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HIV in African American women: Evidence that elevated rate of infection cannot be explained solely on the basis of known individual risk behaviors.

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ABSTRACT

BERMANN FRANCOIS

HIV in African American women: Evidence that elevated rate of infection cannot be explained solely on the basis of known individual risk behaviors.

(Under the direction of Dr Ike Okosun, Faculty Member)

Objective: To compare known individual risk behaviors in African American, Whites, and Hispanic women as found in the literature and support those findings by analyzing data available through NHANES in order to find out if the higher rate of HIV infection in African American women is a direct result of higher risk behaviors. Those risk behaviors include lower rates of condom use, higher rates of drug use including those taken intravenously, higher rates of risky sex habits, higher number of sexual partners over their lifetime, and a more extensive history of sexually transmitted infections. This study also aims to draw attention to larger factors that may foster the conditions for increased HIV rates in African American women.

Results: The perception that higher rate of HIV infection is the result of increased risk factors among African American women is not supported either in the literature or in the analysis of NHANES data. For instance, results from data analysis found that African American women had fewer average number of sexual partners ($P \leq 0.05$), lower overall rate of drug use ($P \leq 0.01$), lower rates of risky sexual practices ($P \leq 0.01$), but more likely to report a history of STIs ($P \leq 0.01$) than Whites. The literature also confirmed that current HIV testing recommendations do not cover a large enough portion of the population to make a significant impact on HIV incidence. In addition, socioeconomic situations further exacerbate the conditions favorable to the transmission of the disease in African American women.

Conclusion: Prevention programs that rely on individual risk behaviors alone may not be enough to reduce HIV rates in African American women, though those same programs may be working in MSM. Programs that address socioeconomic disparities and testing recommendations that cover more people are needed in order to drive down HIV infection rates in African American women.

INDEX WORDS: HIV, African American women, incidence, risk factors, STI

HIV in African American women: Evidence that elevated rate of infection cannot be explained solely on the basis of known individual risk behaviors.

By

Bermann Francois

B.S., Hunter College, NY, 2001

A Thesis Submitted to the Faculty of Georgia State University in Partial
Fulfillment of the Requirements for the Degree

MASTER OF PUBLIC HEALTH

Atlanta, GA 30303

HIV in African American women: Evidence that elevated rate of infection cannot be explained solely on the basis of known individual risk behaviors.

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Chapter I – Introduction

Introduction

Intravenous drug use, past history of STIs, high number of sex partners, inconsistent or non-use of condoms during sex, other risky sex behaviors, as well as socioeconomic level are all factors that increase one's risk of acquiring an STI including HIV. The implementation of aggressive programs focused on gaining control over the spread of HIV yielded good results in White MSM and the rate of new cases of infection with HIV decreased considerably among that group. Such programs have not been very effective among African Americans, who represented 25% of the HIV cases in 1986 and by 2004 accounted for over 50% of cases. As the demographic profile of HIV/AIDS evolves, African Americans make up an increasingly larger portion of the people living with HIV and as a subgroup, African Americans women are highly affected by the disease. The findings of multiple research projects have underscored the magnitude of this issue among African American women. For instance, the rate of infection with HIV in that group are between 3 to 4 times higher than Hispanic women and between 13 and 19 times more than White women (*Satcher et al., 2007, Tillerson K, 2008, Laffoon et al., 2011*). Women represent only 25% of the cases in the US but African American women, who make up 13 percent of the total female population, but they accounted for 61% of new HIV cases among women in 2009 (*Prejean et al., 2011*) and recent trends show no noticeable improvement in HIV incidence among African American women. This should be an area of concern among experts who study demographic patterns of the disease. As a group, African American women have the fourth

highest rate of HIV incidence behind White, Black, and Hispanic MSM (*Prejean et al., 2011*). In the spring of 2012, the HIV Prevention Trials Network released preliminary findings of HTPN 064 Women's HIV Seroincidence Study (ISIS). This ongoing study that includes a cohort 2,099 women (88% African American and 12% Hispanic) in six major cities along the Eastern US found that the rate of new infection in that sample is 0.24%. That is as much as 5 times higher than the CDC estimates of 0.05% for the US African American female population. This finding suggests that there are geographical pockets where incidence of HIV is very high to such an extent that incidence rates are comparable to countries like The Congo 0.28% and Kenya 0.53% in Sub-Saharan Africa (*Rogers, C., 2012*).

According to the literature, researchers have found that the risk factors such as the use of illegal drugs, high number of sex partners, low usage of barriers during sex, risky sex practices, and a history of STIs are associated with increased rates of STIs infections in individuals. Therefore, these as well as other risk behaviors have been the focus of the majority of the research which has been, for the most part, directed toward the MSM population. Studies that focus on the epidemiology of HIV in women in general and Black women in particular are few compared to the attention MSM have received. Therefore, researchers have limited understanding of the underlying dynamics that may be associated with the high the rate of HIV among African American women. This limited knowledge of the factors that contribute to the higher rate of infection in Black women may be the reason for the widely held belief that Whites and Hispanics women have lower risk factors than Black women.

- A- Certain risk behaviors such as intravenous drug use are more frequent among African American women than women of other ethnic groups.
- B- African American women have high number of sex partners and therefore less likely to know about their risk behaviors and HIV status.
- C- African American women have higher rates of HIV because they have more high risk heterosexual contacts than Whites and Hispanic women.
- D- African American women have more of the other risk factors associated with HIV infection than women of other ethnic groups.

The literature provides some insights into the reasons that may explain differences in the risk of HIV infection between African American women and women of other ethnic groups that may explain the higher rates of infection in African American females. Widely held beliefs about African American women suggest that the cause of the higher incidence and prevalence of HIV in that demography is directly related to intravenous drug use, higher number of sex partners, lower frequency of condoms and other barriers during sex, risky sexual activities, and a history of STIs. Results from previous studies that look into those risk behaviors among women are available. Secondary data about many aspects of the risk factors listed above are also available from NHANES. The aim of this study is to compare individual risk behaviors in African American, Whites, and Hispanic women as found in the literature and support those findings by analyzing data available through NHANES in order to find out if the higher rate of HIV infection in African American women is a direct result of higher risk behaviors. Those risk behaviors include lower rates of condom use, higher rates of drug use including those taken intravenously, higher rates

of risky sex habits, higher number of sexual partners over their lifetime, and a more extensive history of sexually transmitted infection. This study also aims to draw attention to larger factors that may foster the conditions for increased HIV rates in African American women. I will review the literature and analyze available data from NHANES in order to find the extent of the existence of those differences between African American, White, and Hispanic women.

Theoretical Model

African American women are disproportionately represented in HIV incidence in the US making up about 60% of new infections in 2009 (Prejean et al., 2011). The disparities in the epidemiology of HIV among women are puzzling because there is no evidence in the literature that African American women report more of the risk behaviors known to be associated with increased risk of HIV infection. Given these reasons, many researchers propose that the explanations for those disparities may be related to a set of external influences that make up the social context in which African American women exist (Adimora & Schoenbach, 2005; Hogben & Leichter, 2008). According to Adimora and Schoenbach, residential segregation in urban areas where the most African American live may ultimately affect sexual networks, since individuals tend to choose partners within their social environments. Adimora and Schoenbach named other social influences such as the high incarceration rate of Black males, racial segregation, illegal drugs, and economic hardship that may impact the HIV transmission in Black females. Hogben and Leichter propose a theoretical model that demonstrates the impacts of societal structures on individual outcomes, as far as HIV transmission to African American women are concerned. They suggest that there is a continuum between the larger societal

constructs and infection rates in Black women. Hogben and Leichter allude to additional social factors such as socioeconomic disparities, and delivery of health services that may affect STD infection rates in Black women. In addition, both studies point out that the social structures may influence several decisions at individual level. For instance, the incarceration rate of African American males, which is more than 8 times that of White males, results in low male to female ratio and ultimately affects partner selection, sexual networks, and even sexual concurrency at the level of the African American female. These social determinants interact with the pathogen to affect the epidemiology of HIV in a way that may increase the risks of transmission to African American females. In other words, the higher HIV rate among African American women may be rooted in determinants well beyond the control of the individuals in that group. Therefore, individuals make choices within the constraints of the social norms.

This study adopts Hogben and Leichter's (2008) theoretical model shown below. It explains the correlation between societal constructs and the community context of African Americans and individual outcomes. This model combines the social determinants identified by Hogben & Leichter and Adimora & Schoenbach to display the association between societal factors and individual choices.

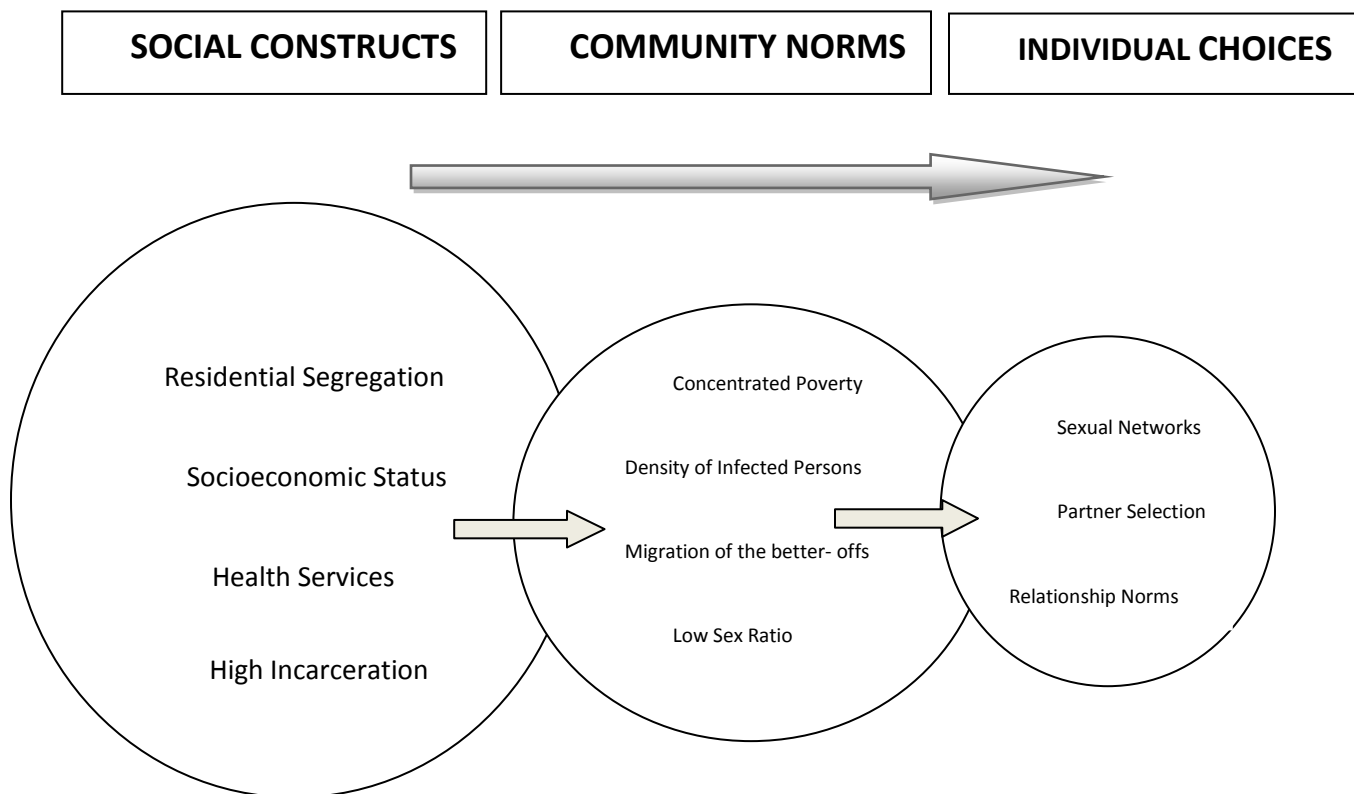


Figure 1. Theoretical model showing the impact of social constructs on the creation of conditions favorable to HIV transmission in African American women. This model is slightly modified from the one originally proposed by Hogben and Leichter (2008).

Chapter II - Literature Review

Literature Review

When considering the epidemiology of sexually transmitted infections, risk behavior is an important predictor of the likelihood that an individual would be infected or a group would have a higher rate of infection than another group. However, for many reasons the relationship is not always clear cut, meaning that the level of risk behaviors do not always result in corresponding rates of disease. Even though African American women have the highest rate of HIV infection among females in the US, risk behaviors among African American women are no

different and in most cases lower than women of other ethnic groups (*Tillerson, K., 2008*). For example, African American women report higher and more consistent condom use than White and Hispanic women (*Soler et al. 2000, Upchurch et al., 2003, Moreno et al., 2007*). In a study that measure prevalence of HSV-2 in 5 STD clinics around the country, Gottlieb and colleagues (2002) found that African American women also reported fewer lifetime sex partners than other ethnic groups even if they were more likely to be seropositive for HSV-2. A similar study which analyzed data from a variety of settings found that African American women had a lower number of lifetime sex partners than Whites but more than Hispanics women (*Kenney, J., 1996*). Van Wagoner and colleagues (2011) estimated that 4 or more lifetime sexual partners alter an individual's risk profile and those above that threshold are less likely to be African Americans, and more likely to report non-vaginal sexual activities such as oral and anal sex.

Drug abuse and history of STIs are other risk factors associated with HIV infection. Having the highest rate of HIV, African American women should have higher rates of drug abuse than other women of other races. Evidence in the literature points a different direction. White women report higher rates of utilization of drugs such as marijuana, cocaine, pills, and inhalants than Blacks and Hispanics (*Sly et al., 1997, Tillerson, K, 2008*). Being one of the modes of transmission of blood borne pathogens, intravenous drug use in the African American community is generally believed to be associated with the high rates of STIs including HIV. In a study that analyzes the characteristics of injected drug users (IDU) between 1979 and 2002, Armstrong found that non-Hispanic white women were more likely to inject drugs than African American women (2007).

Prior sexually transmitted infections are also another risk factors strongly associated with HIV infection. Studies reveal that African American women's STI history show higher rates of Chlamydia, and Syphilis than non-Blacks (*Steele et al., 2006*) and seroprevalence of HSV-2 was higher in African American women than other groups regardless of number of sex partners (*Gottlieb et al., 2002*).

Many African American women, who due to their socio-economic status are already at higher risk than women of other racial groups, know neither their own nor their partners' disease status (*Hageman et al., 2012*). In addition, many African Americans don't learn of their HIV status until late in the course of the disease (*CDC., 2007*). Hageman and colleagues conducted a research study in which 82% of the women are Black. The results demonstrated that more than half of the participants did not know the HIV status of their partners. This study is one of many that found that the risks for infection with HIV and other STIs increase with decreased awareness of the HIV status of one's partner (*Hageman et al, 2012*). One such study, in which 54% of the female participants were Black, found that 11% of the women were unaware that their male partners had injected drugs in the past year, 10% didn't know that their partners has had a recent STD diagnosis, 2% had no idea that their partners have been recently diagnosed with HIV (*Witte et al., 2010*). This lack of knowledge of one's partner risk behaviors and status may give women a false sense of security and unknowingly expose them to STIs. In a study that surveyed college students who are dating, the researchers found that one of the reasons that women give for non use of condoms was the perception that their partners did not pose any risks for STIs (Seal, D., and Palmer-Seal, D., 1996). Another study of

inner city women and their partners found that women that are already infected with STIs generally wrongly assess their partners' risk behaviors and STD status (*Stoner et al., 2003*) and women that are married, cohabitating, or that categorize their current relationship as "main" are far less knowledgeable about their partners' risk behaviors and STI status including HIV (*Witte et al., 2010, Stoner et al., 2003, Nicolai et al., 2002*). In a small study, Bolton and colleagues (2010) interviewed 13 women aged 18-24 looking for the reasons that these women discontinued using condoms were general but unconfirmed "assumptions about the monogamous" nature of their relationship and their partners' sexual history.

Although the role of injected drugs is undetermined in reporting those numbers, the CDC estimates that 85% of African American women who are HIV positive became infected as a result of heterosexual sex (*Prejean et al., 2011*). This suggests that male partners and their sexual network play a major role in the transmission of the virus. The CDC reports that high-risk heterosexual sexual activities is related to the higher rates of STIs including HIV in African American women compared to other ethnic women (*CDC, 2011*). This appears to be inconsistent with what is present in the literature on this topic since African American women tend to report fewer risky behaviors. High-risk heterosexual intercourse is described as having sex with someone known to be HIV positive, an intravenous drug user, a man who has sex with men and/ or a person with hemophilia. As noted earlier, African American women aren't any less aware of their partners STI status than White and Latino women (*Tillerson, K., 2008*). In addition, Kenney found that White and African American women who took part in a study reported that their partners have had an average of at least 55 partners over their lifetime

(Kenney, J., 1996). In another study, sex behavior data for 3,482 women age 18-49 from 23 urban settings in the US who filled out the 1990-1991 National AIDS Behavior Surveys questionnaires were analyzed by Grinstead and colleagues. In that study, the investigators focused on risky sexual partners as one of the risk behaviors for infection with HIV. The results show that 6.3% of African American women, 5.1% of Hispanic women, and 4.3% of the White women reported having high risk heterosexual partners (Grinstead et al., 1993). However, these numbers aren't comparable because the study did not stratify by race. African American men who have sex with men in general have the highest HIV rate of any group and for African American MSM, their sexual networks are more likely to include females (*Millet et al., 2005*). Therefore, many public health professionals who conduct research on the subject use the term "bisexual bridge" in their attempt to explain the abnormally high rate of HIV infection among Black women (*McKirnan et al., 1995*). Because of the stigma attached homosexuality in the black community, African Americans MSMW look for sexual encounters with males outside of their social and family environments while they mostly report their female sex partners being from the same neighborhoods where they live (*Gorbach et al., 2009*). Historically, The MSM population faces higher risk of HIV and has higher incidences than the general population and African American MSMW report more women sex partners than MSMW of other races suggesting that Black MSMW may be a "transmission bridge" to African American women (*McKirnan et al., 1995*) and being on the edges of African American MSMW sexual network puts many African American women in a precarious position since being at the periphery of a sexual

network increases the risk of acquiring an STI by 5 fold when compared to those involved in confirmed (monogamous) dyads (*Fitchenberg et al., 2009*).

The concept of “bisexual bridge” or “transmission bridge” isn’t widely accepted among all researchers for it is heavily dependent upon a thorough understanding of the “down low” phenomenon. For the most part, “down low” refers to bisexually active African Americans males, who choose not to disclose it to their female partners. The issue is that many researchers who use the term falsely assume that they are a homogenous group. However, results from existing studies find a disconnect between the way “down low” individuals self-identify and their actual sexual practices (*Millett et al., 2005*). In a study released in 2008, Malebranche who have worked extensively with the African American MSM, found that the term “down low” is vaguely defined by bisexually active Black men. Black MSM are more likely than other ethnicities to self-identify as “straight” and that seem to have protective effects when it comes to high average number of male sexual partners and the report of sexually transmitted disease infections. However, It’s also important to point out that these “straight” self-identified MSM are more likely to have unprotected anal intercourse and less likely to be tested for HIV. Furthermore, the extent to which “down low” affect HIV infection rate in African American females is not known. According to estimates, the proportion of African American males who are bisexual is only between 2 and 3 percent and it’s unlikely that they are responsible for a large percentage of HIV and other sexually transmitting infections (*Malebranche et al., 2010, Millett et al., 2005*).

Another aspect of high risk sexual partnership concurrency or having overlapping sexual partnership increases the risk of acquiring STIs compared to monogamous relationships. It has also been found that it heightens the risk of transmission of STIs including HIV and sexual concurrency is found to be more common among African American than among Hispanic or Caucasians (*Morris, M., 2001, Adimora et al., 2004, Adimora et al., 2003*). African American women have much higher rates of STIs than Non-Hispanic Whites which may be linked to higher rate concurrency among young African American women (*Harawa et al., 2003*). Although research concerning risk behaviors associated with infection with HIV in MSM is extensive the factors that affect dynamics of HIV incidence in heterosexual Black women is scarce.

Chapter III - Method

Source

The quantitative data used in this study is retrieved entirely from the National Health and Nutrition Examination Survey (NHANES) dataset which, unlike the preceding two surveys, has a smaller sample size and is continuous yearly survey. NHANES is a program that is administered by the National Center for Health Statistics, a branch of the CDC. The NCHS's mission is to provide vital and health statistics for the country. The aim of the NHANES is to evaluate the health and nutritional needs of adults as well as children in the United States. Unlike any other health survey in the US, the data available through this survey is a combination of interview questions and physiological measurements. NHANES surveys a national representative sample

of 5,000 participants every year. The survey is a reflection of the U.S population across all ages. African Americans, Hispanics and people over the age of 60 are oversampled in order to generate statistically reliable data. Americans aged 60 and older make up an increasingly larger segment of the population and oversampling them offer insights into the health picture of this group. The questionnaire portion of the dataset gathers information on demographics, socioeconomic, dietary, and health-related questions. The examination component consists of medical, dental, and physiological measurements, as well as laboratory tests administered by highly trained medical personnel.

The data obtained in the course of the yearly survey serve a wide range of purposes such as determining the prevalence for the conditions that have the most impact on Americans and risk factors for diseases. Risk factors, distinctive features such as heredity, diet, sexual practices, drug use, weight, alcohol intake, smoking, physical activity, and environment, are studied in this survey. The information collected by this survey has become a reference for anthropometric measurements such as height, weight, and waist circumferences.

The interviews take place at the home of the participants. The teams conducting those interviews travel nationwide on mobile centers staffed by physicians, health interviewers, medical and health technicians, diet and health interviewers for the purpose of collecting data and physiological specimen. Transportation to the mobile centers is provided as needed. Each participant is compensated and receives a report of medical findings. All information is kept confidential. NHANES data are collected and processed using advanced softwares and computer network. The field data collectors bring touch screen computers for respondents to

enter their data thereby ensuring complete privacy and drastically reducing the amount of paper. The data is uploaded to the NCHS servers within 24 hours of collection ensuring speedy analysis and availability to the public. State and local health authorities over those areas chosen for the survey receive letters in advance and the local media is encouraged to run spots about the survey.

Federal entities such as the National Institute of Health and the Food and Drug Administration, which help design the survey, are the primary users of its data. The information from the survey gives public health officials unique insights into the health of the population and help to create policies and design research, education, and health promotion programs that benefit the present and future health of the population. State and local governments, private research institutions, as well as universities use the NHANES datasets for research purposes.

Study Sample

The purpose of this study is to compare Black women with White and Hispanic women in order to see if there are any differences between the groups and if those differences exist, do they explain the higher rates of infections with HIV? As stated above, there are a number of risk factors that increase individual susceptibility to being infected with HIV as well as other STIs. In 2003, NHANES started collecting information on risk behaviors such as oral and anal sex which, according to the literature, increase one's of STIs infection. Therefore, sampling for this study begins with that year's participants and finishes with the 2010 survey. Furthermore, the survey asks certain questions about drug use and sexual behaviors only to individuals that are

between 20-59 years old. Consequently, my sample population fell within that age group. For the purpose of this study, Black, White, and Hispanic women that are at least 20 and no older than 59 years old were selected for this study.

Analytical Tool and Instrumentation

Statistical Package for Social Sciences version 20 (SPSS 20) was used to analyze NHANES datasets from 2003-2010 from the demographics, laboratory, and questionnaire sections. This study's interest focuses on the lack of progress toward reducing the rate (incidence and prevalence) of HIV among Black women. Through a search of the literature as well as analyses of related and available data from the NHANES datasets, this study tries to flesh out those characteristics that increase the vulnerability to HIV among Black women. As far as the traditionally cited risk factors are concerned, this study contrasts Black women with White, and Hispanic women, the other two largest ethnic groups in the US. SPSS version 20 was used to view the downloaded data. Then the variables are merged, renamed, and analyzed for the most part from interview sections but there is a small amount such as HIV related information used in this study that derives from laboratory tests on biological specimen collected from interviewed participants.

Studies confirm that Black women have higher rates of HIV infection than other women groups, which draws attention to the need for comparisons between Black, White, and Hispanic women. Most questions on sexual behaviors were limited to participants over the age of 20.

Therefore, only female participants between 20 and 59 years old were selected from the NHANES datasets from 2003-2010.

In order to highlight those comparisons, this study first isolates cases by gender and age. Then it considers other demographic characteristics such as income, education, marital status, and insurance coverage; all relevant to the purpose of the study (see table 1). This study analyzes other factors that have been identified to increase the risks for infection with HIV. Previous infections with a sexually transmitted disease increase an individual's susceptibility to other STDs including HIV (Chart 1). The questionnaire asks about the patients being told of having had genital herpes, genital warts, gonorrhea or Chlamydia. Some of those STDs are suspected to impair the physiological barriers that makes in individual resistant to HIV. Another factor for higher HIV risk cited has been the use of illegal drugs. This study also looks at participants report history of drug use other than those taken intravenously. According to studies, intravenous drugs users are more likely to be infected with blood borne pathogen, including HIV, than the general population (Chart 2). In the NHANES survey, individual are asked about the number of sexual partners they have over their lifetime because this factor is one of those that increases rate of infection with STDs (Table 2). Finally, certain risky sexual activities about sexual activities with men that are oral or anal in nature. Data for analysis were collected from the sexual behaviors section from the questionnaire portion. Depending on the interview question, the numbers of participants responding to a particular question ranged between 180 and 7,117.

The demographics data sections contain the highest number respondents. Data about age, income, education, marital status and insurance coverage were deemed suitable for the aims of this study. There were 7,117 women between 20 and 59 years old that participated in NHANES surveys between 2003 and 2010. The age variable was categorized in 4 groups, each group is made up of all participants aged within a 10 year periods. As far income is concerned, less than half (n=3498) reported their income level. The income variable was re-coded into a new variable according to their position related to the 2010 federal poverty level for a family of 4. The respondents to education variable were ranked in relation to their level of education from pre high school to college graduate and above. Marital status was divided into 4 groups including single, married or living with someone, divorced, and widowed. Lastly, health insurance coverage is included in the analysis as a categorical variable, the same way participants reported it in NHANES. Chi square ($P \leq 0.01$) test of association was used to measure if chance can reasonably explain the observed associations between race/ethnicity and the independent variables in table 1.

Four of the five variables about sexually transmitted diseases that appear in figure 1 were taken from questions as they appear in the NHANES survey. A high number of respondents (n= 5,760 to 5,776, depending on the variable) answered the questions about their recollection of being told by a doctor that they have had one or more of the STDs listed in that figure. The fifth variable was computed in order to find out how large the proportion of the participants who have had more than one infection would be. This study used chi square ($P \leq 0.01$) to determine

whether chance can explain the association between the diagnosis with a sexually transmitted disease and race.

Table 2 shows the comparison of participants reported mean value of sexual partners over their lifetime between the three groups. There are two questions in the NHANES survey that appear to be asking about the same thing. Here is the difference. Number of intercourse partners means the sexual activity where either the male genitalia or an object is inserted in the vagina whereas the number of sex partner/lifetime alludes to any kind of sexual activity including anal and oral. One way ANOVA was used to estimate if the participants mean value of sexual partners differed by race. Tukey's test was used to identify the mean sexual partners among the races that were significant from each other at significance level of $P \leq 0.05$. Of the four variables in this table, the two that are found to be significant are used in univariate and multivariate regression analyses to estimate if these two dependent variables are driven by demographic characteristics.

Figure 2 illustrates the history of the respondents' use of illegal drugs. In this section, the study wanted to conduct a more comprehensive analysis of the participants' use of drugs by considering those taken through injections and those taken by other routes. Although intravenous drug users that do not use clean needles are at higher risk of being infected with blood-borne pathogens than those who use other types of drugs and should be the main focus of this section, the study's interest is to look at the overall drug habits of the sample population. Chi square was used to determine whether these associations happen by chance ($P \leq 0.01$).

The first three independent variables in table 3 were taken as they appear in the NHANES survey (2003-2010) when they were asked to female participants between the age of 20 and 59. In order to better measure risk in the sample population, this study transformed the other two into categorical (yes or no) variables. Other than those who refused to answer, all participants who provided answers to these questions were assigned to one of the two categories. Those that answered “always” when asked about using condoms or oral protection during sex were entered into the “yes” groups but those whose answers were “never, sometimes, rarely, and usually” during oral sex or never, less than half the time, about half the time, and not always but more than half the time” during anal and vaginal sex were entered into the “no” group. Chi square was used to see if differences could be attributed to chance ($P \leq 0.01$).

Table 4 shows the univariate and multivariate linear relationship between the mean number of sexual partners and relevant demographic variables in order to find out which variables affecting the rate of HIV infection in the three groups. $P \leq 0.05$ was used to determine level of significance.

Chapter IV – Results

Results

These results are based on a sampled population of women from the three largest ethnic groups in the US. All participants are between the age of 20 and 59. The sample size varied for

each variable due to non-response or some questions being non-applicable to some respondents.

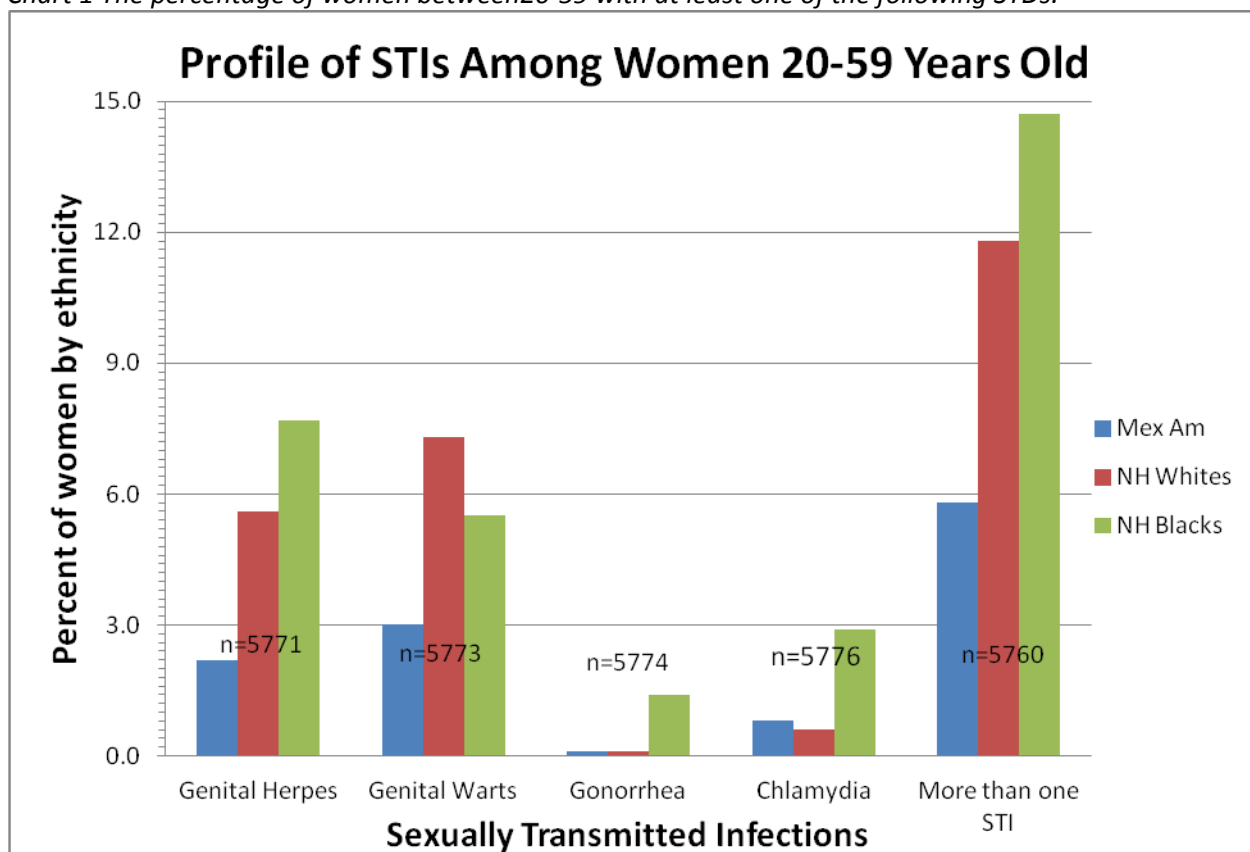
Table 1 - Demographics characteristics of the study population by race/ethnicity (100% female).

Variable	Total	Hispanics	NH Whites	NH Blacks	Means Pop %	P-value
Age	N=7117	2148	3363	1606		
20-29		31.8%	26.1%	27.8%	28.2%	0.00
30-39		26.5%	26.4%	24.0%	25.9%	
40-49		24.4%	25.4%	26.8%	25.4%	
50-59		17.3%	22.0%	21.4%	20.5%	
Annual Family Income	N=3498	1117	1649	732		
Just below Poverty Level		26.3%	25.2%	28.3%	26.2%	0.00
Up to 1.5x Poverty Level		28.8%	18.3%	24.5%	23.0%	
Up to 2x Poverty Level		9.7%	7.0%	9.0%	8.3%	
Up to 2.5x Poverty Level		9.0%	6.0%	9.6%	7.7%	
Up to 3x Poverty Level		6.1%	6.9%	6.1%	6.5%	
Over 3x Poverty Level		20.1%	36.6%	22.5%	28.4%	
Education	N=7110	2146	3358	1606		
Less than High School		44.6%	12.9%	22.0%	24.5%	0.00
High School/GED		20.7%	23.5%	23.3%	22.6%	
Some College including AA		25.1%	34.1%	37.5%	32.1%	
College Grad and above		9.6%	29.5%	17.2%	20.7%	
Marital Status	N=7113	2147	3361	1605		
Never married / Single		17.1%	17.3%	37.9%	21.9%	0.00
Married / Living with partner		67.0%	65.7%	39.6%	60.2%	
Divorced / Separated		13.8%	15.2%	19.8%	15.8%	
Widowed		2.0%	1.8%	2.8%	2.1%	
Covered by Health Insurance	N=7009	2111	3313	1585		
Yes		82.9%	83.1%	83.7%	83.2%	0.806

The sections in this table contain a high number of respondents except the income section where only about half chose to report to what income range they belong. All age groups are well represented especially those over 50 who have seen the fastest growing rate of sexually

transmitted infections in the past decade. Similar to age, the distributions of income/poverty among the three races were different. Education is also an area of interest since it's tied so closely to income because those with less education tend to also be in the lower income brackets. According to this survey, White women possessed more advanced degree rates than other groups. Fewer Whites reported having less than a high school education. The level of High school completion and some college education are roughly equal among the groups. Hispanic women reported the lowest rates of every education level ($P \leq .01$). As far as marital status is concerned, the number Black women who reported to be single are more than the number of Non-Hispanic whites and Hispanic combined. Therefore, as expected Black women reported being married or living with partner 27 and 25 percentage points lower than Hispanics and Whites respectively. Women of all three ethnic groups reported high percentage of health insurance coverage.

Chart 1 The percentage of women between 20-59 with at least one of the following STDs.



Previous diagnosis of a sexually transmitted infection has been found to be associated with higher risks of being infected with other STIs, including HIV. Black women reported higher rates of infections than Whites and Hispanics in 3 of the 4 sexually transmitted disease categories, other than HIV. Among the women surveyed by NHANES from 2003-2010, Blacks report higher rates of genital herpes than Whites and more than 3 times the rate among Hispanics. As far as Gonorrhea and Chlamydia are concerned, the rates show the disproportionate distribution of the diseases by ethnicity. Rates among Blacks were 14 times and almost 5 times higher than among Whites for Gonorrhea and Chlamydia respectively. Genital warts is the only infection category that Whites reported higher rates than Blacks. A search of the literature show that

those infected with one sexually transmitted disease are often infected with at least one other STI. In order to investigate that relationship, a new category was created to assess what percentage of each ethnic group who has reported one STI have also been told by a doctor that they were positive for at least one other STI. These results seem to support previous findings in the literature. In all those results a p-value < 0.001 was recorded in that the groups are significantly different from one another.

Table 2 - Mean values of number of sex partners by race/ethnicity.

Variable	Hispanics	NH Whites	NH Blacks	P value
Number of men sex intercourse partners/lifetime n= 1265	4.04 ± 6.66a*	11.25 ± 77.46a*	10.18 ± 30.21a*	0.204
Number of women sex intercourse partner/lifetime n= 4326	0.16 ± 0.83a*	0.5 ± 3.41b**	0.52 ± 4.06b**	0.00
Number of female on whom you performed oral sex n= 115	2.12 ± 1.42a*	3.56 ± 4.44a*	4.78 ± 9.60a*	0.250
Number of male sex partners/lifetime n= 2889	4.90 ± 7.70a*	9.12 ± 13.13b**	8.47 ± 13.36b**	0.00

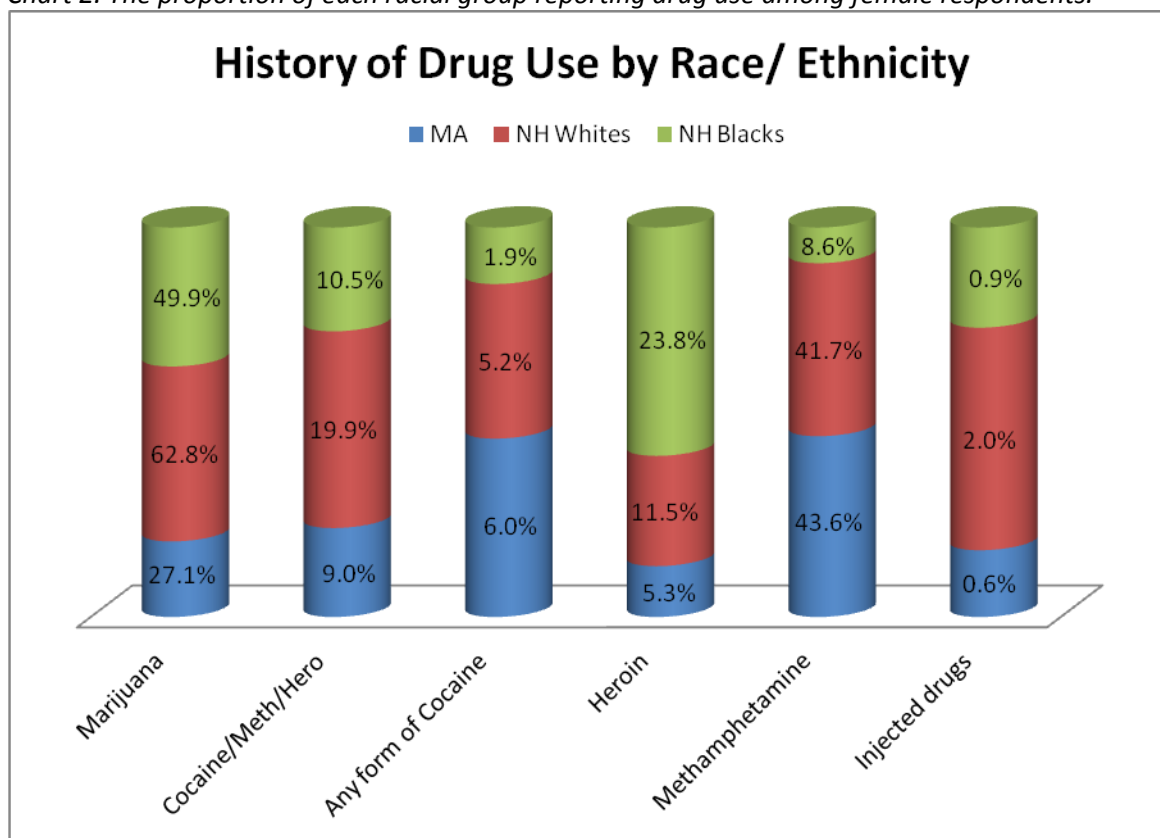
* values that have different superscript differ from each other at 0.05 level of probability using Tukey's test

** values that have same superscript are the same using Tukey's test

Serial monogamy and concurrent sexual partnerships carry more risk of acquiring an STI compared to those involved in monogamous relationships. Therefore, this section of the questionnaire is an important indicator of risk for STIs including HIV. One thousand two

hundred sixty five women provided answers for the questions above. The CDC estimates that heterosexual intercourse may account for up to 85 percent of HIV cases in Black women. Although that estimate seems very high, there is little doubt that the majority of cases are transmitted heterosexually. The mean values that represent sexual activities strictly between women are small. One possible explanation for the low mean values may be that the women in this sample that have sex with other women are fewer than those that who have sex with men. Only one of the mean values that result from heterosexual sex is significant.

Chart 2. The proportion of each racial group reporting drug use among female respondents.



In the section that measures the use of illegal drugs in the sample population. It appears that marijuana use was widespread in this sample with at least half Whites and Black

respondents reported using marijuana in the past with almost 63 percent of Whites saying they've smoked marijuana. Whites also answered positively to the use of cocaine/methamphetamine/heroin and intravenous drugs at twice the rate of Blacks and Hispanics. Hispanics used methamphetamine at a higher rate than Whites and Blacks. Heroin was the only drug that Blacks reported using at a rate more than twice higher than Whites and almost 5 times higher the rate of Hispanics. All these were values significant at $P \leq 0.01$.

Table 3. Risky Sexual behaviors of the study population by race/ethnicity (100% female).

Variable	Total	Hispnics	NH White	NH Blacks	Means Pop %	p-value
Ever performed oral sex on a man	N=1642	531	808	303		
	Yes	69.7%	90.8%	66.3%	79.5%	0.00
Ever had anal sex with a man	N=1643	533	807	303		
	Yes	35.5%	44.2%	30.0%	38.8%	0.00
Ever had any kind of sex with a woman	N=1646	534	809	303		
	Yes	6.2%	10.4%	11.6%	9.2%	0.010
Have you had sex w/o a condom at any time in the past year	N=2628	870	1195	593		
	Yes	79.2%	79.5%	79.8%	79.5%	0.967
Do you use protection during oral sex	N=998	294	549	155		
	Yes	5.1%	4.2%	9.0%	5.2%	.056

This section explores risky behaviors by women during sexual activities. As stated earlier, risky sex behaviors are found to be associated with HIV infection. As a risk behavior, Black women reported lower rates of oral and anal sex than the other 2 groups ($p < .001$). As much as 50 percent more Whites reported those risk behaviors compared to Blacks. White women also reported lower usage of barriers, such as dental dams, during oral sex, though this value was not significant. The literature shows that Black women report using condom at a rate higher

than other ethnic groups. This study, however, finds that the proportion of women who have reported to using condom during sex in the 12 months preceding the answering of the survey questionnaire is roughly equal across all ethnic groups. However, these values are not found to be significant.

Table 4 Results of univariate association between selected independent variables and mean numbers of sex partners in Hispanic, White, and Black women.

Independent Variables	Dependent variables								
	Number of Male Sex Partners/Lifetime								
	Hispanics			Non-Hispanic Whites			Non-Hispanic Blacks		
	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>
<i>Age</i>	0.02	0.84	0.40	-0.02	-0.70	0.49	-0.06	-1.26	0.21
<i>Annual Family Income</i>	-0.04	-0.21	0.83	-0.44	-1.58	0.11	-0.10	-0.23	0.81
<i>Marital Status</i>	0.41	3.16	0.00	0.94	4.87	0.00	0.48	1.70	0.09
<i>Education</i>	0.83	3.34	0.00	0.21	0.57	0.57	-0.16	-0.30	0.76
<i>Health Insurance Coverage</i>	-0.57	-0.84	0.40	-0.09	-0.10	0.92	-0.52	-0.36	0.72

	Number of Women Sex Intercourse Partner/Lifetime								
	Hispanics			Non-Hispanic Whites			Non-Hispanic Blacks		
	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>
<i>Age</i>	0.00	-1.94	0.05	-0.01	-1.76	0.08	-0.02	-1.86	0.06
<i>Ann Family Income</i>	0.00	-0.08	0.94	-0.14	-1.82	0.07	-0.14	-1.30	0.20
<i>Marital Status</i>	-0.14	-3.50	0.00	-0.05	-0.39	0.70	-0.28	-1.77	0.08
<i>Education</i>	0.05	2.39	0.02	-0.07	-1.02	0.31	-0.91	-0.73	0.47
<i>Health Insurance Coverage</i>	-0.04	-0.60	0.55	0.05	0.26	0.79	-0.33	-0.92	0.36

P < 0.05 level

As found in a study, having 4 or more lifetime sexual partners is closely associated to the habits of oral and anal sex, both important predictors of risk for sexually transmitted infections including HIV (Van Wagener et al., 2011). This study analyzed the role that certain demographic characteristics plays in the average number of sexual partners a woman takes

over her lifetime. As far as the mean number male sexual partners are concerned, this study found, that marital status plays a significant role across race, though only marginally in African American women. Education level also seems to be an important factor in Hispanics.

When it comes to the average number of women that survey participants have sexual intercourse with over their lifetime, age seems to have a very small but somewhat significant role in that category ($P=0.08$ and 0.06) for Whites and Blacks respectively. Marital status also appears to protect women from STIs.

Table 5. Results of multivariate association between selected independent variables and the mean number of sex partners in Hispanic, White, Black women.

Independent Variables	Dependent variables								
	Number of Male Sex Partners/Lifetime								
	Hispanics			Non-Hispanic Whites			Non-Hispanic Blacks		
	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>
<i>Age</i>	-0.01	-0.27	0.79	-0.09	-1.52	0.13	0.01	0.11	0.91
<i>Annual Family Income</i>	-0.40	-1.51	0.13	-1.03	-3.34	0.00	-0.96	-2.45	0.02
<i>Marital Status</i>	-0.80	-1.04	0.30	3.99	4.09	0.00	-0.33	-0.31	0.76
<i>Education</i>	1.10	3.05	0.00	0.03	0.05	0.96	-1.02	1.35	0.18
<i>Health Insurance Coverage</i>	1.05	0.84	0.40	-1.17	-0.73	0.47	-3.92	-2.03	0.04

	Number of Women Sex Intercourse Partner/Lifetime								
	Hispanics			Non-Hispanic Whites			Non-Hispanic Blacks		
	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>	<i>UnStd. Coef. B</i>	<i>t-test</i>	<i>P value</i>
<i>Age</i>	-0.01	-1.26	0.21	-0.02	-1.40	0.16	-0.01	-0.22	0.83
<i>Annual Family Income</i>	-0.01	-0.37	0.72	-0.17	-2.04	0.04	-0.16	-1.35	0.18
<i>Marital Status</i>	-0.24	-3.13	0.19	0.08	0.29	0.77	-0.53	-1.70	0.09
<i>Education</i>	0.05	1.33	0.00	0.30	1.84	0.07	0.22	1.04	0.30
<i>Health Insurance Coverage</i>	0.02	0.13	0.90	0.03	0.08	0.94	-0.66	-1.16	0.25

P <0.05 level

This section of the analysis calculates the effects of mean number of sexual partners for

each independent variable while controlling for all others. Income appeared to be a protective factor against having high average number of sexual partners of either sex for Whites while this seems to be true for African American women only for the average number of male sex partners. White women are found to have higher number of male sexual partners regardless of their marital status. Level of education has no effects on lowering the number of sexual partners in Hispanics. Finally, health insurance coverage is an important protective factor in African American women as far as the average number of male sexual partners is concerned.

Chapter V – Discussion

Discussion

The aim of this study was to explore the literature and analyze available datasets for evidence that African American women as a group have more risk factors than White and Hispanic women. As stated earlier, the CDC made recommendations to clinicians and other public health professionals for HIV testing based on a certain risk profile. Originally released in 1993 and revised in 2001, individuals with a history of injected drug use and sharing equipment, and those who have unprotected sexual intercourse are deemed to be at high risk of contracting HIV. A high risk person is someone who injects drugs, or has been diagnosed with an STI, or had multiple anonymous sex partners, or has offered and taken money for sex or drug. Other risk factors that clinicians and other health care providers should consider are multiple sex partners, and a diagnosis of at least one other STI (CDC, 2001). These risk factors

formed the basis of the programs that successfully reduced HIV incidence among MSM throughout the 1990s and into the current millennium.

Public health programs aimed at reducing new cases of HIV have not yielded the desired results in the African American community more specifically for women. As shown in the revised recommendations put forward by the CDC in the beginning of the last decade, the risk based approach for HIV testing was a major element of the HIV reduction programs going forward. Although the face of the HIV epidemic has changed from White MSM to African American men and women, yet the approach to controlling the spread of the disease for the most part remained the same. Since African American women have the highest rate of HIV among women of any other ethnic groups, the assumption is that the literature and analysis of data available from NHANES would support the following hypotheses:

- A- Certain risk behaviors such as intravenous drug use are more frequent among African American women than women of other ethnic groups.
- B- African American women have high number of sex partners and therefore less likely to know about their risk behaviors and HIV status.
- C- African American women have higher rates of HIV because they have more high risk heterosexual contacts than Whites and Hispanic women.
- D- African American women have more of the other risk factors associated with HIV infection than women of other ethnic groups.

The fact that the percentage of African American women who get infected with HIV can be as much as 4 times the rate of Hispanics women and 19 times the rate of Whites women is

supported in the literature. So, the aim of this study was to search the literature for evidence that, when compared to Whites and Hispanic women, African American women as a group possess more of the risk behaviors that are associated with increased risk of infection with HIV. This study also looked into the NHANES surveys for data that corroborate the evidence found in the literature.

As far as illegal drugs are concerned, the study searched the literature for evidence and analyzed available dataset for drug use by women to see how African Americans compare to Whites and Hispanics. Evidence from published studies suggests that African American women do not use illegal drug at the rate that White women do, including those taken intravenously. These findings are supported by the NHANES survey. African Americans are found to have higher use of heroin. Even though the literature points to much lower number of lifetime sex partners by African Americans, the NHANES surveys do not show a significant difference. This study observes a similar pattern when participants were asked about their use of condom during sex. The literature and the NHANES surveys are in agreement that this study found more Whites women to have other risk behaviors such as oral and anal sex. There is, however, one set of risk factors where African Americans women reported higher rates. The rates of Gonorrhea, and Chlamydia in African Americans women were fourteen times and five times higher than Whites respectively.

Single and multiple linear regression analysis were performed in order to see if there is any single independent variable or multiple variables driving the two important risk behaviors of HIV infection in African American women – the number of male sexual partners/lifetime and

the number of women sex intercourse partner/lifetime. The regression analyses did not yield many significant results except that income appears the one variable, though not always significant, to have a protective effect against involvement in risk behaviors in all the groups. This result further supports the argument that socioeconomic context may play a larger role than individual behavior in the rate of HIV infection.

Compared to MSM, studies that address the disproportionate effects of HIV among African American women have been lacking since incidence of HIV in 46 states and 5 districts that allow name based confidential reporting has remained stable between 2007 and 2010 (CDC.,2012). There are 1.0-1.2 million in the US living with HIV and approximately a quarter of those are unaware of their infection making easy for them to transmit the virus to others (Walensky et al., 2007). For many years, the number of new cases of HIV total over 40,000 per year and that incidence has remained constant suggesting that the epidemic has matured in the US (Prejean et al., 2011, Holtgrave, D., 2007). These findings highlight the limits of the efficacy of the programs aimed at reducing HIV incidence among the population. The effectiveness of the approach that recommends health care providers would have to first verify the existence of at least one HIV risk factor among those seeking care before referring them for HIV testing has been challenged for fear that a large portion of the infected population would be missed (Walensky et al., 2007). In this study, Walensky and his colleagues show the cost benefits of a testing plan that makes the HIV test accessible even to those being missed by risk based method that forms the basis of the CDC recommendations.

The lack of progress toward lowering the incidence of HIV among African Americans who, in

2009, accounted for over 60 percent of the new cases has been evident for some time now. The practice among health care providers where only those that acknowledge at least one risk factor are referred for testing has been successful only to a certain point. The constant rate of infection with STDs including HIV among African Americans despite the existence of prevention strategies has been the focus of some research. This research draws attention to the shortcomings of the prevention programs which solely focus on individual factors. Similarly, Adimora and Schoenbach (2005) points out that there are several other factors, all of them beyond the control of African American women, that are associated with high rate of infection with STIs including HIV. In the same research study, Adimora and Schoenbach argue that programs that address risk factors alone are unlikely to make a significant difference in reducing incidence of HIV among African American. Furthermore, they stress the need for collective intervention that joins politicians, anthropologists, sociologists, economists, urban planners, and others to public health professionals in order to address the “macro” factors such as racial segregation, lower male to female ratio in the Black community, high rate of incarceration among Black males, poverty and drugs that affect the African American communities. Other studies drew similar conclusions that wider social contexts seem to have a role in the rates STIs including HIV among African American women (Hogben & Leichter, 2008).

The lack of relationship between individual risk behaviors and disease transmission becomes clearer in this study when it found a general lack of difference in risk behaviors and other practices between African American women and the other two largest ethnic groups,

namely Whites and Hispanics. Tillerson (2008) performed a systematic review of the literature searching for evidence of higher proportions of individual risk factors among African American women compared to Whites and Hispanic. She found that White women report risky behaviors more often than African Americans and Hispanics in most categories. Her findings are in agreement with this study in that factors on the individual level are insufficient to explain the elevated rates of STIs infections that are confirmed among African American women.

Strength and limitations

This study uses NHANES data collected between 2003 and 2010. The strength of this data lies in the fact that the study sample is a national representative. The participants are chosen from different racial background, age groups, and geographical locations throughout the United States. African Americans, Hispanics, and seniors are oversampled in order increase reliability. Besides, the staffs conducting this survey are highly trained and these are quality control measures imbedded in the collection methods, which increase confidence in the quality of the data. The sample size is another feature that speaks to the power of this data set. NHANES surveys 5,000 people every year from a wide range of backgrounds, which is far larger and more diverse than other surveys. These features help allay the negative effects of biases. However, there are inherent limitations to secondary data such as NHANES. First of all, the NHANES data was collected for purposes other than the aim of this study. Therefore, some of the more desirable data aren't present in the data set. Similar to all secondary data source that includes questionnaires recall bias affects the reliability of the data in that patients are asked to recall events or conversations that occurred years ago. Another issue with this type of data is

the high number of non-response to certain questions that respondents may find a little too invasive. This study does not assess risky behaviors of the male partners of the participants through data analysis.

Implications

This study searches the literature for evidence that refutes the hypothesis that African American women are infected with higher rates of STI and HIV because they have higher individual risk behaviors. The results from NHANES data analysis support literature findings. Since research in factors that affect the rate of HIV infection in this specific subgroup is lacking, this study adds to the body of knowledge on an issue that need serious and immediate attention from professionals within public health and beyond.

Conclusion

This study adds to a number of other research studies that point the inadequacies of the approach that rely on individual behavior alone as a way of assessing risks of infection with HIV. Furthermore, this study finds that certain individuals and even groups with riskier profiles do not necessarily end up with higher rates of sexually transmitted infections. For instance, African Americans women report lower risk profiles than Whites for most of the factors known to be associated with HIV infection. However, White women have the lowest rate of HIV of the three groups that were compared in this study. More efforts are needed to include policy makers, social scientists, and other stake holders in the efforts by public health scientists to create policies capable of addressing the social and economic factors that may influence the conditions that drive HIV infection in African American women.

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