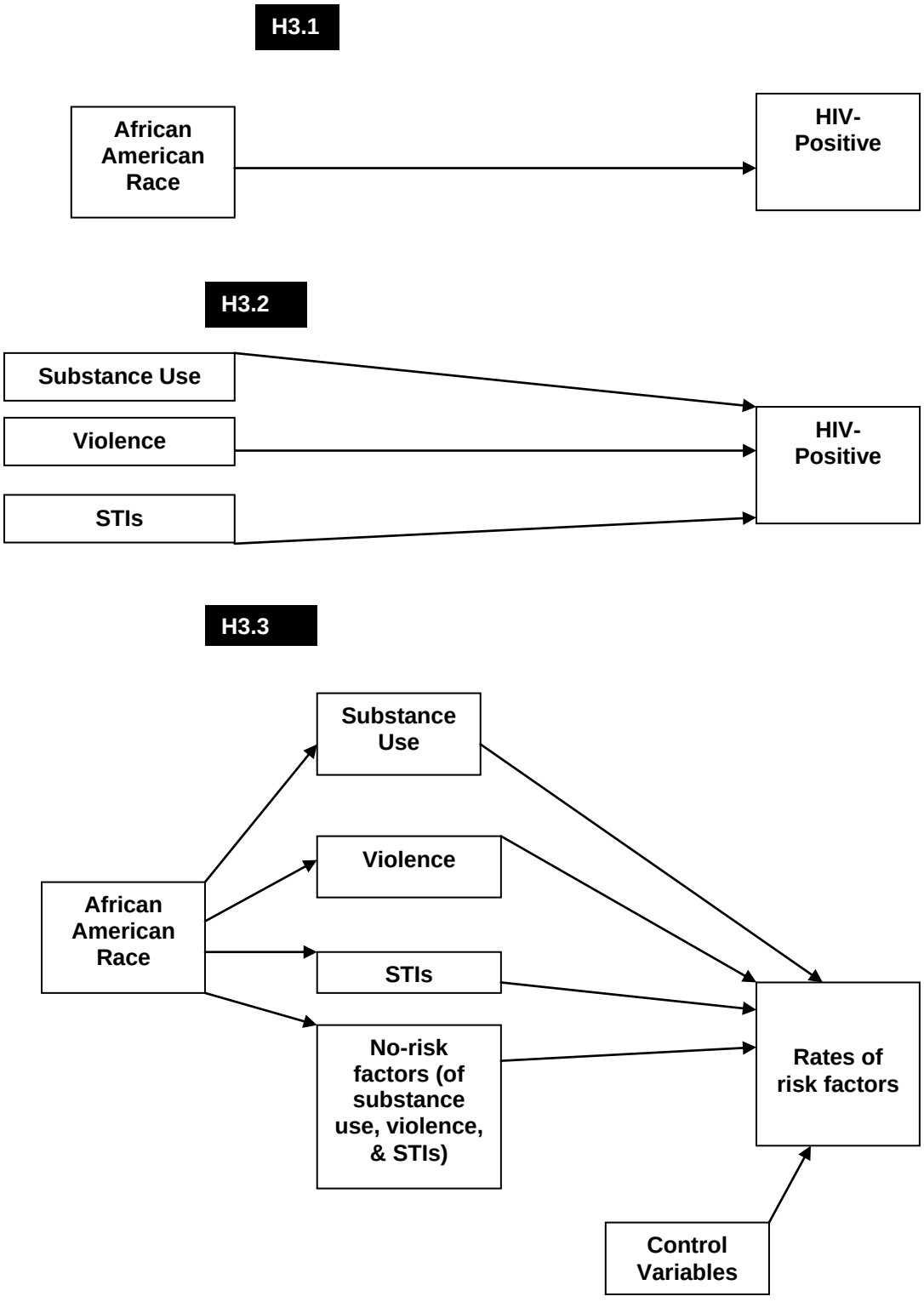
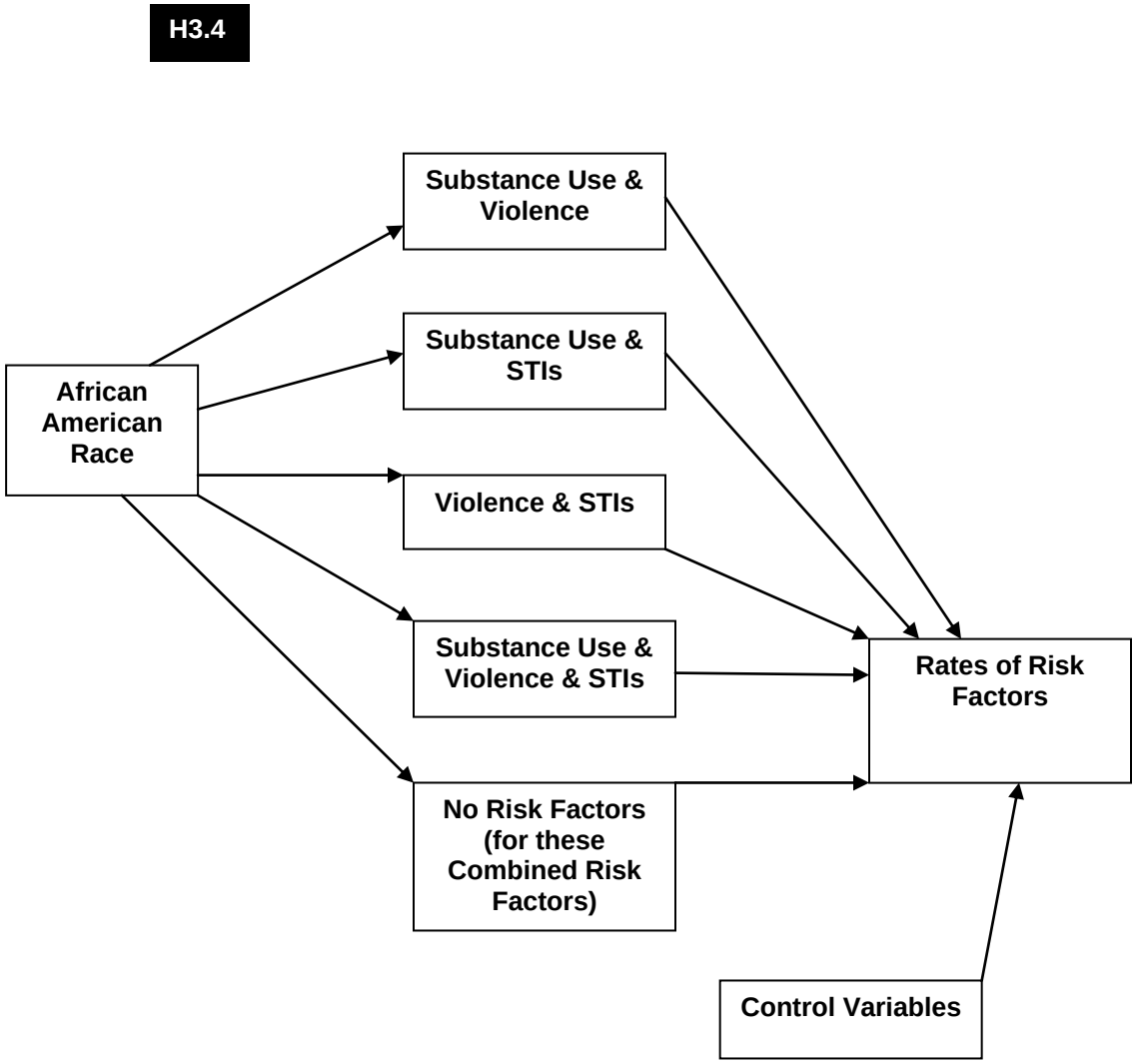



Figure 4c: Aim 3 and Models for Hypotheses 3.1, 3.2, 3.3, and 3.4






These analyses help to explain whether racial disparities in HIV seroprevalence exist among MSSW. The results of these analyses will be examined next.

## Results

This dissertation's findings concern general characteristics of the total MSSW sample. The study then examined racial differences in HIV seroprevalence in order to determine possible relationships with HIV-risk factors. Given descriptive statistics and bivariate differences, the results will then be examined in binary logistic regression models.

This Results section was organized as follows: The demographic characteristics (sample description; see Table 4) include all of the potential risk factors explored for final inclusion in aims 1, 2, and 3. The control variables (age, education, income, and sexual orientation), the race variable, and the dependent variable of HIV-status were also examined as part of the sample description.

The differences and bivariate relationships were then examined as follows (see Tables 5 through 10): HIV status by the control variables, by race, and all of the potential risk factors. Also analyzed were the control variables (age, education, income, and sexual orientation) by HIV status, race, and all of the potential risk factors. This process assists in understanding the selection of the final risk factors for inclusion in aims 1, 2, and 3 as described in Figure 3.

The diagnostics for this dissertation are shown in Table 11. The remainder of this section provides the results for aims 1, 2, and 3 (see tables 12 through 23) as put forth in the Methods section of this dissertation.

*Sample Description*

*General Characteristics of Total MSSW Sample*. Table 4 shows that this dissertation sample (N=181) is 52.5% Caucasian (n=95) and 47.5% African American (n=86). The total MSSW sample age range is 19 to 49 years, with the mean age being just over 30 years. The average years of education were 11.18. Over half of this sample reported being bisexual. Most of the men made $600 or more in the past 30 days.

Self-reported HIV status was as follows: 49 men (27.1%) reported being HIV-positive. Only MSSWs who self-reported being tested for HIV/AIDS are included in this sample.

Almost the entire sample had used crack cocaine. About half of the participants confirmed methamphetamine and IDU histories. Only 27.1% (n=49) had used heroin. Over half of the MSSWs had been in substance-abuse treatment one or more times in their lives.

Table 4. Sample Characteristics of the Dissertation Sample of MSSWs.

| | **Dissertation Sample (N=181) n (percentage)** | **Black Participants (N=86) (47.5%) n (percentage)** | **White Participants (N=95) (52.5%) n (percentage)** |
|---|---|---|---|
| ***MAIN EFFECT & MODERATING VARIABLE:*** | | | |
| **Race*** | | | |
| White | 95 (52.5%) | | |
| Black | 86 (47.5%) | | |
| ***CONTROL VARIABLES*:** | | | |
| **Age (years)*** ± | Mean=32.08 | Mean=35.06 | Mean=29.39 |
| **Education (years)** ± | Mean=11.18 | Mean=11.57 | Mean=10.82 |
| **Sexual Orientation*** ± | | | |
| Gay | 68 (37.6%) | 40 (46.5%) | 28 (29.5%) |
| Straight | 19 (10.5%) | 9 (10.5%) | 10 (10.5%) |
| Bisexual | 94 (51.9%) | 37 (43.0%) | 57 (60.0%) |
| **Income (last 30 days)*** ± | | | |
| Interpolated Median | | $498 | $1,260 |
| ***DEPENDENT VARIABLE*:** | | | |
| **Self-Reported HIV Status** ± | | | |
| HIV-Positive | 49 (27.1%) | 32 (37.2%) | 17 (17.9%) |
| HIV-Negative | 132 (72.9%) | 54 (62.8%) | 78 (82.1%) |
| ***INDEPENDENT VARIABLES*:** | | | |
| ***Substance Use (explored)*:** | | | |
| **Crack-Cocaine Use (lifetime)** | | | |
| Yes | 175 (96.7%) | 82 (95.3%) | 93 (97.9%) |
| No | 6 (3.3%) | 4 (4.7%) | 2 (2.1%) |
| **Heroin Use (lifetime)*** ± | | | |
| Yes | 49 (27.1%) | 6 (7.0%) | 43 (45.3%) |
| No | 132 (72.9%) | 80 (93.0%) | 52 (54.7%) |
| **Methamphetamine (lifetime)*** ± | | | |

| | | | |
|---|---|---|---|
| Yes | 92 (50.8%) | 13 (15.1%) | 79 (83.2%) |
| No | 89 (49.2%) | 73 (84.9%) | 16 (16.8%) |
| **Table 4 (Continued)** | | | |
| **IDU (lifetime)*** ± | | | |
| Yes | 95 (52.5%) | 14 (16.3%) | 81 (85.3%) |
| No | 86 (47.5%) | 72 (83.7%) | 14 (14.7%) |
| ***Violence (explored)*:** | | | |
| **Lifetime Sexual Assault*** | | | |
| Yes | 53 (29.3%) | 27 (31.4%) | 26 (27.4%) |
| No | 128 (70.7%) | 59 (68.6%) | 69 (72.6%) |
| **Lifetime Physical Assault*** ± | | | |
| Yes | 94 (51.9%) | 37 (43.0%) | 57 (60.0%) |
| No | 87 (48.1%) | 49 (57.0%) | 38 (40.0%) |
| ***STIs (explored*):** | | | |
| **Gonorrhea**± | | | |
| Yes | 36 (19.9%) | 23 (26.7%) | 13 (13.7%) |
| No | 145 (80.1%) | 63 (73.3%) | 82 (86.3%) |
| **Syphilis*** ± | | | |
| Yes | 23 (12.7%) | 16 (18.6%) | 7 (7.4%) |
| No | 158 (87.3%) | 70 (81.4%) | 88 (92.6%) |
| **Genital Warts** | | | |
| Yes | 5 (2.8%) | 3 (3.5%) | 2 (2.1%) |
| No | 176 (97.2%) | 83 (96.5%) | 93 (97.9%) |
| **Genital Herpes*** | | | |
| Yes | 12 (6.6%) | 2 (2.3%) | 10 (10.5%) |
| No | 169 (93.4%) | 84 (97.7%) | 85 (89.5%) |
| **Chlamydia** | | | |
| Yes | 14 (7.7%) | 7 (8.1%) | 7 (7.4%) |
| No | 167 (92.3%) | 79 (91.9%) | 88 (92.6%) |

* = Bivariate difference in HIV status ($p \leq .05$); ± = bivariate difference in race ($p \leq .05$)

Violence was investigated by means of lifetime sexual and physical assaults. Over half of the men had experienced physical assault, while almost 30% had experienced sexual assault.

STIs were examined in terms of lifetime occurrence of gonorrhea, syphilis, genital warts, genital herpes, and chlamydia, including when the MSSWs had last received treatment for any STIs they had contracted. These MSSWs reported relatively

low rates of STIs. Gonorrhea was the highest at 19.9%. All of the MSSWs received treatment for contracted STIs with the exception of genital herpes. One-quarter did not receive treatment for this STI.

*General Characteristics of African American MSSWs*. Table 4 includes the general characteristics of African American MSSWs. The mean age was mid-thirties; the mean education was just under high-school graduation. The interpolated median for income in the last 30 days was $498. Most of the men reported their sexual identity as gay or bisexual.

The researcher determined HIV status by asking respondents whether they had been tested for HIV and, if so, whether they had received test results. Almost 40% of the African American MSSWs were HIV-positive.

Most of these men had a lifetime history of crack-cocaine use. They did not report high rates of heroin, methamphetamine, or IDU use. Over half of these African American MSSWs had received substance-abuse treatment at least once.

In terms of violence, over 30% of these men had experienced lifetime sexual assault. Physical assault occurred at a rate of over 40%.

Over 25% of African American MSSWs reported lifetime gonorrhea. Syphilis, genital warts, genital herpes, and chlamydia occurred at much lower rates.

*General Characteristics of Caucasian MSSWs*. Table 4 shows the characteristics of the Caucasian MSSWs. The mean age was late twenties, with an average in education of 10.82 years. The interpolated median suggests that these men had, on average,

incomes of over $1,000 a month. Over half of the Caucasian MSSWs identified themselves as bisexual.

Substance-use variables yielded the following results: Caucasian MSSWs reported high use of crack cocaine, heroin, methamphetamine, and IDU. Over half had received substance-abuse treatment.

In terms of violence, approximately 25% of Caucasian MSSWs had experienced lifetime sexual assault. Over half had histories of physical assault.

Lifetime gonorrhea, syphilis, genital warts, genital herpes, and chlamydia were relatively low among Caucasian MSSWs as compared to African American MSSWs.

*Bivariate Differences*

The dissertation analyzed the following mean differences and bivariate relationships: HIV status by the control variables, by race, and the potential risk factors. Also analyzed were the control variables (age, education, income, and sexual orientation) by race and risk factors.

*HIV Status*. Table 5 illustrates the bivariate differences based on HIV status. HIV status was first analyzed by the control variables of age, education, income, and sexual orientation. Those MSSWs who were HIV-positive were significantly older than those who were HIV-negative. Gay sexual orientation was significantly associated with HIV seroprevalence, with three-fourths of the gay MSSWs being HIV-positive.

HIV status was next analyzed by race. HIV-positive status was significantly associated with African American race.

HIV status was then analyzed by the potential independent variables under the categories of substance use, violence, and STIs. Lifetime heroin, methamphetamine, and IDU use were significantly associated with being HIV-negative.

Analysis revealed that both sexual assault and physical assault were significantly associated with HIV-positive status.

Table 5. Differences in Demographics and Risk Factors by HIV Status. (Reported: Significant and Near-Significant Results)

| | **HIV-positive MSSWs (N=49)** | | | **HIV-negative MSSWs (N=132)** | | | **$\chi^2$ (df)** | **T** | **P Value** |
|---|---|---|---|---|---|---|---|---|---|
| | **n(%)** | **Mean** | **SD** | **n(%)** | **Mean** | **SD** | | | |
| Age | | 33.80 | 7.45 | | 31.45 | 6.0 | | -1.98 | .049* |
| Education | | | | | | | | | ns |
| Income | | | | | | | | | ns |
| Sexual Orientation | | | | | | | | | |
| Gay | 37(75.5%) | | | 31(23.5%) | | | 45.86(2) | | ≤.001* |
| Bisexual | 12(24.5%) | | | 82(62.1%) | | | | | |
| Heterosexual | 0 | | | 19(14.4%) | | | | | |
| Race (1=Black) | 32(37.2%) | | | 17(17.9%) | | | 7.58(1) | | .006* |
| Crack Cocaine | | | | | | | | | ns |
| Heroin | 6(12.2%) | | | 43(32.6%) | | | 6.49(1) | | .011* |
| Methamphetamine | 17(34.7%) | | | 75(56.8%) | | | 6.14(1) | | .013* |
| IDU | 18(36.7%) | | | 77(58.3%) | | | 5.85(1) | | .016* |
| Sexual Assault | 26(53.1%) | | | 27(20.5%) | | | 16.81(1) | | ≤.001* |
| Physical Assault | 35(71.4%) | | | 59(44.7%) | | | 9.19(1) | | ≤.001* |
| Gonorrhea | | | | | | | | | ns |
| Syphilis | 16(32.7%) | | | 7(5.3%) | | | 21.70(1) | | ≤.001* |
| Genital Warts | | | | | | | | | ns |
| Genital Herpes | 8(16.3%) | | | 4(3.0%) | | | 8.17(1) | | .004* |
| Chlamydia | | | | | | | | | ns |

*Significant at p≤.05; ns = not significant

Finally, HIV status was examined in relation to the STI category and the potential independent variables of gonorrhea, syphilis, genital warts, genital herpes, and

chlamydia. Over half of the MSSWs who had a history of syphilis and genital herpes and these were significantly associated with HIV-positive status. Gonorrhea, genital warts, and chlamydia were not significantly associated with HIV-positive status.

*Race*. Table 6 gives the bivariate differences of the demographic characteristics and risk factors with regard to race. As noted before, the African American race was significantly associated with HIV seroprevalence. African American MSSWs reported significantly less income in the last 30 days than their Caucasian counterparts ($z = -4.93$; Mean Rank=108.94 [White] vs. 71.18 [Black]; $p \leq .001$). In other words, while Caucasian MSSWs earned $1,260 (interpolated median) in the past 30 days, African American MSSWs earned $498. African American MSSWs were significantly older than Caucasian MSSWs. African American MSSWs also had significantly more education than their Caucasian counterparts and were significantly more likely to identify as gay.

In the substance-use category, lifetime heroin, methamphetamine, and IDU use were significantly associated with the Caucasian race. It should be noted that the large chi-square indicates that the observed frequencies differ markedly from the expected frequencies. In this case the observed frequency of African American MSSW heroin, methamphetamine, and injection-drug users was lower than the expected count. However, crack-cocaine use was high for both African American and Caucasian MSSWs.

In the violence category, the occurrence of physical assault was significantly associated with the Caucasian race. Sexual assault was not significantly associated with race.

In the STI category, gonorrhea and syphilis were significantly associated with African American race. None of the other STIs was significantly associated with race.

Table 6. Differences in Demographics and Risk Factors by Race. (Reported: Significant and Near-Significant Results)

| | **African American MSSWs (N=86)** | | | **Caucasian MSSWs (N=95)** | | | $\chi^2$ **(df)** | **t** | **P Value** |
|---|---|---|---|---|---|---|---|---|---|
| | **n(%)** | **Mean** | **SD** | **n(%)** | **Mean** | **SD** | | | |
| Age | | 35.06 | 7.20 | | 29.39 | 5.96 | | -5.79 | ≤.001* |
| Education | | 11.57 | 1.87 | | 10.82 | 2.18 | | -2.47 | .014* |
| Income (see text) | | | | | | | | | |
| Sexual Orientation | | | | | | | | | |
| Gay | 40(46.5%) | | | 28(29.5%) | | | 6.02(2) | | .049* |
| Bisexual | 37(43%) | | | 57(60%) | | | | | |
| Heterosexual | 9(10.5%) | | | 10(10.5%) | | | | | |
| Crack Cocaine | | | | | | | | | ns |
| Heroin | 6( 7%) | | | 43(45.3%) | | | 31.6(1) | | ≤.001* |
| Methamphetamine | 13(15.1%) | | | 79(85.3%) | | | 80.91(1) | | ≤.001* |
| IDU | 14(16.3%) | | | 81(85.3%) | | | 83.39(1) | | ≤.001* |
| Sexual Assault | | | | | | | | | ns |
| Physical Assault | 37(43%) | | | 57(60%) | | | 4.55(1) | | .033* |
| Gonorrhea | 23(26.7%) | | | 13(13.7%) | | | 4.05(1) | | .028* |
| Syphilis | 16(18.6%) | | | 7(7.4%) | | | 4.18(1) | | .041* |
| Genital Warts | | | | | | | | | ns |
| Genital Herpes | | | | | | | | | ns |
| Chlamydia | | | | | | | | | ns |

*Significant at p≤.05; ns = not significant

*Control Variables (Age, Education, and Income).* The association of HIV status and race with the control variables has already been examined in the above sections. The control variables will now be analyzed in relation to the potential moderating variable (race) and the independent variables.

*Age*. Table 7 shows the bivariate differences by age. Age was examined first in relation to the substance-use category. Lifetime use of crack cocaine characterized subjects who were significantly older than non-users. Lifetime heroin, methamphetamine, and injection drug users were significantly younger than non-users, while respondents who sought substance-abuse treatment were significantly older than non-users.

Age was next examined in relation to the violence category. There was no significant difference in mean age among MSSWs who had been sexually assaulted and those who had been physically assaulted.

Table 7. Differences in HIV Seroprevalence, Demographics, and Risk Factors by Age. (Reported: Significant and Near-Significant Results)

| | Age | | | | | |
|---|---|---|---|---|---|---|
| | **$M_1$** | **$SD_1$** | **$M_0$** | **$SD_0$** | **T** | **P Value** |
| HIV-positive | 33.80 | 7.45 | 31.45 | 6.0 | -1.98 | .049* |
| Race (1=Black) | 35.06 | 7.20 | 29.39 | 5.96 | -5.79 | ≤.001* |
| Crack Cocaine | 32.28 | 7.16 | 26.33 | 3.67 | -2.02 | .045* |
| Heroin | 29.71 | 6.64 | 32.96 | 7.15 | 2.77 | .006* |
| Methamphetamine | 29.59 | 6.12 | 34.66 | 5.10 | 5.10 | ≤.001* |
| IDU | 30.61 | 6.63 | 33.71 | 7.38 | 2.98 | .003* |
| Sexual Assault | | | | | | ns |
| Physical Assault | | | | | | ns |
| Gonorrhea | 35.25 | 7.36 | 31.30 | 6.90 | -3.44 | .003* |
| Syphilis | 36.22 | 7.10 | 31.48 | 6.98 | -3.04 | .003* |
| Genital Warts | | | | | | ns |
| Genital Herpes | | | | | | ns |
| Chlamydia | | | | | | ns |

*Significant at p≤.05; ns = not significant

Age was finally examined in relation to the STI category. MSSWs who had contracted gonorrhea and syphilis were significantly older than the men who had not. Chlamydia, genital warts, and genital herpes were not significantly different with age.

*Education*. Table 8 shows the bivariate differences for the control variable of education, which was examined first in relation to the substance-use category. Lifetime heroin and injection-drug users had significantly less education than non-users. There were no other significant differences in education for the categories of violence and STIs.

Table 8. Differences in HIV Seroprevalence, Demographics, and Risk Factors by Education. (Reported: Significant and Near-Significant Results)

| | Education | | | | | |
|---|---|---|---|---|---|---|
| | **$M_1$** | **$SD_1$** | **$M_0$** | **$SD_0$** | **T** | **P Value** |
| HIV-positive (1=HIV+) | | | | | | ns |
| Race (1=Black) | 11.57 | 1.87 | 10.82 | 2.18 | -2.47 | .014* |
| Crack Cocaine | | | | | | ns |
| Heroin | 10.39 | 1.98 | 11.47 | 2.03 | 3.21 | .002* |
| Methamphetamine | | | | | | ns |
| IDU | 10.79 | 2.03 | 11.60 | 2.03 | 2.70 | .008* |
| Sexual Assault | | | | | | ns |
| Physical Assault | | | | | | ns |
| Gonorrhea | | | | | | ns |
| Syphilis | | | | | | ns |
| Genital Warts | | | | | | ns |
| Genital Herpes | | | | | | ns |
| Chlamydia | | | | | | ns |

*Significant at $p \leq .05$; ns =not significant

*Income*. Table 9 shows the bivariate differences of income. Income was examined in relation to the risk factors, using the rank-sum test due with incomes placed

in eight categories. In the substance-use category, the incomes of the following substance-users were significantly higher than those of non-users: lifetime heroin, methamphetamine, and injection-drug users. Sexual and physical assault was not significant in relation to income.

Next, potential risk factors in the STI category were correlated with income. Those MSSWs who had contracted chlamydia in their lifetime had significantly more income in the past 30 days than those who reported never having had chlamydia.

Table 9. Differences in HIV Seroprevalence, Demographics, and Risk Factors by Income. (Reported: Significant and Near-Significant Results)

| | **Income** | | | |
|---|---|---|---|---|
| | **Mean Rank$_1$** | **Mean Rank$_0$** | **Z** | **P Value** |
| HIV-positive (1=HIV+) | | | | ns |
| Race (1=Black) | 71.18 | 108.94 | -4.93 | ≤.001* |
| Crack Cocaine | | | | ns |
| Heroin | 111.54 | 83.38 | -3.27 | ≤.001* |
| Methamphetamine | 109.80 | 71.56 | 5.0 | ≤.001* |
| IDU | 107.05 | 73.27 | -4.41 | ≤.001* |
| Sexual Assault | | | | ns |
| Physical Assault | | | | ns |
| Gonorrhea | | | | ns |
| Syphilis | | | | ns |
| Genital Warts | | | | ns |
| Genital Herpes | | | | ns |
| Chlamydia | 127.75 | 87.92 | -2.78 | .005* |

*Significant at p≤.05; ns = not significant

*Sexual Orientation*. Table 10 shows the bivariate associations with sexual orientation. African American MSSWs were significantly less likely to identify themselves as heterosexual. Gay MSSWs were significantly less likely to be heroin,

methamphetamine, and injection-drug users. Bisexual MSSWs were significantly more likely to have received drug treatment in their lifetime.

In the violence category, heterosexual MSSWs were significantly less likely to have experienced sexual assault than gay and bisexual men. With regard to STIs, gay MSSWs were significantly less likely to have contracted chlamydia.

Table 10. Differences in HIV Seroprevalence, Demographics, and Risk Factors by Sexual Orientation. (Reported: Significant and Near-Significant Results)

| | **Sexual Orientation Percentage** | | | | |
|---|---|---|---|---|---|
| | **Gay (N=68) n(%)** | **Heterosexual (N=19) n(%)** | **Bisexual (N=94) n(%)** | **$\chi^2$ (df)** | **P Value** |
| HIV-positive (1=HIV+) | 37(54.4 %) | 0 | 2(12.8%) | 7.58(2) | .006* |
| Race (1=Black) | 40(46.5%) | 9(10.5%) | 37(43%) | 6.02(2) | .049* |
| Crack Cocaine | | | | | ns |
| Heroin | 5(7.4%) | 7(36.8%) | 37(39.4%) | 24.64(2) | ≤.001* |
| Methamphetamine | 24(35.3%) | 10(52.6%) | 58(61.7%) | 11.7(2) | .004* |
| IDU | 25( 36.8%) | 12(63.2%) | 58(61.7%) | 10.90(2) | .004* |
| Ever in Drug Treatment | 32(47.1%) | 8(42.1%) | 63(67%) | 8.36(2) | .015* |
| Sexual Assault | 30(44.1%) | 2(10.5%) | 21(22.3%) | 12.91(2) | .002* |
| Physical Assault | | | | | ns |
| Gonorrhea | | | | | ns |
| Syphilis | | | | | ns |
| Genital Warts | | | | | ns |
| Genital Herpes | | | | | ns |
| Chlamydia | 1(7.1%) | 2(52.6%) | 11(44.7%) | 4.65(2) | .024* |

*Significant at p≤.05; ns = not significant

*Risk Factors Representing the Categories of Substance Use, Violence, and STIs*. Figure 3 presents a flow chart for the method of choosing risk factors for inclusion in the categories of substance use, violence, and STIs. The following are the results for including risk factors in those categories.

For the category of substance use, lifetime heroin, methamphetamine, and IDU use were significantly associated with HIV-negative status. The researcher decided to have IDU (p=.016) represent the substance-use category, as it is a direct route of HIV/AIDS infection and has been used as a risk factor in previous studies of MSSWs most relevant to this dissertation (Elifson et al., 1993; Morse et al., 1991). Furthermore, heroin and methamphetamine are often administered by injection. Although bivariate analysis shows that IDU is significantly associated with HIV-negative status, this does not mean that a positive relationship will not occur when other risk factors and control variables are considered in full modeling. Simpson's paradox demonstrates that such a negative association may be reversed with the inclusion of other risk factors (Spitznagel, personal communication, 2009; Wagner, 1982). Social and medical sciences frequently encounter this issue. Therefore, the researcher chose IDU to represent the substance-use category.

For the violence category, sexual assault and physical assault were both associated with HIV-positive status. Based on the literature and the nature of MSSWs work, sexual assault was the most appropriate factor to represent the violence category. Sexual assault is an inherent risk in street sex work, particularly with MSSWs' non-paying sexual partners (Elifson et al., 1993; Morse et al., 1991). Like IDU, sexual assault can also be a direct route to HIV infection, which is not the case with physical assault. For these reasons the researcher chose sexual assault to represent the violence category.

For the STI category, only syphilis and genital herpes were significantly associated with HIV status. Syphilis was also associated with the African American race. Elifson and colleagues (1993) found syphilis to be associated with HIV seroprevalence in

his sample of MSSWs, thus it is congruent with theoretical fit. Therefore, the researcher chose syphilis to represent the STI category.

*Diagnostics*

Diagnostic statistics were run with the dependent variable (HIV seroprevalence), control variables (age, education, income, sexual orientation), the race variable, and the independent variables (IDU, sexual assault, syphilis). Based on these diagnostics it became clear that the control variable of sexual orientation was problematic. A review of the sample characteristics and bivariate relationships suggested that this was due to none of the 19 heterosexual MSSWs' reporting HIV-positive status. Therefore, sexual orientation was recoded to gay=1 and bisexual/straight=0. Based on the literature regarding MSSWs, this is the most fitting way to recode the sexual-orientation variable, since gay MSSWs are consistently at higher risk for HIV infection (e.g., Elifson et al., 1993; Morse et al., 1991). For this dissertation sample, gay MSSWs were HIV-positive at a rate of 54.4%, whereas bisexual MSSWs had a low rate of HIV seroprevalence (12.8%), as was also the case with heterosexual MSSWs (0%). This recoding cleared up the issues noted in the original diagnostics and preliminary logistic regressions. The diagnostics reviewed hereafter are those after the recoding for sexual orientation.

*Model Evaluation*. The model summary had a Cox and Snell R-square (measure-of-effect size) of .339 and a Nagelkerke's R-square of .368. Nagelkerke's R-square is the most reported pseudo R-square in binary logistic regression. This implies that 36.8% of

the variance in HIV seroprevalence is explained by the model, which is statistically significant ($p \leq .001$).

*Checking Assumptions*. The largest VIF in this study was only 2.28, which corresponds to an increase in standard error by the square root of $2.28 \approx 1.5$. See Table 11. Inspection of the Pearson correlation showed that the correlation between race and IDU was -.690.

Table 11. Model Coefficients for Prediction of HIV Seroprevalence in MSSWs.

| *Variables* | Unstandardized Coefficients | | Standardized Coefficients | *Partial Correlations* | *Confidence Intervals* | *Sig.* | *Tolerance* | *VIF* |
|---|---|---|---|---|---|---|---|---|
| | *β* | *Std Error* | *Beta* | | | | | |
| (Constant) | -.025 | .219 | - | - | .457~.407 | - | - | - |
| Age (years) | .003 | .004 | .050 | .045 | -.005~.011 | .460 | .798 | 1.253 |
| Education (years) | -.001 | .014 | -.006 | -.006 | -.028~.025 | .921 | .927 | 1.079 |
| Income | -.007 | .016 | -.027 | -.025 | -.038~.025 | .683 | .843 | 1.186 |
| Race (1=Black) | .041 | .081 | .046 | .030 | -.120~.202 | .616 | .439 | 2.280 |
| Sexual Orientation (1=Gay) | .365 | .060 | .398 | .370 | .247~.483 | ≤.001 | .865 | 1.156 |
| IDU (1=Yes) | -.023 | .077 | -.026 | -.018 | -.176~.129 | .764 | .488 | 2.049 |
| Sexual Assault (1=Yes) | .154 | .063 | .157 | .147 | .029~.279 | .016 | .874 | 1.145 |
| Syphilis (1=Yes) | .376 | .085 | .282 | .267 | .207~.544 | ≤.001 | .897 | 1.115 |

Examination of the coefficients showed that the following variables made unique contributions to predicting HIV seroprevalence: sexual orientation ($p \leq .001$), sexual assault ($p = .016$), and syphilis ($p \leq .001$). Squaring the partial correlations showed the contribution of the significant variables to R-square. Sexual orientation contributed

13.8%, sexual assault 2.2%, and syphilis 7.1% to R-square. The total contribution to R-square explained by these variables was 23.1%. The model fit was adequate.

The Cook's Distance residual statistic value was .049. Values larger than 1.0 indicate problem cases (Tabachink & Fisell, 2001). There do not appear to be any highly problematic cases in this sample once sexual orientation was recoded.

Eighty-two percent of the Pearson correlations were of weaker strength than desired, which would be between 0.3 and 0.7. The restricted range of the correlations is not unusual because this is a study of an extreme group; therefore, the correlations will not generalize beyond the range of data used in this study (see Pallant, 2004).

The measures of monotone association found concordance at 86.6%. Discordance was found in 13.1% of the sample, while only two tied pairs were noted (0.2%). The Harrell C statistic was .868.

There was no indication of heteroscadasticity from the Studentized residuals. The researcher noted a moderately negative correlation between HIV seroprevalence and the independent variables. Pearson correlations suggested that this may be due to income (the lower the income, the higher the chance of being HIV-positive) and IDU (injection-drug use may not be the best fit). While the income variable can be explained theoretically, IDU and its negative association with HIV seroprevalence cannot be, but it was accurate in this sample (IDU was significantly associated with HIV-negative status), and was also found in Morse et al.'s (1991) study of MSSWs. Therefore, IDU had the potential to be problematic as a risk factor but was retained until further analysis of the literature's support for IDU as a predictor of HIV seroprevalence. Simpson's Paradox may also exist with IDU (Spitznagel, personal communication, 2009).

*Hypotheses 1.1 and 1.2 and Binary Regression*

*H 1.1: Risk Factors for Increased Likelihood of HIV Seroprevalence in Total MSSW Sample*. In order to understand if IDU, syphilis, and sexual assault increase the likelihood of HIV seroprevalence in the total MSSW sample, binary logistic regression models were developed. Backward elimination was used to remove the most non-significant risk factor(s) until a parsimonious model emerged for hypothesis 1.1.

Binary logistic regression modeled the probability of a positive HIV self-report for the total sample of MSSWs given the values of the other variables. The number and coding of the variables was as expected. The overall percentage of correctly classified cases was 72.9%, which was the baseline without any of the independent variables included in the model.

The Hosmer and Lemeshow Test suggested that the model is significant ($\chi^2$=17.89; df=8; p=.022), which indicates that the null hypothesis should be rejected due to the absence of difference between the observed and model-predicted values of the dependent variable of HIV seroprevalence (SPSSX-L#listserve.uga.edu, 2005). This means that the model's predicted values are significantly different from the observed values.

The Cox and Snell R-square for this model was .327; the Nagelkerke R-square was .474. For purposes of binary logistic regression, the Nagelkerke R-square (or pseudo R-square) of .474 is most often used.

The classification table indicated whether the model was able to predict the correct category (HIV-negative/HIV-positive) for each case. It also indicated whether the

model could be compared with the previous classification table when the predictor variables were not included. This model (with predictor variables) correctly classified 80.1% of the cases. The model's sensitivity is the sample percentage that has HIV seroprevalence or true positives (53.1%). The model's specificity is the sample's percentage without HIV seroprevalence or true negatives (90.2%). The positive predictive value was the percentage of cases the model classified as being HIV-positive and as actually observed in this sample (66.7%). The negative value was the percentage of cases predicted by the model to be HIV-negative and as actually observed to be HIV-negative (83.8%).

The binary-regression model for the full sample of MSSWs appears in Table 12. The overall model is significant ($\chi^2$=71.61; df=7; N=181; p≤.001). MSSWs identifying as gay had significantly increased the odds of HIV seroprevalence by 10.91 (p≤.001). Lifetime sexual assault increased reports of HIV seroprevalence by 2.95 (p=.022). Syphilis infection increased the odds of HIV seroprevalence by 11.64 (p≤.001). Note that confidence intervals are often high when the sample size is small.

IDU is the most significant factor in the above model (p=.260). This term was removed next in backward elimination.

Table 12. Regression of Age, Education, Income, Sexual Orientation, IDU, Sexual Assault, and Syphilis on HIV Seroprevalence

| **Independent Variable** | **b** | **$\chi^2$(1)** | **Odds Ratio** | **95% CI** | **Significance** |
|---|---|---|---|---|---|
| Intercept | -3.14 | 2.48 | -- | -- | .116 |
| Age (years) | .028 | .720 | 1.03 | .964~1.10 | .396 |
| Education (years) | -.023 | .049 | .977 | .794~1.20 | .825 |
| Income (last 30 days) | -.037 | .040 | .964 | .671~1.39 | .842 |
| Sexual Orientation (1=Gay) | 2.39 | 24.75 | 10.91 | 4.26~27.98 | ≤.001* |
| IDU | -.543 | 1.27 | .581 | .226~1.49 | .260 |
| Sexual Assault | 1.08 | 5.28 | 2.95 | 1.17~7.40 | .022* |
| Syphilis Infection | 2.46 | 13.53 | 11.64 | 3.15~43.07 | ≤.001* |

N =181; pseudo-$R^2$ = .474; *significant at p≤.05

*H1.1: Total Sample with IDU Removed in Backward Elimination*. IDU was removed due to its being the only risk factor that was not significant in the previous model. The number and coding of this new model was as expected, with the percentage of correctly classified cases being 72.9%. The overall model is significant. The Hosmer and Lemeshow Test is not significant in this model. The Nagelkerke R-square for this model was .470 (adjusted R-square). The classification table indicated whether the model was able to predict the correct category (HIV-negative/HIV-positive) for each case. The sensitivity was 53.1% (accurately identified true positives), an increase of 4.1% over the previous model with IDU included.

The binary-regression model for the full sample of MSSWs is presented in Table 13. The overall model was significant ($\chi^2$=70.90; df=6; N=181; p≤.001). MSSWs who identified themselves as gay increased the odds of HIV seroprevalence by 12.04 (p≤.001). Lifetime sexual assault increased reports of HIV seroprevalence by 2.62 (p=.034). Reported syphilis infection increased the odds of HIV seroprevalence by 12.48

($p \leq .001$). Table 13 represents the parsimonious model for hypothesis 1.1. Confidence intervals have narrowed in comparison to the previous model, with only a slight reduction of the pseudo-R-square.

Table 13. Regression of Age, Education, Sexual Orientation, Sexual Assault, and Syphilis on HIV Seroprevalence

| **Independent Variable** | **b** | **$\chi^2$(1)** | **Odds Ratio** | **95% CI** | **Significance** |
|---|---|---|---|---|---|
| Intercept | -3.48 | 4.13 | -- | -- | .042 |
| Age (years) | .030 | .865 | 1.03 | .967~1.10 | .352 |
| Education (years) | .001 | .000 | 1.00 | .818~1.23 | .991 |
| Income (last 30 days) | -.114 | .829 | .893 | .699~1.14 | .893 |
| Sexual Orientation | 2.49 | 27.45 | 12.04 | 4.75~30.53 | ≤.001* |
| Sexual Assault | .963 | 4.50 | 2.62 | 1.08~6.37 | .034* |
| Syphilis Infection | 2.52 | 14.53 | 12.48 | 3.41~45.71 | ≤.001* |

N =181; pseudo $R^2$ = .470; *significant at $p \leq .05$

The Casewise List clarifies those cases in the model that are not predicted correctly by the Studentized Residuals plot (see Table 14). Each of these cases was predicted to be HIV-negative but was observed to be HIV-positive. Because these responses appear to be random, each was retained. Next, sexual assault and syphilis were entered into the model.

Table 14. Predicted Probabilities and Problem Cases in the Above Model

| Case | Selected Status | Observed Outcome of last HIV Test | Predicted | Predicted Group | Temporary Variable | |
|---|---|---|---|---|---|---|
| | | | | | Residual | Z-Residual |
| 57 | Selected | Positive (misclassified) | .058 | Negative | .942 | 4.029 |
| 70 | Selected | Positive (misclassified) | .132 | Negative | .868 | 2.561 |
| 81 | Selected | Positive (misclassified) | .111 | Negative | .889 | 2.835 |
| 90 | Selected | Positive (misclassified) | .074 | Negative | .926 | 3.534 |
| 175 | Selected | Positive (misclassified) | .046 | Negative | .954 | 4.544 |
| 180 | Selected | Positive (misclassified) | .060 | Negative | .940 | 3.965 |

*H 1.2: Combination of Risk Factors and Increased Likelihood of HIV Seroprevalence in Total Sample*. For hypothesis 1.2, the risk factors of syphilis and sexual assault are combined and included in the binary logistic regression model in order to examine if the combined risk factor increases the likelihood of HIV seroprevalence in the total sample of MSSWs. Backward elimination will remove the most non-significant risk factor one at a time, until a parsimonious model is attained for hypothesis 1.2.

With removal of IDU from the model, the number and coding of the variables are as expected. The Hosmer and Lemeshow Test indicates that the model is not significant ($\chi^2$=10.27; df=8; p=.247). The Nagelkerke R-square for this model is .473 (adjusted R-square). The classification table continues to have only fair sensitivity.

The binary- regression model for the full sample of MSSWs appears in Table 15. The overall model is significant ($\chi^2$=71.38; df=7; N=181; p≤.001). MSSWs who identified themselves as gay increased reports of HIV seroprevalence by an odds of 11.76. "Lifetime syphilis but no sexual assault" infection increased the odds of HIV seroprevalence by 9.37. "Lifetime sexual assault but no syphilis" was not significant (p=.089). The combined risk factor of "Syphilis and sexual assault" increased the odds of HIV seroprevalence by 55.32 (p≤.001).

Although "Lifetime sexual assault but no syphilis" was not significantly associated with HIV seroprevalence, there was a trend toward significance in the term "Sexual assault and syphilis." Therefore, this term was retained for future modeling purposes. This constitutes the parsimonious model for Hypothesis 1.2.

Table 15. Regression of Age, Education, Sexual Orientation, Sexual Assault, and Syphilis on HIV Seroprevalence

| **Independent Variable** | **b** | **$\chi^2$(1)** | **Odds Ratio** | **95% CI** | **Significance** |
|---|---|---|---|---|---|
| Intercept | -3.48 | 4.14 | -- | -- | .042 |
| Age (years) | .029 | .829 | 1.03 | .967~1.10 | .363 |
| Education (years) | .011 | .011 | 1.01 | .825~1.24 | .916 |
| Income (last 30 days) | -.122 | .948 | .885 | .692~1.13 | .330 |
| Gay sexual identification | 2.46 | 26.72 | 11.76 | 4.62~29.93 | ≤.001* |
| Sexual assault, no syphilis | .835 | 2.90 | 2.31 | .881~6.04 | .089 |
| Syphilis, no sexual assault | 2.24 | 7.95 | 9.37 | 1.98~44.36 | .005* |
| SA and syphilis | 4.01 | 11.08 | 55.32 | .5.21~587.86 | ≤.001* |
| Neither SA or Syphilis (referent) | | | | | |

N =181; adjusted $R^2$ = .473; *significant at p≤.05

*Hypotheses 2.1 and 2.2 and Binary Regression*

*H 2.1: Syphilis and Sexual Assault and Their Individual Influence on HIV Seroprevalence with African American Race as Potential Moderator*. Race was added to the binary logistic regression model in order to test for African American race as a moderator in both unadjusted and adjusted models. IDU was not included in these models due to being non-significant in hypothesis 1.1. Backward elimination was again used with the adjusted model to remove the most non-significant risk factors, until a parsimonious model was attained for hypothesis 1.2.

*Unadjusted Model without Control Variable*. The unadjusted model was significant ($\chi^2$=14.93; df=5; =181; p=.011) and had a Hosmer and Lemeshow test that was not significant (p=.785). The unadjusted R-square was .115. Africa-American race (OR=3.0) and "syphilis but no sexual assault" (OR=2.75) were significant in this model (see Table 16).

Table 16. Regression of Race, Sexual Assault, and Syphilis in Unadjusted Model

| Independent Variable | b | $\chi^2(1)$ | Odds Ratio | 95% CI | Significance |
|---|---|---|---|---|---|
| Intercept | -1.86 | 32.0 | -- | -- | ≤.001 |
| Race (1=African American) | 1.10 | 7.09 | 3.0 | 1.34~6.73 | .008* |
| SA, but no Syphilis | 1.01 | 4.46 | 2.75 | 1.08~7.03 | .035* |
| Syphilis, but no SA | 1.17 | .849 | 3.22 | .268~38.64 | .357 |
| Black*SA but no Syphilis | -.192 | .077 | .825 | .211~3.22 | .782 |
| Black*Syphilis, but no SA | -.405 | .076 | .667 | .037~11.97 | .783 |

N =181; adjusted $R^2$ = .115; *significant at p≤.05

An adjusted model with the control variables proved significant ($\chi^2$=54.89; df=9; N=181; p≤.001). The Hosmer and Lemeshow test was not significant (p=.624). The pseudo R-square increased to .380. In this model race and "syphilis but no sexual assault" were not significant when the control variables were added. However, gay sexual identification was significant, increasing the odds of HIV seroprevalence by 12.07. No other variables were significant in this model (see Table 17).

Table 17. Adjusted Model

| Independent Variable | b | $\chi^2(1)$ | Odds Ratio | 95% CI | Significance |
|---|---|---|---|---|---|
| Intercept | -3.57 | 4.62 | -- | -- | .032 |
| Race (1=African American) | .459 | .781 | 1.58 | .572~4.38 | .377 |
| Age (years) | .045 | 2.03 | 1.05 | .983~1.11 | .155 |
| Education (years) | -.055 | .280 | .947 | .773~1.16 | .597 |
| Income (last 30 days) | -.022 | .031 | .979 | .769~1.24 | .860 |
| Sexual Orientation (1=gay) | 2.49 | 31.16 | 12.07 | 5.03~28.93 | ≤.001* |
| SA, but no Syphilis | .576 | 1.02 | 1.78 | .581~5.45 | .313 |
| Syphilis, but no SA | 1.33 | .700 | 3.78 | .168~84.91 | .403 |
| Black*SA , no syphilis | .359 | .186 | 1.43 | .281~7.31 | .666 |
| Black*Syphilis , no SA | .492 | .075 | 1.64 | .048~56.05 | .785 |

N =181; adjusted $R^2$ = .380; *significant at p≤.05

Next in backward elimination, "Black race and syphilis but no sexual assault" was removed due to its being the most highly non-significant (p=.785) (model not shown). The overall model was significant ($\chi^2$=54.85; df=8; N=181; p≤.001). The Hosmer and Lemeshow goodness-of-fit test was not significant ($\chi^2$=6.81; df=8; =.558). The pseudo R-square was .379. "Syphilis but no sexual assault" was significant ($\chi^2$=4.69; CI[95%]= 1.17, 24.10; OR=5..31; p=.030). Gay sexual orientation was also significant and increased the likelihood of HIV/AIDS infection by 12.07. In the next step of backward elimination, "Black race and sexual assault but no syphilis" was removed (p=.679).

When this term was removed, the overall model was significant ($\chi^2$=54.68; df=7; N=181; p≤.001) (model not shown). The Hosmer and Lemeshow test was not significant ($\chi^2$=6.09; df=8; =.637), and the pseudo R-square was .378. In this model "syphilis but no sexual assault" remained significant ($\chi^2$=4.59; CI[95%]= 1.15, 23.31; OR=5.18; p=.032). Gay sexual orientation continued to increase the odds of HIV seroprevalence by 11.88.

Lastly, the term "sexual assault but no syphilis" was removed in backward elimination. The overall model was significant ($\chi^2$=52.67; df=6; N=181; p≤.001). The Hosmer and Lemeshow was not significant ($\chi^2$=13.58; df=8; =.094). The pseudo R-square was .366. "Syphilis but no sexual assault" significantly increased the odds of HIV/AIDS infection by 4.54. Gay sexual orientation significantly increased the likelihood of HIV seroprevalence by 12.84. African American race continues to not be significant (p=.255). This model, shown in Table 18, is the parsimonious model for Hypothesis 2.1.

Table 18. Regression of Race, Age, Education, Income, Sexual Orientation, and "Syphilis but No Sexual Assault." Parsimonious Model.

| Independent Variable | b | $\chi^2(1)$ | Odds Ratio | 95% CI | Significance |
|---|---|---|---|---|---|
| Intercept | -4.53 | 5.57 | -- | -- | .018 |
| Race (1=African American) | .511 | 1.2 | 1.67 | .691~4.02 | .255 |
| Age (years) | .050 | 2.56 | 1.05 | .989~1.12 | .110 |
| Education (years) | -.003 | .001 | .997 | .825~1.20 | .972 |
| Income (last 30 days) | -.052 | .086 | 1.05 | .746~1.49 | .769 |
| Sexual Orientation (1=gay) | 2.55 | 33.34 | 12.84 | 5.40~30.53 | ≤.001* |
| Syphilis, but no SA | 1.49 | 3.86 | 4.54 | 1.00~19.77 | .049* |

N =181; adjusted $R^2$ = .366; *significant at p≤.05

*H 2.2: Combinations of Risk Factors and Influence on HIV Seroprevalence with African American Race as Potential Moderator*. This section considers the combination of sexual assault and syphilis in the model with African American race as the potential moderator. The researcher first developed an unadjusted model and then an adjusted model with the inclusion of the control variables. With the adjusted model, backward elimination was used to remove the most non-significant risk factors, until a parsimonious model was arrived at.

Results of the unadjusted model are presented in Table 19. The overall model was significant ($\chi^2$=34.28; df=7; N=181; p≤.001). The Hosmer and Lemeshow goodness-of-fit test was not significant ($\chi^2$=1.78; df=3; =.759). MSSWs who were African American increased the odds of seroprevalence by 2.77 (p=.034). A history of sexual assault but no syphilis increased the likelihood of HIV seroprevalence to 4.86 (p=.003). The combined factor of sexual assault and syphilis increased the odds of HIV/AIDS by 10.72 (p=.008). African American race did not moderate sexual assault or syphilis, as single or combined factors.

Table 19. Unadjusted Model of the Regression of Race, Sexual Assault, and Syphilis (Singly or Combined) on HIV Seroprevalence

| Independent Variable | b | $\chi^2(1)$ | Odds Ratio | 95% CI | Significance |
|---|---|---|---|---|---|
| Intercept | -2.24 | 32.55 | -- | -- | ≤.001 |
| Race (1=African American) | 1.02 | 4.50 | 2.77 | 1.08~7.12 | .034* |
| SA, but no Syphilis | 1.58 | 9.08 | 4.86 | 1.74~13.59 | .003* |
| Syphilis, but no SA | -.327 | .048 | .721 | .039~13.47 | .230 |
| Syphilis and SA (combined) | 2.37 | 7.04 | 10.72 | 1.86~61.79 | .008* |
| Black*SA, but no Syphilis | -.654 | .720 | .520 | .115~2.36 | .396 |
| Black*Syphilis, but no SA | -.327 | .048 | .721 | .039~13.47 | .827 |
| Black Race*Syphilis and SA (combined) | .792 | .313 | 2.21 | .137~35.54 | .576 |
| White with no Syphilis or SA (referent) | | | | | |

N =181; pseudo-R-square= .250 ; *= significant at p≤.05

The researcher then developed an adjusted model with the control variables (see Table 20). The overall model was significant ($\chi^2$=67.01; df=11; N=181; p≤.001). The Hosmer and Lemeshow test was not significant ($\chi^2$=11.73; df=8; N=181; p=.164). The R-square increased to .450. For this model only gay sexual orientation was significant (OR=11.19; p≤.001). There was a trend toward significance for "sexual assault but no syphilis" (OR=2.93; p=.080) and for "sexual assault and syphilis combined" (OR=7.49; p=.053). African American race did not moderate any of the risk factors.

Backward elimination removed Black *syphilis and sexual assault (combined). This overall model (not displayed) was significant ($\chi^2$=66.72; df=10; N=181; p≤.001). The pseudo-R-square was .447. The Hosmer and Lemeshow test was not significant ($\chi^2$=12.51; df=8; p=.130). In the new model "sexual assault and syphilis (combined)" became significant ($\chi^2$=10.16; CI[95%]=2.62, 56.93; OR=12.21; p≤.001). Gay sexual orientation also significantly increased

the odds of HIV seroprevalence by 10.96 (p≤.001). African American race continued not to moderate any of the remaining risk factors.

Table 20. Adjusted Model of the Regression of Race, Age, Education, Income, Sexual Orientation, Sexual Assault, and Syphilis (Singly or Combined) on HIV Seroprevalence

| **Independent Variable** | **b** | **$\chi^2$(1)** | **Odds Ratio** | **95% CI** | **Significance** |
|---|---|---|---|---|---|
| Intercept | -3.87 | 3.74 | -- | -- | .053 |
| Race (1=African American) | .471 | .686 | 1.60 | .526~4.87 | .407 |
| Age (years) | .030 | .835 | 1.03 | .966~1.10 | .361 |
| Education (years) | -.002 | .043 | .978 | .792~1.21 | .836 |
| Income (last 30 days) | .000 | .000 | .999 | .695~1.44 | .998 |
| Sexual Orientation (1=gay) | 2.42 | 26.52 | 11.19 | 4.46~28.06 | ≤.001* |
| SA, but no Syphilis | 1.08 | 3.07 | 2.93 | .880~9.76 | .080 |
| Syphilis, but no SA | 1.62 | 1.10 | 5.07 | .245~104.97 | .294 |
| SA and Syphilis (combined) | 2.01 | 3.75 | 7.49 | .975~57.47 | .053 |
| Black *SA, but no Syphilis | -.054 | .004 | .948 | .164~5.49 | .952 |
| Black *Syphilis, but no SA | .617 | .121 | 1.85 | .057~59.97 | .728 |
| Black *Syphilis and SA (combined) | 1.07 | .440 | 2.92 | .123~69.56 | .507 |
| White with no Syphilis or SA (referent) | | | | | |

N =181; pseudo-R-square= .450 ; *= significant at p≤.05

The next step of eliminated the term "Black *syphilis, but no sexual assault" (p=.780). In this model the adjusted R-square remains .447. The overall model remained significant ($\chi^2$=66.64; df=9; p≤.001). The Hosmer and Lemeshow test was not significant ($\chi^2$=12.64; df=8; p=.125). "Sexual assault, but no syphilis" ($\chi^2$=3.92; CI[95%]= 1.01, 10.57; OR=3.27; p=.048) and "syphilis, but no sexual assault" ($\chi^2$=7.02; CI[95%]= 1.71, 36.60; OR=7.02; p=.008) became significant. "Sexual assault and syphilis (combined)" remained significant ($\chi^2$=10.16; CI[95%]= 2.62, 56.92; OR=10.16; p≤.001) Gay sexual orientation also remained significant (OR=10.82;

p≤.001). In the next model "Black *sexual assault, but no syphilis" was removed due to its being the next most non-significant (p=.738).

With this backward elimination the adjusted R-square dropped slightly to .446 (see Table 21). The overall model was significant ($\chi^2$=66.53; df=8; p≤.001), and the Hosmer and Lemeshow test was significant. In this model all of the risk factors were significant, with "sexual assault, but no syphilis" increasing the likelihood of HIV/AIDS infection by 2.95, "syphilis, but no sexual assault" by 7.89, and "sexual assault and syphilis (combined)" by 11.29. Gay sexual orientation increased the likelihood of HIV seroprevalence by 11.07. Race was not significant. Table 21 presents the parsimonious model for hypothesis 2.2.

Table 21. Regression of Race, Age, Education, Income, Sexual Orientation, SA but No Syphilis, Syphilis but No SA, and SA and Syphilis (Combined), on HIV Seroprevalence. Parsimonious Model.

| **Independent Variable** | **b** | **$\chi^2$(1)** | **Odds Ratio** | **95% CI** | **Significance** |
|---|---|---|---|---|---|
| Intercept | -3.99 | 4.04 | -- | -- | .044 |
| Race (1=African American) | .559 | 1.37 | 1.75 | .686~4.46 | .242 |
| Age (years) | .035 | 1.21 | 1.04 | .973~1.10 | .271 |
| Education (years) | -.037 | .121 | .964 | .785~1.18 | .728 |
| Income (last 30 days) | .014 | .005 | 1.01 | .707~1.45 | .941 |
| Sexual Orientation (1=gay) | 2.40 | 27.14 | 11.07 | 4.48~27.36 | ≤.001* |
| SA, but no Syphilis | 1.08 | 4.45 | 2.95 | 1.08~8.05 | .035* |
| Syphilis, but no SA | 2.07 | 6.88 | 7.89 | 1.68~39.91 | .009* |
| SA and Syphilis (combined) | 2.42 | 10.30 | 11.29 | 2.57 ~49.59 | ≤.001* |
| No SA or Syphilis (referent) | | | | | |

N =181; pseudo-R-square= .446 ; *= significant at p≤.05

Though the pseudo-R-square in Table 15 is slightly lower for this model when compared to Table 16 (the model with the combined factor of "sexual assault and syphilis" without the inclusion of race), in that model "sexual assault, but no syphilis" was not significant (p=.089). In

Table 21, with race included in the model, "sexual assault, but no syphilis" is significant (p=.035). Therefore, Table 21 appears to best explain HIV seroprevalence among MSSWs.

This dissertation next attempted to address the cause of disparities in HIV/AIDS infection rates between Black and White MSSWs by examining sexual assault and syphilis as risk factors. It did so by analyzing the mediation of sexual assault and syphilis between African American race and HIV seroprevalence.

*H3.1: The Association between African American Race and HIV Seroprevalence*. As already mentioned, there was a bivariate association between African American race and HIV seroprevalence in this study (37.2% vs. 17.9%; $\chi^2$=7.58; df=1; p=.006). Of those MSSWs reporting HIV-positive status, 34.7% were White, while 65.3% were African American. Aim three will examine sexual assault and syphilis in order to determine whether mediation effects may contribute to racial differences in HIV/AIDS rates.

*H3.2: The Association between African American Race and HIV-Risk Factors of Sexual Assault and Syphilis*. Bivariately, African American MSSWs have significantly higher rates of syphilis (18.6% vs. 7.4%; $\chi^2$=4.18; df=1; p=.041) as compared to Caucasian MSSWs. The association between race and sexual assault, however, is not significant.

*H3.3: Mediation of Sexual Assault and/or Syphilis between Race and HIV/AIDS*. Mediation may be explained by variables that demonstrate a significant association

between race and HIV seroprevalence. The researcher examined sexual assault and syphilis for mediation between race and HIV seroprevalence.

As seen in the results for hypothesis 1.1 and 3.1, the condition of sexual assault being significantly associated with HIV/AIDS infection was met, but sexual assault was not significantly associated with race. Of the total sample reporting sexual assault, 50.9% (n=27) were African American and 49.1% (n=26) were White (31.4% vs.27.4%; $\chi^2$=.186; df=1; p=.666). Sexual assault was significantly associated with HIV seroprevalence ($p \leq .001$). Due to the non-significance with race, sexual assault could not be considered as a mediating risk factor in this study, as it does not meet the conditions for mediation testing.

Syphilis indicated a significant association with African American race (18.6% vs. 7.4%; $\chi^2$=4.18; df=1; p=.041). Of those reporting lifetime histories of syphilis, 69.6% n=16) were African American and 30.4% (n=7) were Caucasian. Syphilis is also significantly associated with HIV/AIDS infection ($p \leq .001$). The relationship between African American race and HIV seroprevalence is still significant after entering syphilis into the logistic regression model (p=.024), but the direct association between African American race and HIV/AIDS infection was more significant prior to the inclusion of syphilis into the model (p=.006). Therefore syphilis does not meet the conditions for testing for mediation.

*Hypothesis 3.4: Mediation of Combined Risk Factors between Race and HIV/AIDS*. The combined terms of "sexual assault and syphilis" could not be further tested for mediation due to their not meeting the conditions for mediation. Hierarchical modeling and general log-linear

modeling were not required due to "sexual assault," syphilis," and "sexual assault and syphilis" not meeting the conditions for mediation testing.

The study next examined predicted probabilities to illustrate the absence of significant racial differences in HIV seroprevalence when considered in relation to the risk factors of sexual assault, syphilis, and sexual assault and syphilis (combined).

*Predicted Probabilities to Illustrate HIV Seroprvalence in Black and White MSSWs*. Predicted probabilities allow for examination of the likelihood of MSSWs' being HIV seroprevalent with the inclusion or exclusion of individual variables and combined variables. Predicted probabilities were developed for African American and Caucasian MSSWs and are shown in Table 22.

Although African American MSSWs were always predicted to be HIV-positive at higher rates than Caucasian MSSWs, the difference did not appear overly conspicuous. African American MSSWs with no risk factors of sexual assault and/or syphilis were predicted to be HIV-positive at 9.1% (OR=.100) as compared to 6.7% (OR=.072) for Caucasian MSSWs. For those men with histories of sexual assault histories but no syphilis, Black MSSWs were predicted at 17.9% (OR=.218) and Caucasians at 13.6% (OR.157). For men with histories of syphilis but no sexual assault, Black MSSWs were predicted to be HIV seroprevalent at 37.9% (OR=.611) and Whites at 30.6% (OR=.440). For those MSSWs with histories of both sexual assault and syphilis, Blacks were predicted at 78.4% (OR=3.62) and White MSSWs at 72.3% (OR=2.61). The combined risk factor of sexual assault and syphilis causes a tremendous likelihood of HIV/AIDS infection, but this does not account for the significant racial disparity between African

American and Caucasian MSSWs in HIV seroprevalence noted in this sample of MSSWs. The combined increase of sexual assault and syphilis increases the likelihood of being HIV-positive in both Africa-American and Caucasian MSSWs, as was also demonstrated in hypothesis 1.2.

Table 22. Probability of HIV Seroprevalence among African American and Caucasian MSSWs

| | **African American (N=86)** | **Caucasian (N=95)** | **Difference** |
|---|---|---|---|
| **No Risk Factors of Sexual Assault and/or Syphilis** | 9.1% (OR=.100) | 6.7% (OR=.072) | 2.4% |
| **Sexual Assault History (only)** | 17.9% (OR=.218) | 13.6% (OR=.157) | 4.3% |
| **History of Syphilis (only)** | 37.9% (OR=.611) | 30.6% (OR=.440) | 7.3% |
| **History of Sexual Assault and Syphilis** | 78.4% (OR=3.62) | 72.3% (OR=2.61) | 6.1% |

The results of these analyses depict a hidden population of men who are highly vulnerable to HIV infection. Though racial disparities in HIV seroprevalence are apparent by the African American MSSWs' HIV/AIDS rates that are over twice that of Caucasian MSSWs, this dissertation has not found the reasons for these disparities. What is clear is that MSSWs are a high-risk group of men. The next section of this dissertation will elaborate on these results while exploring their implications for social-work practice and research.

# Discussion

This chapter discusses the dissertation's findings, implications for social work, limitations of this study, recommendations for future research, and the final conclusions. The purpose is to expand on the dissertation's concepts in order to provide a fuller understanding of their possible influence for social work practice and to present recommendations for future research on racial disparities in HIV seroprevalence among MSSWs.

## *Discussion of the Findings*

Previous researchers have studied HIV seroprevalence in MSSWs (e.g., Elifson et al., 1993; Morse et al., 1991). Racial disparities in HIV seroprevalence were not the specific aim examined in these previous MSSW studies. Using the tripartite model of HIV risk, the goals of this study were to explore HIV/AIDS among the total MSSW sample, to investigate racial disparities in HIV/AIDS among these MSSWs, and to understand what might influence those disparities if they exist. This section discusses the findings and implications for each aim of this study, along with the eight hypotheses associated with the aims.

Aim one of this study was to examine the relationship among IDU, sexual assault, syphilis (singularly), and sexual assault and syphilis (combined) in relation to HIV status in the total MSSW sample. Two hypotheses were associated with this aim.

Hypothesis 1.1: *HIV risk (IDU, sexual assault, and syphilis) increases association with HIV seroprevalence in the total MSSW sample.*

The findings resulting from this hypothesis indicated an increased likelihood of HIV-positive status for MSSWs who had histories of sexual assault or syphilis. Similar finding were noted in Elifson and associates' 1993 study of Atlanta street prostitutes, which confirmed that syphilis and sexual abuse (prior to age 16) were significantly associated with HIV/AIDS infection. In this study lifetime sexual assaults were self-reported, not only those occurring before the age of 16. The age at time of sexual assault was not queried in this dissertation.

Because IDU was not significantly related to HIV seroprevalence when included in binary logistic regression models, the researcher eliminated it in backward elimination for the next hypothesis associated with aim one, and in all subsequent hypotheses. This finding is consistent with the previous research of Elifson et al. (1993) and Morse et al. (1991). They did not find IDU to be associated with HIV/AIDS in their studies of MSSWs in Atlanta and New Orleans, though in both of those studies IDU was high, as is the case in this dissertation study. Elifson and colleagues (1993) found that HIV seroprevalence was related primarily to high-risk sexual behaviors among MSSWs. Morse and colleagues (1991) had similar findings, but with a few caveats. They established a near-significant rate of HIV seroprevalence in injection drug-using, non-White MSSWs age 25 and over.

Perhaps more importantly, Morse and colleagues (1993) also found IDU to be negatively bivariately associated with HIV status in their sample of New Orleans MSSWs, as is the case in the present study when examining bivariate differences. Morse, Simon, and associates (1993) suggested that frequent substance use in large quantities, rather than having the expected disinhibiting effect that usually results in increased sexual

risk-taking behaviors among substance users, may actually contribute to decreased interest in sexual activity and even impotence, which could result in HIV-risk reduction. This study corroborates Morse and colleagues' (1993) theory that IDU may potentially be a protective factor against sexual risk-taking, though further study is required for substantiation. If Morse and associates' (1993) assertions are corroborated in regard to IDU and HIV-risk behaviors, it could also partially explain the lower rates of HIV/AIDS in Caucasian MSSWS, who were much higher in IDU than their African American counterparts. This area deserves further exploration in studies of MSSWs and HIV-risk behaviors.

Hypothesis 1.2: *Combinations of HIV-risk factors (sexual assault and syphilis) increase the likelihood of HIV seroprevalence in the total MSSW sample.*

For this analysis IDU was eliminated due to its not being a significant risk factor for HIV/AIDS infection. Therefore, only sexual assault (without syphilis), syphilis (without sexual assault), and sexual assault and syphilis (combined) were tested in a binary logistic regression model.

The risk factor of sexual assault and syphilis (combined) significantly increases the odds of HIV seroprevalence in the total sample of MSSWs. Though expected, this specific finding extends that of Elifson et al. (1993), who found that syphilis infection and sexual assault, as individual risk factors, increased the likelihood of HIV/AIDS infection. In the present study, while sexual assault and syphilis (combined) increased the likelihood of HIV/AIDS infection, sexual assault (without syphilis) showed only a trend in increasing HIV seroprevalence, whereas syphilis (without sexual assault)

significantly increased HIV/AIDS infection. With regard to syphilis, this finding supports those of Elifson and associates (1993) and Morse and associates (1991) concerning syphilis as a risk factor for HIV/AIDS infection in their MSSWs samples. This dissertation demonstrates that when syphilis and sexual assault (combined) there is a significant increase HIV/AIDS in the total MSSW sample when compared to HIV/AIDS rates when syphilis and sexual assault are considered as individual risk factors.

Aim two of this dissertation was to explore whether the relationship among sexual assault (without syphilis), syphilis (without sexual assault), sexual assault and syphilis (combined), and HIV status varies by race. Two hypotheses are associated with aim two.

Hypothesis 2.1: *Sexual assault and syphilis will have more influence on HIV seroprevalence for African American MSSWs than Caucasian MSSWs.*

When the researcher tested for moderation among MSSWs in this sample, syphilis and sexual assault did not vary by race as risk factors for HIV seroprevalence. This outcome contradicts Millet and colleagues' (2006; 2007) finding that African American race and STIs interact to increase HIV/AIDS infection. However, the Millett et al. (2006; 2007) studies were done with African American men in the general population, not MSSWs specifically.

While syphilis and HIV seroprevelance are associated with African American race in males, there is no precision in understanding the effects of syphilis on HIV/AIDS (Easterbrook, Chmiel, & Hoover, 1993; Torian, Makki, & Menzies, 2002). While Adimora et al. (2005; 2006) found that segregated sexual networks contribute to STIs in African Americans, theses could not be determined through this data. However, if the

sexual networks of African Americans are more segregated and STI rates are higher within those segregated sexual networks, this would likely increase STI rates among African Americans. This area requires further investigation. There also needs to be a determination if sexual networks are also segregated among African American MSSWs.

Belenko and associates (2005) examined sexual assault and HIV-risk among male felony drug offenders. They found that sexual assault did not vary by race as a risk factor for HIV/AIDS. This dissertation supports those findings. Next, the dissertation study considered the risk factor of sexual assault and syphilis (combined) with African American race as the moderating variable.

Hypothesis 2.2.: *The risk factor of sexual assault and syphilis (combined) will have more influence on HIV seroprevalence for African American MSSWs than Caucasian MSSWs.*

The risk factor of sexual assault and syphilis (combined) and HIV seroprevalence does not significantly vary by race. Morse and associates (1991) examined these risk factors in their sample of New Orleans MSSWs by age and race. They found no significant differences, though these researchers were looking at individual risk factors. The present study found that race does not significantly moderate the relationship between sexual assault and syphilis (combined) and HIV seroprevalence. Although the combined factor in this study does not explain racial moderation in HIV/AIDS rates, it does support the need for future examination of HIV-risk factor combinations and variation by race with a larger sample of MSSWs. Hidden populations, like MSSWs,

appear to have more racial equity in sexual-risk behaviors when compared to the general population where men are not as prone to sexual risk-taking.

Aim three of this study was to identify the existence of racial disparities among MSSWs in HIV seroprevalence and to explore what may account for those disparities. Four hypotheses fell under aim three.

Hypothesis 3.1: *African American MSSWs will have higher rates of HIV seroprevalence than Caucasian MSSWs.*

Black MSSWs are HIV-positive at more than twice the rate of White MSSWs. This is the most important finding of this dissertation. This finding contradicts the conclusions of Morse and associates (1991) and Elifson and colleagues (1993), who found no significant bivariate racial differences in HIV/AIDS infection rates among their MSSW samples. Elifson et al. (1993) did find, however, that Black MSSWs were HIV-positive at a rate of 33.9%, as compared to Whites at a rate of 24.8%, but this disparity was not significant. Zolopa and associates' (1994) in their examination of HIV seroprevalence among homeless men in San Francisco, many of whom had exchanged sex for money, drugs, or other goods found 11% of the Black homeless men and 8% of the White homeless men were HIV-positive in that study. This was also not a statistically significant difference.

Although the findings of this dissertation cannot be generalized beyond this sample of MSSWs, there are possible plausible explanations as to why previous studies of MSSWs did not find racial disparities in HIV/AIDS rates. The Elifson et al. (1993) and Zolopa et al. (1994) studies were conducted at the height of the AIDS epidemic.

Since that time most HIV/AIDS funding for interventions has concentrated their efforts on White gay males (Levensen, 2004), while ignoring calls for intervention in poor Black communities (e.g., Fullilove et al., 1990). This exclusion of the Black communities in HIV/AIDS prevention and intervention could potentially increase HIV/AIDS infection in Black MSSWs, while simultaneously lowering rates for White MSSWs. Black communities have also been reluctant to acknowledge the contribution of AIDS to the devastation of African American communities and health due to fear of further discrimination and oppression (e.g., Levenson, 2004). Further study of racial disparities among those involved in hidden populations should resolve the prevalence of disparities in HIV/AIDS infection rates among African-America MSSWs.

Hypothesis 3.2: *African American MSSWs will have higher rates of HIV-risk factors of sexual assault and syphilis than Caucasian MSSWs.*

African American MSSWs have significantly higher rates of syphilis. In fact the rates of syphilis are more than double that of their Caucasian counterparts (which is also the case with HIV/AIDS infection rates). This is consistent with studies by Millett (2006; 2007), which found that STIs in African American men facilitate the transmission of HIV/AIDS. Sexual assault is significantly associated with HIV/AIDS, but rates of sexual assault are essentially equal between Black and White MSSWs. This finding contradicts reports that Caucasian men are more likely to self-report being sexually assaulted in the general population (Frazier, 1993). Considering the violent nature of sex work and the high incarceration rates of both races, racial parity in sexual assaults among these

participants may be understandable, but requires further examination for corroboration (e.g., Elifson et al., 1993; Fullilove et al., 2006; Morse et al., 1991).

Hypothesis 3.3: *Risk factors (syphilis and/or sexual assault) that vary by African American race will account for at least some of the HIV/AIDS disparity.*

Sexual assault does not significantly vary by race, but is associated with HIV/AIDS. Syphilis significantly varies by race, and is also significantly associated with HIV seroprevalence.

Syphilis does not meet the conditions for mediation. Despite this, the disease's importance in African-America men's health and its influence on HIV/AIDS among these men has been well-established in studies by Fullilove et al. (1990), Elifson et al. (1993), Millett et al. (2006, 2007), and Morse et al. (1991). What is very likely is that syphilis does not mediate the relationship between race and HIV/AIDS infection in this sample of MSSWs who are all involved in extremely high-risk sexual activity, and who probably all generally have low access to health care when syphilis is contracted.

There is now a need to determine what preventative interventions will lower syphilis rates. Halifors and associates (2007) suggest a media campaign to de-stigmatize STIs and HIV/AIDS infection in African Americans. Another possible intervention involves targeting African American men who come in for treatment of syphilis and other STIs in order to educate them on prevention methods. Such intervention could also target these men for HIV/AIDS testing, facilitating earlier treatment for those who are HIV-positive and decreasing transmission of the virus.

Hypothesis 3.4: *African American MSSWs will have higher rates of combined HIV-risk factors (sexual assault and syphilis) than Caucasian MSSWs.*

African American MSSWs have elevated rates of sexual assault and syphilis (combined) as compared to Caucasian MSSWs; however, sexual assault and syphilis do not mediate the relationship between race and HIV/AIDS. The combined risk factor of sexual assault and syphilis also does not meet the conditions for mediation. The MSSWs in this sample who have histories of both sexual assault and syphilis are much more likely than not to be HIV-positive, regardless of race. As HIV-risk behaviors culminate the more likely Black *and* White MSSWs will be diagnosed with HIV/AIDS. The combined effects do not explain racial disparities in HIV/AIDS.

*Other Findings*. Other findings of this study are secondary to its proclaimed aims but still should be addressed because of their potential for shedding light on possible other reasons for the racial disparities in HIV/AIDS infection rates. These findings concern age, gay sexual orientation, and income.

African American MSSWs are significantly older than their Caucasian counterparts. HIV-positive MSSWs are significantly older than HIV-negative MSSWs. These findings are consistent with the results of Harris (2008) and the Centers for Disease Control and Prevention (2008), who found that Caucasian men are more likely to become HIV-positive between the ages of 30-40 while African American men are more likely to become HIV-positive in their teens and 20s. The lower HIV/AIDS rate among Caucasian MSSWs in this sample may be due, in part, to their not yet seroconverting or to their not

having traded sex as long as African American MSSWs. Since the length of time involved in sex work was not measured, this is an important area for future research.

This dissertation found gay MSSWs always to be associated with HIV seroprevalence. This was expected based on previous studies of MSSWs (Elifson et al., 1993; Morse et al., 1991), yet there were some important caveats. African American MSSWs were also significantly more likely to identify themselves as gay as compared to Caucasian MSSWs. This study thus contradicts many antecedent studies that found Black men to be less likely to disclose a gay sexual identity when compared to White men, especially when coupled with low education and high unemployment (e.g., CDC, 2003; Miller, Serner, & Wagner, 2005; Milett, Flores, Peterson, & Bakeman, 2007; Wheeler, 2006; Wolititski, Jones, Wasserman, & Smith, 2006).

African American MSSWs have significantly less income as compared to White MSSWs, yet low income is not associated with HIV seroprevalence. This confirms that monetary income may not always be indicative of HIV-risk, since MSSWs may trade sex for drugs, a place to stay, food, or other non-monetary staples (e.g., Stephens, Braithwaite, Lubin, Carn, & Colbert, 2001). Non-monetary sex transactions are common among MSSWs and often result in an increase in unprotected sexual encounters and other HIV risks due to the impulsivity and haste that may be involved in these transactions (e.g., Stephens et al., 2001). For instance, Stephens and associates (2001) found that African American MSSWs who were hungry were more likely to engage in unprotected sexual activity than those who were not hungry. White MSSWs are also more involved in IDU, heroin, and methamphetamine use (but Whites and Blacks equally use crack cocaine), which may equate with more involvement in drug distribution for White

MSSWs that could substantially increases their income. African American men are in survival mode may be more apt to engage in riskier survival sexual behaviors that places them at greater risk for HIV exposure (e.g., Stephens et al., 2001). Black and White income disparity is an important consideration for future study.

*Limitations*

There are key limitations to this study that may contribute to the inability to find the exact causes of racial disparities in HIV/AIDS between Black and White MSSWs. Those limitations will now be discussed.

Because of the small sample size, the statistical power of the analyses was restricted, which may explain some non-significant findings. However, there was sufficient statistical power to detect multiple main effects such as racial differences in HIV seroprevalence.

Another limitation was the heavy reliance on self-reporting. Although self-reporting is crucial when assessing trauma and violence histories, lab verification of HIV/AIDS status and of syphilis seromarkers would have flagged potential false negatives. Recall bias, social desirability, acquiescence, and MSSWs seroconversion subsequent to a negative HIV/AIDS test result must be considered as a limitation to ascertaining the accuracy of racial disparities in HIV seroprevalence (McMurtry, 1997).

The inclusion of only one variable in each HIV-risk category may have been restrictive, especially with respect to the violence and substance use categories. The variable chosen for inclusion in the respective categories was based on its having the highest significance associated with HIV seroprevalence, potentially being a direct route

of HIV infection, and/or based on theoretical fit. Although the process for inclusion may have been restrictive, the variables chosen were the best fit for representing the respective category. Future studies will examine more risk factors for HIV seroprevalence and should consider population-level factors.

Cross-sectional data do not allow for the temporal ordering of variables and thus limits an understanding of causality. Despite this caveat, cross-sectional data do well with exploratory research for characteristics of a sample (Grinnell, 1997). In this study it was not possible to determine what HIV-risk factors actually preceded HIV infection.

The homogeneity of some sample characteristics (e.g., crack cocaine use and incarceration history) restricted the variables that could be considered as HIV-risk factors. Since virtually all of the MSSWs had been incarcerated, it was impossible to use this as a risk factor. While nearly all the MSSWs had used crack cocaine, most Caucasian men had IDU histories, but most African American men did not. A larger sample size and key informants recruited from more diverse areas would probably have lessened these issues.

There is also an inability to determine the age of sexual assault, which does not allow for distinguishing between child and adult sexual assault. Additionally, the length of time that MSSWs were involved in sex work was not measured, nor was the age at which they first engaged in sex work. This was a major limitation to this data. Considering that African American MSSWs were significantly older than Caucasian MSSWs, and were significantly more likely to be HIV-positive, there is the possibility that they were also involved in sex work for a significantly longer period of time than the

Caucasian MSSWs. Unfortunately this relationship can only be speculated due to length of time involved in sex work not being reported.

Finally, though the RBA has established reliability (Needle et al., 1995), there remains the need for a qualitative component in a study this exploratory. A qualitative component could explore potential risk factors such as high-risk incarceration behaviors, long-term poverty, racial discrimination, and age at first sex work. Focus groups would also be beneficial in understanding issues that are important to MSSWs and for gaining their insight into potential risk factors contributing to racial disparities in HIV/AIDS.

The data were collected in Houston in one specific neighborhood known for MSSW activity, thus limiting the results' generalizability to that specific neighborhood. Although Hispanics represent a large segment of the Houston area, they were clearly underrepresented in this study. Therefore, the results appear applicable to this specific neighborhood but not to Houston at large. The sampling design focused on obtaining a convenience cross-section sample of MSSWs and was not concerned with the racial diversity of that hidden population. However, another study of street prostitutes also found Hispanics to be underrepresented among Houston study participants (Brewer, Muth, & Potterat, 208). It may be that Hispanic MSSWs are reluctant to participate in studies regarding prostitution. These findings clearly cannot be generalized to other minorities or to other African American male populations.

Despite these limitations, the present study has some unique features. There were no missing data among the variables chosen for inclusion. This fact prevented many problematic issues with analyses, especially considering the small sample size. The data demonstrates high rates of African American HIV/AIDS infection that persists in a

population of already highly oppressed men. Non-significant findings indicate the need to look for other risk factors that are affecting the racial disparities in HIV seroprevalence among these men.

*Implications for Theory and Social Work Practice*

This dissertation's implications are important for theory and social work practice in adding to our knowledge of hidden population, such as MSSWs. Though the study did not find the reasons for racial disparities, racial disparities in HIV/AIDS clearly exist. This study also presented findings important for all men involved in sex work.

This study supports use of the tripartite model with MSSWs by demonstrating that sexual assault and syphilis as combined risk factors increase the likelihood of HIV seroprevalence among the total sample of MSSWs. Although the combined factors do not explain racial disparities in HIV/AIDS infection, their robustness in terms of the total sample demonstrates the high-risk behaviors in which these men are involved in, and that the combination of risk factors further increases risk of HIV/AIDS infection.

In regard to aim one, syphilis is consistently found to be a predictor of HIV seroprevalence in MSSWs and in African American men in the general population (see Halifors et al., 2007; Millett et al., 2006; 2007). Successful STI programs could lower rates of HIV/AIDS by preventing its transmission. Also, early treatment of STIs could lead to the detection and treatment of HIV/AIDS. Media campaigns should address the stigmatization and fear that Black men often feel when seeking treatment (Halifors et al., 2007).

Screening instruments should be developed that address the issues of sexual assault and syphilis for MSSWs. These tools would be especially important for service providers working with the homeless, drug-users, and African Americans living in poverty. Awareness of these populations' multidimensionality is important for effective services and treatment. Questions about whether these men are trading sex for monetary and non-monetary compensation should be addressed routinely in the intake process. Homeless practitioners and health care workers rarely ask male clients about sex work, sexual assault, or STIs. There is a need to develop screening tools and assessment measures that are sensitive to understanding that men may be reluctant to answer questions regarding same-sex sexual activity and assault (Collins, 2005; Ross et al., 2007). In order to develop such instruments, focus groups with MSSWs are desirable. Without intervention in the screening process, men's shame and fear about disclosing sexual assault and other potentially stigmatizing conditions will continue the cycle of delaying treatment for STIs and HIV/AIDS infection, while increasing the spread of these infections.

With respect to aim two, African American race does not moderate sexual assault, syphilis, or sexual assault and syphilis (combined). These risk factors predict HIV/AIDS infection better for the total sample of MSSWs than when race is entered into the model. Such findings support those of Halifors et al. (2007) and Millett et al. (2006; 2007), who found that individual-level risk factors do not consistently explain racial disparities. Halifors and associates (2007) recommend that a media campaign inform African Americans of their high rates of STIs and HIV/AIDS, thereby reducing the stigma of receiving an STI diagnosis and encouraging testing on an annual basis. These media

campaigns should not just target African American men in the general population, but also MSSWs and other hidden populations, through street outreach, as well as 24-hour quick shops, coffee houses, and restaurants where MSSWs and other high-risk populations may congregate. While education about STI prevention has become normative with regard to HIV prevention, sexual assault in men has not. Prevention strategies that help these men become aware of danger signals for potential sexual assault, as well as methods for defending themselves, should be considered in the development of HIV-prevention programs for African American men, as well as for all MSSWs.

Furthermore, the enormous disparity of Black men in prison requires that social assistance be provided to men while they are incarcerated and when released back into the community. If this does not happen many of these men will be released into homelessness and turn to sex work, which is often the only means for income. Community reentry programs should be routine for newly released inmates (Stephens, Braithwaite, Robillard, Finnie, Colbert, 2002). The evidence-based success of these programs demonstrates that they provide a safe forum for discussing HIV/AIDS-prevention strategies with case workers. Wohl and associates (2000; 2002) found that HIV risk is significantly higher for African American men living on the streets than during periods of incarceration. This suggests that African American men who experience homelessness at the highest rates are also at high-risk for sexual assault. Street outreach workers should be trained in identifying and providing crisis intervention to these men on the streets, with an understanding that they are prone to sexual assault.

Social work practitioners need to develop more effective prevention and intervention strategies for this population.

With regard to this study's third aim, African American MSSWs have a higher rate of HIV seroprevalence than their Caucasian counterparts. African American men in the general population have the highest rates of imprisonment, homelessness, and HIV/AIDS. Despite Americans desire to be politically correct, inoffensive, and avoid controversy may claim we are a color-blind society. However this does not appear to be the case, or a goal Americans should strive for as it ignores racial and cultural diversity, as well as potential areas of discrimination and oppression. (Bonilla-Silva, 2006). These racial disparities among Black men suggest institutional racism, which may make it challenging for these men to concentrate on HIV prevention due to the many competing needs complicating their lives (Gelberg, Andersen, & Leake, 2000). Social work practitioners need to understand the importance of activism and advocacy in order to effectively deal with issues of institutional racism.

The Center for Disease Control and Prevention (2007) funded outreach programs for African American heterosexual men to reduce HIV-risk. However, these programs tend to include the same message for gay, bisexual, and straight men. The implications of this dissertation and other studies of MSSWs suggest that differences among these men are based, in large part, on their sexual identification (Elifson et al., 1993; Morse et al., 1992; Ross et al., 2003). African American men need HIV-prevention messages to which they can relate (e.g., Wheeler, 2006). Prevention programs that are Afrocentric in nature may lead to more empowerment and sense of control among African American men (Schiele, 2000). Programs should take into

account other potential differences such as age, income, homelessness, substance use, and the like. African American men involved in street sex work are qualitatively different from the vast majority of African American men who are not MSSWs. In this sample Black MSSWs are also qualitatively different from White MSSWs in that they are older, have lower income, more educated, and are lower in IDU. Prevention/intervention programs designed specifically for these African American MSSWs are warranted. An Afrocentric program that addresses HIV-risk as well as spiritual needs and need for connecting to others may be worth attempting. Susser's (1998) SexG program successfully lowered HIV-risk among a targeted population of homeless, mentally ill, mostly African American men. This study supports replication of evidenced-based programs such as Susser's.

Despite the significantly higher rate of HIV/AIDS among African American MSSWs, this study did not demonstrate mediation of sexual assault or syphilis, whether separately or combined, between race and HIV/AIDS. This again supports the findings of Halifors and associates (2007), Millett and colleagues (2006; 2007), and Fullilove (2006) that individual HIV-risk factors are insufficient for explaining HIV/AIDS infection in African American men.

*Recommendations for Future Research*

This study considered sexual assault and syphilis as risk factors for HIV/AIDS disparities between African American and Caucasian MSSWs, yet specific risk factors remain unknown. Future research should examine sexual assault and syphilis in larger samples of MSSWs, in order to curb high HIV seroprevalence among the total MSSW

population. Also essential is continued exploration of yet unidentified HIV risk factors that may relate to the racial disparities in HIV/AIDS among African American MSSWs.

Research should investigate the causality of HIV seroprevalence among MSSWs and others living in poverty. For instance, we don't know whether sexual assault is the direct cause of syphilis infection, which in turn may contribute to HIV infection, or how often sexual assault is the direct route for HIV infection. While this study corroborates that gay sexual identification increases the likelihood of sexual assault (e.g., Elifson et al., 1993), much remains unknown about what other factors place a MSSW at risk for sexual assault.

From the present study we know that IDU is significantly negatively associated with HIV/AIDS infection. What accounts for this association? African American MSSWs' low injection-drug use does not prevent them from being more than twice as likely as Caucasian MSSWs to have HIV/AIDS. It is important to discover whether this negative association between IDU and HIV/AIDS is attributable to poor healthcare among injection-drug users that prevents them from knowing if they have seroconverted, or whether these men have safer sexual practices and/or refrain from using unclean paraphernalia, or if IDU is a possible protective factor against HIV/AIDS infection due to these men being less likely to participate in sexual activity as suggested by Morse et al. (1993).

Future research should examine population-level risk factors in order to understand African American racial disparities in HIV seroprevalence. Halifors and associates (2007) suggest investigation of such factors as incarceration and socio-economic status. Millett and colleagues (2007) advocate the examination of social

networks. Fullilove (2006) isolates environmental factors as likely to contribute to HIV/AIDS. Future research on the ecological behaviors related to incarceration may offer insight into possible correlations between the high incarceration rates of African American men and their high HIV-infection rates. However, we must first develop innovative research designs that encourage men's accurate reporting of high-risk sexual behaviors while incarcerated. Men are sometimes reluctant to answer such sensitive questions; therefore, the information obtained from studies of men experiencing incarceration may not yet be as reliable and valid as desired. A component of such a study could also be qualitative and explore differences in high-risk sexual behaviors, IDU, and tattooing while incarcerated. It can be hypothesized that these factors contribute to higher HIV/AIDS rates among African American men.

Future comparison of Black and White MSSWs should include variables related to long-term poverty versus crisis situations. On the one hand, it can be hypothesized that long-term poverty among African American MSSWs is associated with longer-term sex work, which may be causal for the higher HIV seroprevalence noted in this study. On the other hand, the high rates of IDU among Caucasian MSSWs could indicate that these men are in crisis mode due to addiction, which contributes to their shorter-term involvement in sex work. Additionally, Caucasian MSSWs' higher income may be due to drug distribution, which could lead to less need for as much involvement in street-level sex work, potentially accounting for their lower rate of HIV/AIDS. These areas are important for future research.

This dissertation's findings of racial disparities between African American and Caucasian MSSWs HIV/AIDS infection rates are relevant to the parent study of Williams

et al. Potential differences in social networks by race may assist Williams and colleagues in better understanding the importance of race among these MSSWs, instead of treating them as homogeneous due only to their involvement in street-level sex work.

The exact cause of the racial disparity in HIV seroprevalence between Black and White MSSWs in this sample remains unknown. What is apparent, however, is that these racial disparities in HIV/AIDS do exist. This dissertation has revealed that, in a hidden and high-risk population of MSSWs, African American men continue to experience HIV/AIDS at alarmingly high rates, as is the case among African American men in the general population in the United States.

*Conclusions*

This dissertation found that sexual assault and syphilis, both separately and combined, correlate with HIV seroprevalence among the total sample of MSSWs. African American MSSWs have more than double the rate of HIV/AIDS as compared to their Caucasian counterparts. Risk factors associated with this racial disparity remain unknown. It is clear that the racial disparities that exist in HIV/AIDS infection rates among this sample of MSSWs are also present among African American men in the United States. Although we do not yet know the reason for these racial disparities, syphilis and other STIs are important risk factors that should be targeted in prevention/intervention programs (Millett, 2006; 2007). This dissertation also supports the findings of researchers who advocate examination of ecological, environmental, and other population-level risk factors that may be influencing this disparity (Fullilove, 2006; Halifors et al., 2007; Millett et al., 2006; 2007).

Research on MSSWs has decreased over the past twenty years, and has not developed beyond exploratory examination. The premiere studies on these men were completed at the height of the AIDS crisis (Elifson et al., 1993; Morse et al., 1991). HIV/AIDS in the United States has radically changed over those twenty years. While HIV/AIDS was once seen as an issue for primarily White gay males, it now affects African Americans at disproportionate rates. It is likely that this racial disparity in HIV/AIDS is affecting MSSW populations as well. Future research is needed to investigate whether or not HIV/AIDS rates are consistently disparate in Black and White MSSWs and other hidden populations.

Social work practitioners are on the front line when it comes to MSSWs. Through street outreach for the homeless, social workers often encounter MSSWs, but are unaware of it. These street outreach workers are often the only persons who will encounter these men, and are in a position to provide assistance to them. Unfortunately, interventions have been minimal. Social work needs to strategize regarding possible interventions that would effectively deal with the multiple issues facing MSSWs, including HIV/AIDS. Social work also needs to recognize and acknowledge the racial disparities in HIV/AIDS that may be due to institutional racism – an area they remain marginally on the fringes of, when they should be on the front lines.

This study has been important in increasing the understanding of racial disparities in HIV/AIDS among MSSWs. The next step is to locate the variables that are contributing to these disparities and for social workers to find effective preventive interventions for these men.

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