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Rates of Smoking and Visitations to Healthcare Facilities among People Living with HIV in Higher-risk vs. Lower-risk areas in Atlanta, Georgia

Brittani Carter

ABSTRACT

RATES OF SMOKING AND VISITATIONS TO HEALTHCARE FACILITIES AMONG PEOPLE LIVING WITH HIV IN HIGHER-RISK VS. LOWER-RISK AREAS IN ATLANTA, GEORGIA

by

BRITTANI P. CARTER

April 18th, 2017

INTRODUCTION: The rate of smoking is significantly higher among people living with HIV (PLWH) in comparison to the general population (CDC, 2017b; Humfleet et al., 2009). Tobacco use among PLWH heightens the risk for HIV-related symptoms and is a pertinent public health issue. Smokers living with HIV are also more likely to develop non-AIDS-related illness in comparison to non-smokers living with HIV. Smoking cessation interventions are desperately needed to cater towards PLWH. This warrants the need for patient-provider interactions in healthcare facilities regarding smoking cessation.

AIM: To document rates of smoking and visitations to healthcare facilities among persons living with and without HIV in higher vs. lower-risk areas and to examine associations among healthcare visitations, stressors, and smoking in these sub-samples (i.e., PLWH in higher-risk areas, PLWH in lower-risk areas, people without HIV in higher-risk areas, people without HIV in lower-risk areas).

METHODS: Secondary analyses were conducted using data from a network-based, HIV endemic study that was conducted in Metro Atlanta (Rothenberg, Dai, Adams & Heath, 2017). The study included 927 participants from 10 Atlanta zip codes (5 lower-risk and 5 higher-risk based on reported HIV cases). Participants provided information on their smoking status and healthcare visitations, as well as whether they had experienced several stressors (e.g., violence, homelessness, being threatened with a weapon, lack of transportation). Descriptive analyses and frequency distributions were conducted and presented on key variables. Logistic regression analyses were conducted to examine associations between key variables and smoking.

RESULTS: Overall, the rate of smoking was quite high in this study. Seventy-four percent of the sample smoked, which is almost five times the smoking rate among the general adult U.S. population (CDC, 2016a). The smoking rate was strikingly high among PLWH in the higher-risk areas (95%). In unadjusted analyses, participants who were older, male, homeless, and do not drive their own car were more likely to smoke. In the adjusted analyses age, gender, and lack of transportation remained significant predictors of smoking. Visitations to healthcare facilities were not significantly associated with smoking or other variables in this study.

DISCUSSION: Smoking appears quite common among PLWH, especially those living in

higher-risk areas. This study provided important information on the extent to which persons living with and without HIV in higher and lower-risk areas of Atlanta are receiving healthcare services, as well as how demographic factors and stress relate to smoking in these sub-samples. Future research is needed to develop and disseminate effective smoking cessation programs among smokers living with HIV.

KEYWORDS: smoking, people living with HIV, zip codes, HIV, Atlanta, PLWH

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by

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APPROVAL PAGE

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Author's Statement Page

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TABLE OF CONTENTS

List of Tables

CHAPTER I

INTRODUCTION

1.1 Background

Accounting for nearly 500,000 deaths per year, smoking is the leading cause of preventable death in the United States (Centers for Disease Control and Prevention [CDC], 2016a; CDC, 2016c). Although steadily declining, in 2015 approximately 15% of the adults over the age of 18 were current cigarette smokers (CDC, 2016c). Smoking can lead to detrimental health problems such as asthma, heart disease, cancer, and respiratory issues (CDC, 2016a; Cui et al., 2010). The World Health Organization [WHO] has reported that nearly 6 million people die from the adverse health effects of smoking each year (2017a). Human Immunodeficiency Virus (HIV) involves the progressive deterioration of the immune system (CDC, 2016b). When HIV is acquired, CD4 cells or T-cells are nearly destroyed which diminishes the body's chances of fighting off infections and diseases (CDC, 2016b). HIV can be transmitted through breast milk, vaginal secretions, semen, and blood (CDC, 2016b). If left untreated the latter stage of HIV, Acquired Immunodeficiency Disease Syndrome (AIDS), may arise (CDC, 2016b). In the U.S., approximately 1.2 million people were living with HIV by the end of 2013 (CDC, 2017a). In 2015, nearly 40,000 people were newly diagnosed with a positive HIV status and, by the end of 2015, more than 36 million people were living with HIV worldwide (CDC, 2017a; WHO, 2017b).

Smoking rates are disproportionately high among people living with HIV (CDC, 2017b; Humfleet et al., 2009; Reynolds, 2009; Vidrine, 2009). People living with HIV smoke nearly three times the smoking rate of the U.S general population (Bean, Richey, Williams, Wahlquist, & Kilby, 2016; CDC, 2017b; CDC, 2016c; Cui et al., 2010; Horvath, Eastman, Prosser,

Goodroad & Worthington, 2012; Reynolds, 2009; Shirley, Kaner & Glesby, 2013; Tesoriero, Gieryic, Carrascal, & Lavigne, 2010). People living with HIV (PLWH) are particularly vulnerable to the adverse health outcomes of smoking (CDC, 2017b; Cui et al., 2010; Horvath et al., 2012; Shirley et al., 2013). Smoking exacerbates the rates of smoking-related illnesses, comorbidities, and mortality rates among people living with HIV (Bean et al., 2016; CDC, 2017b; Shirley et al., 2013). Smokers living with HIV are more likely to develop Pneumocystis pneumonia (lung infections), thrush (mouth infections), hairy leukoplakia (white sores in the mouth), chronic obstructive pulmonary diseases (COPD), and complicated respiratory issues in comparison to nonsmokers living with HIV (CDC, 2017b; Cui et al., 2010; Humfleet et al., 2009; Rahmanian et al., 2011; Shirley et al., 2013). Studies suggest that smoking among PLWH doubles the risk of cryptococcosis, which is a pulmonary yeast-like fungus that causes tumors to develop in the lungs and brain (Burkhalter, Springer, Chabra, Ostroff & Rapkin, 2005; Vidrine, 2009). Smoking among PLWH is also associated with an increase in non-AIDS-related illnesses (Helleberg et al., 2013; Pacek & Crum, 2015; Patel et al., 2008; Shirley et al., 2013). Studies have shown that the probability of death from non-AIDS-related ailments was five times higher among smokers living with HIV in comparison to PLWH who never smoked (Helleberg et al., 2013). Furthermore, research has shown that lower respiratory infections relating to tobacco use is one of the leading causes of morbidity among PLWH (Miguez-Burbano et al., 2005).

Rates of both smoking and HIV are more prevalent among individuals with low socioeconomic status and those living in the southeastern parts of the United States (Bean et al., 2016; CDC, 2016c; Lazev, Vidrine, Arduino & Gritz, 2004; Stewart, Jones & Minor, 2011). According to the U.S Census, among the four geographical regions (Northeast, Midwest, South, and West), cigarette smoking was highest among those living in the Midwest region and

southern region (CDC, 2016c). In 2015, approximately 18% of adults living in Georgia were current smokers (CDC, 2016c). This percentage alone is higher than the rate of adult smokers who lived in the South in 2015 (15.3%; CDC, 2016c). In the U.S., southern states are disproportionately affected by the HIV epidemic (Bean et al., 2016; Gray et al., 2016; Kalichman et al., 2012; Reif et al., 2014). Approximately 50% of HIV diagnoses were reported in the South in 2011 (Reif et al., 2014). Among U.S. cities, the City of Atlanta carries one of the greatest burdens of HIV (Gray et al., 2016; Kalichman et al., 2012). The Georgia Department of Public Health [GDPH] noted that in 2014, 66% of people living with HIV resided in the Metro Atlanta area ("Data, Fact Sheet & Summaries", n.d.).

Ethnic minorities are also disproportionately affected by the health effects of both smoking and HIV (CDC, 2016c; CDC, 2015). In comparison to other racial/ethnic groups, African Americans are more likely to be affected by HIV and more likely to initiate smoking at a later age (CDC, 2017c; CDC, 2016d). Despite the fact that African Americans smoke less and are delayed in their onset of smoking, they are more likely to develop and die from to smoking-related illnesses in comparison to non-Hispanic whites (CDC, 2016d; Fagan, Moolchan, Lawrence, Fernander & Ponder, 2007). Research has shown that African Americans reported more quitting attempts, but were less likely to successfully quit smoking than non-Hispanic whites and Hispanic smokers (CDC, 2016d). Lack of utilization of smoking cessations services may be one reason for lower quit rates among African American smokers (CDC, 2016d). Studies have also shown that in comparison to non-Hispanic whites, African Americans and Hispanics indicated higher levels of perceived stress and depressive symptoms (Hooper & Kolar, 2015). Higher stress and depressive symptoms may be prominent reasons for difficulty with smoking cessation among African Americans (Hooper & Kolar, 2015). Research also suggests that

African American smokers are more vulnerable to the adverse health outcomes related to smoking, which can intensify depressive symptoms (Payne, Ma, Crews, & Li, 2013; Sims et al., 2016). The current study will examine rates of smoking, stressors, and visitations to healthcare facilities in a predominantly African American sample.

1.2 Purpose of study

The present study sought to examine the rates of smoking, exposure to specific stressors, and visitations to healthcare facilities among a predominately African American sample living in higher-risk and lower-risk areas in Atlanta, Georgia. This study involves secondary data analyses of the HIV Endemic study conducted by Rothenberg, Dai, Adams, and Heath (2017). Higher-risk areas were defined as zip codes with higher reported cases of HIV in Atlanta, Georgia. It is hypothesized that people living with HIV in higher-risk (vs. lower-risk) areas will report less frequent healthcare visitations and higher rates of smoking. It is also hypothesized that greater exposure to specific stressors will be associated with greater smoking and fewer healthcare visitations.

CHAPTER II

LITERATURE REVIEW

2.1 Smokers Living with HIV

Smoking among people living with HIV (PLWH) is a critical public health issue. Research suggests that as many as 70% of PLWH are current smokers (Lazev et al., 2004; Rahmanian et al., 2011; Reynolds, 2009). Studies found that smokers living with HIV are more likely to develop intensified health complications in comparison to non-smokers living with HIV (Mdodo et al., 2015; Reynolds, 2009; Vidrine, 2009). Smoking causes an array of adverse health outcomes in the general population, but among PLWH smoking poses the additional risk of detrimental HIV-related comorbidities, which can ultimately result in premature death (Reynolds, 2009). Specifically, from the combination of smoking and having a compromised immune system, smokers living with HIV are more likely to suffer from emphysema, acute bronchitis, and life-threatening pulmonary diseases (Reynolds, 2009). In general, evidence has shown that cancers of the lung, head, and neck are more common among smokers living with HIV in comparison to smokers living without HIV (Vidrine, 2009).

Vidrine (2009) examined the extent of adverse health outcomes related to smoking among PLWH. For example, cardiovascular disease (CVD), anal cancer, and cervical cancer pose significant risk among PLWH (Mdodo et al., 2015; Vidrine, 2009). In comparison to people living without HIV, PLWH are at heightened risk of developing CVD (Pacek & Crum, 2015). The use of highly-active antiretroviral therapy (HAART) heightens the risk of CVD for PLWH (Burkhalter et al., 2005; Mdodo et al., 2015; Modrich et al., 2010; Pacek & Crum, 2015; Vidrine, 2009). HAART is a combination of medications aimed to reduce the transmission of

HIV by suppressing viral loads (CDC, 2017d). Studies have shown that smoking while using HAART may result in a decline its effectiveness by 40% (Pacek & Crum, 2015). Although HAART serves an essential purpose in decreasing the transmission of HIV, future research should focus on the ailments associated with its use (Modrich et al., 2010). Smoking among PLWH not only increases the likelihood of a number of illnesses, but also compromises health-related quality of life (Vidrine, 2009). The CDC defines health-related quality of life (HRQOL) as one's perception of physical and mental health over time (2016e). Research suggests that HRQOL among smokers living with HIV is lower in comparison to nonsmokers living with HIV (Harris, 2010; Humfleet et al., 2009; Pacek & Crum, 2015; Vidrine, 2009). This warrants the need to improve HRQOL among smokers living with PLWH (Vidrine, 2009).

In relation to quality of life, Helleberg and colleagues (2013) examined mortality rates among 2921 smokers living with HIV in Denmark. In a matched-cohort study, researchers assessed life expectancy, life-years lost, and population attributable risk (PAR). Mortality was calculated based on the number of deaths per 1000 person-years. Results suggested that in comparison to non-smokers living with HIV, smokers living with HIV had more non-AIDS-related deaths. Smoking clearly contributes to the progression of HIV-related symptoms and increases likelihood of premature death (Helleberg et al., 2013; Reynolds, 2009; Vidrine, 2009). Helleberg et al. (2013) also found that smokers living with HIV lost more life-years from smoking than from HIV-related symptoms. Although the prevalence rates of HIV in Denmark were comparatively low in comparison to the United States, it sets a precedent for future studies to examine morbidity and mortality rates among smokers living with HIV (Helleberg et al., 2013).

Extensive research has focused on assessing the social determinants related to adverse

health outcomes among smokers living with HIV. Reynolds (2009) described various factors that may contribute to cigarette smoking among PLWH. Smoking is especially common among marginalized populations of PLWH (e.g., non-Hispanic Blacks with low socioeconomic status). Research has shown that dealing with stressful life events such as being involved in, or witnessing acts of racism and discrimination are associated with increased rates of cigarette use (Hooper & Kolar, 2015; Pacek & Crum, 2015; Sims et al., 2016; Stewart et al., 2011). Studies have shown that stressors such as poverty, stigmatization, and loneliness are barriers to smoking cessation among smokers living with HIV (Pacek & Crum, 2015). Among African Americans, smoking may serve as an ineffective mechanism for coping with stressors such as limited access to resources, discrimination, and financial instability (Hooper & Kolar, 2015; Sims et al., 2016; Stewart et al., 2011).

Psychological disorders such as depression may also influence smoking behaviors among PLWH (Niaura et al., 2000; Reynolds, 2009; Stewart et al., 2011). Studies suggest that up to 32% of smokers living with HIV reported currently being depressed; this was nearly three times higher than depression rates among the general population (Niaura et al., 2000; Pacek & Crum, 2015; Reynolds, 2009). Research has shown that there is an association between depression and smoking (Berg et al., 2012; Hooper & Kolar, 2015; Payne et al., 2013). Specifically, smokers reported higher levels of depression in comparison to non-smokers (Berg et al., 2012; Payne et al., 2013). Studies have also shown that depression and smoking co-occur among PLWH (Stewart et al., 2011; Tesoriero et al., 2010). Depressive symptoms can decrease the likelihood of smoking cessation (Anda et al., 1990; Berg et al., 2012; Vidrine, 2009). Researchers theorized that the population of smokers living with HIV will steadily increase as more individuals are being diagnosed with the virus and linked to care, which suggest that there is a critical need for

additional smoking cessation resources specifically tailored for smokers living with HIV (Bean et al., 2016; Reynolds, 2009).

2.2 Smoking Cessation and PLWH

With the advancement of medications to prevent the transmission and acquisition of HIV, the virus is no longer seen as a death sentence (Cui et al., 2010; Lazev et al., 2004; Niaura et al., 2000; Patel et al., 2008; Rahmanian et al., 2011; Vidrine, 2009). The use of HAART is essential for viral suppression among PLWH. Smoking cessation is imperative to the quality of life and positive health outcomes among PLWH (Cui et al., 2010; Harris, 2010; Humfleet et al., 2009; Lazev et al., 2004; Pacek & Crum, 2015; Vidrine, 2009). There is a dire need for smoking cessation resources, treatments, and interventions for PLWH (Pacek & Crum, 2015; Harris, 2010; Reynolds, 2009; Vidrine, 2009; Niaura et al., 2000). Research has shown that in comparison to smokers in the general population, PLWH receive less information and consideration from healthcare providers regarding smoking cessation (Pacek & Crum, 2015).

Smoking cessation interventions for smokers living with HIV may include face-to-face counseling, group counseling, and counseling using technology (e.g., online, mobile health interventions; Murray, Bauld, Hackshaw & McNeill, 2009; Pacek & Crum, 2015). Research suggests that up to 75% of PLWH are interested in reducing or quitting smoking (Pacek & Crum, 2015; Tesoriero et al., 2010). Through the creation of smoking cessation interventions for PLWH, studies have shown that counseling and nicotine replacement therapy (NRT) were realistic and appealing (Lazev et al., 2004; Pacek & Crum, 2015; Vidrine, 2009). Research has shown that smokers living with HIV who received a combination of counseling and NRT were more likely to engage in smoking cessation in comparison to smokers in a control group (Pacek & Crum, 2015). Research has also focused on motivation to quit smoking among PLWH (Burkhalter et al., 2005; Niaura et al., 2000). Research has shown that among the general

population, nearly 80% of smokers living with HIV are not motivated to quit within the next month (Niaura et al., 2000). Studies suggest that receiving motivation from healthcare providers can significantly increase willingness and readiness to quit smoking among PLWH (Burkhalter et al., 2005). Research has shown that smoking cessation programs among PLWH can be efficacious if issues such as depression and motivation are addressed (Tesoriero et al., 2010).

To encourage consistent adherence with antiretroviral medications, PLWH are advised to frequently visit healthcare facilities (Niaura et al., 2000). Thus, it is essential for this population to have access to adequate healthcare services, transportation, and health insurance. In addition, there is a need for clinical guidelines regarding conversations about smoking cessation with PLWH in healthcare settings. Despite the desperate need for these conversations, research has shown that healthcare providers and PLWH do not perceive cigarette use as a pertinent issue (Pacek & Crum, 2015). However, healthcare facility visits present important opportunities for healthcare providers to speak with PLWH about strategies for smoking cessation (Niaura et al., 2000; Pacek & Crum, 2015).

Smoking clearly impacts health and quality of life among PLWH. Some research suggests that readiness to quit smoking is a challenge among this subpopulation (Niaura et al., 2000). On the other hand, some studies have shown that up to 75% of smokers living with HIV are interested in smoking cessation (Horvath et al., 2012; Pacek & Crum, 2015). Unfortunately, there is a dearth of information on how smoking cessation interventions should be tailored to target the negative health impacts this population is facing (Grover, Gonzalez & Zvolensky, 2013; Harris, 2010; Niaura et al., 2000; Pacek & Crum, 2015; Reynolds, 2009; Vidrine, 2009).

2.3 Healthcare Services

Lack of access to adequate healthcare often poses a significant barrier among PLWH, particularly among those with low socioeconomic status or lack of consistent transportation

(Lazev et al., 2004; Stewart et al., 2011). These barriers not only hinder PLWH from seeking healthcare services related to their HIV treatment, but also limits the opportunity for conversations about smoking cessation. Despite the need for patient-provider conversations about smoking behaviors among PLWH, there is still a dearth of information about how best to have these conversations during medical visits with PLWH (Horvath et al., 2012).

Horvath et al. (2012) examined physicians' beliefs about smoking cessation services for their patients living with HIV and patients' attitudes regarding the smoking cessation services their physician provided. These services included: brief advice to quit smoking, prescribing medications, outside resources (referrals), and nicotine replacement therapy. Oftentimes, interactions between the patients and providers avoided conversations regarding smoking cessation completely. One theme that emerged was that the patients did not feel that their physicians were capable of helping them to change their smoking behavior; the patients were not confident in their physician's ability to help them quit smoking (Horvath et al., 2012). Similarly, more than 50% of physicians reported that they lacked the confidence to provide adequate resources to assist their patients with smoking cessation (Horvath et al., 2012; Pacek & Crum, 2015). Patients also reported that not only were there time constraints during HIV consultation visits, but during the visits the primary discussions being held were regarding their HIV status (i.e., not about their smoking or other health-related concerns).

The majority of physicians reported engaging in a five-minute or less conversation encouraging their patients to quit smoking, but many physicians believed that it was their duty to assess the events that were occurring in their patients' lives first, before engaging in conversations regarding smoking cessation. Despite the mixed opinions from patients and providers, the most common attitude among providers was the belief that cigarette smoking was

an issue among their patients living with HIV. Physicians and patients living with HIV were aware of the adverse health outcomes related to smoking, however there was a lack of consistent conversation which warrants the need for further investigation (Horvarth et al., 2012).

Kalichman et al. (2012) conducted a study to assess the access and utilization of health services for PLWH in Atlanta, GA. Researchers assessed 45 HIV-related services in the City of Atlanta. Healthcare services were described as basic needs, mental health resources, and support services. Lack of transportation services was one of the common unmet needs among PLWH; this is vital to the wellbeing of PLWH because access to transportation limits access to healthcare facilities. This aligns with recent research suggesting that in comparison to non-smokers, smokers living with HIV reported less frequent visits to outpatient healthcare facilities (O'Cleirigh et al., 2015). Research has also shown that stressors such as lack of food supply, hunger, and homelessness are related to adverse health outcomes associated with HIV (Kalichman et al., 2012).

Kalichman et al. (2012) sampled 654 predominantly African Americans living with HIV. These participants had low levels of education and income (Kalichman et al., 2012). They expressed the need for adequate healthcare services in order to meet basic survival needs including food, housing, and transportation (Kalichman et al., 2012). As the HIV epidemic continues, it disproportionately affects African Americans in comparison to any other racial or ethnic group (CDC, 2017c; CDC, 2015; Stewart et al., 2011). In order to work toward the elimination of health disparities, it will be critical to increase healthcare access for underserved populations including low-income African Americans living with HIV.

2.4 Smoking and HIV among African Americans

African Americans comprise only 13% of the U.S. population, yet account for the highest rates of HIV (CDC, 2015). In 2015, approximately 18,000 African Americans were diagnosed

with HIV, which accounted for nearly 45% of HIV cases in the United States (CDC, 2017c). Although African Americans are more likely to have a delayed onset in smoking, they are more likely to suffer from smoking-related illness in comparison to non-Hispanic whites (CDC, 2016d; Fagan et al., 2007). In 2013, nearly 30% of African American adults reported they were current smokers (CDC, 2016d). African American smokers living with HIV are at heightened risk for adverse health outcomes (Payne et al., 2013; Sims et al., 2016). According to the CDC, tobacco use is one of the primary causes of death among African Americans (2016d). Heart disease, cancer, and stroke are the three leading causes of death among members of the African American community, all of which are increased by smoking (2016d).

In a retrospective cohort study of 125 participants, Thakur, Lyons, Smith, Shinohara & Mateen (2016) found that African Americans were twice as likely to suffer from a stroke in comparison to non-Hispanic whites. Among this predominantly African American sample (84%), 66% reported being current smokers. Previous studies have shown that cigarette use among PLWH causes more health consequences than in comparison to the general population (Bean et al., 2016; CDC, 2017b; Cui et al., 2010; Horvath et al., 2012; Shirley et al., 2013). African Americans living with HIV may be at even greater risk for developing smoking-related illnesses than other racial/ethnic groups (Thakur et al., 2016).

Matthews, Conrad, Kuhns, Vargas & King (2013) examined the effectiveness of a smoking cessation program tailored towards HIV-positive, African American men who have sex with men (MSM) smokers. Forty-one participants were offered seven sessions of group-based treatment. The sessions involved education about health problems associated with smoking and HIV, discussion about barriers to smoking cessation and reasons for quitting, and culturally tailored motivation. Of the participants enrolled, 71% reported being daily smokers. After the

three-month follow-up, the percentage of participants who were regular smokers with high concentrations of carbon monoxide (21+ ppm) was lower than at baseline (approximately 50%; Matthews et al., 2013). It will be important to continue to tailor smoking cessation interventions to take into account cultural factors among specific priority populations (e.g., African Americans living with HIV).

2.5 Geography and HIV

Previous research suggests that rates of HIV are especially high in specific geographical locations (Gray et al., 2016; Reif et al., 2014). For example, HIV rates are much higher in Atlanta, GA compared to other major cities in the U.S (Gray et al., 2016; Kalichman et al., 2012; Rothenberg et al., 2017). Research has shown that Atlanta has reported more than 23,000 cases of AIDS (Kalichman et al., 2012). Taylor and colleagues (2006) assessed the rates of HIV testing behaviors among "higher-risk" zip codes in Los Angeles, California. Higher-risk zip codes were defined as zip codes where people reported engaging in higher-risk sexual behaviors (Taylor, Leibowitz, Simon, & Grusky, 2006). These higher-risk sexual behaviors included lack of consistent condom use and multiple sex partners within the last year (Taylor et al., 2006). Researchers found that a majority of participants living in higher-risk areas were predominantly African American. Research assessing zip codes as geographical locations to understand the prevalence of HIV prevention, acquisition, and transmission has steadily been increasing among researchers and will be thoroughly discussed below (Rothenberg et al., 2017; Taylor et al., 2006).

CHAPTER III
METHODS and PROCEDURE

3.1 Background

The HIV endemic study conducted by Rothenberg et al. (2017) assessed rates of HIV and associated risk behaviors in Atlanta, GA. A total of 927 participants were enrolled in this study. Variables such as networking relationships, geographic contiguity, and compound risk behaviors were assessed to determine and understand the transmission and maintenance of HIV. Rothenberg and colleagues reported zip codes in the Atlanta Metropolitan Statistical Area (MSA), which were divided to designate areas that were considered higher-risk vs. lower-risk, based upon reported rates of HIV at the beginning of the study. The higher-risk areas were 30318, 30314, 30310, 30315, and 30308 and the lower-risk areas were 30311, 30331, 30337, 30344, and 30349 (Rothenberg et al., 2017). This study was approved by the Institutional Review Boards at Emory University and Georgia State University.

The purpose of this thesis is to examine the rates of smoking and visitations to healthcare facilities among four sub-groups in the Rothenberg et al. (2017) study: 1) people living with HIV in lower-risk areas, 2) people living with HIV in higher-risk areas, 3) people living without HIV in lower-risk areas, and 4) people living without HIV in higher-risk areas. It is hypothesized that smoking rates will be highest among people living with HIV in higher-risk areas (vs. lower-risk areas) and that visitations to healthcare facilities will be less frequent among this subpopulation. This thesis also aims to examine the associations among healthcare visitations, stressors, and smoking among these four subgroups. It is theorized that exposure to these specific stressors (e.g., threatened with a weapon, homelessness, transportation, physical violence) will be associated with higher smoking rates and fewer healthcare visitations.

3.2 Participants

Participants were 927 adults from two connecting geographic areas in Atlanta, Georgia. The sample included 797 participants (398 in lower-risk areas and 397 in higher risk areas). The mean age for the males in the lower-risk and higher-risk areas was 34.2 and 32.0 (Rothenberg et al., 2017). The mean age for females in the lower-risk and higher-risk areas was 41.1 and 36.2 (Rothenberg et al., 2017). The rates of HIV were reported as 12% in the lower-risk areas versus 17% in the higher-risk areas. More than 90% of the sample was comprised of African Americans and more than 60% reported their marital status as single. Nearly 50% of the sample reported being unemployed and more than 20% of the participants living in higher-risk reported being homeless. Participants also reported rates of recreational drug use such as crack, heroin, and intravenous drug use. However, in the overall sample, more than 85% reported that they currently smoked cigarettes (Rothenberg et al., 2017).

3.3 Procedure

After 6 months of ethnographic assessments in the higher-risk and lower-risk areas, initial contact in the network was made with 30 individuals who acted as “seeds” (Rothenberg et al., 2017). These 30 seeds were eligible for this study if they were at least 18 years of age, willing to report their partners, and be engaged in risky health behaviors that may result in the acquisition of HIV. These risk behaviors were defined as “compound risk” which included engaging in a variety of sexual acts with multiple partners. These sexual acts included: having more than 10 different partners within the past 6 months, having more than 6 male partners within the past 6 months, intravenous drug use, anal sex in the past 6 months, engaging in sex work, and engaging in sex with a person who injects drugs. Researchers used a chain-link design to recruit participants for the study. Through this chain-link design, these seeds reported an

individual who would become the next person linked in the chain. Between 2006 and 2011, the interviews were conducted with the target population using a standardized survey instrument. The survey inquired about demographic information as well as location of continuous contacts, frequency of location visits, HIV testing behaviors, and drug use (Rothenberg et al., 2017). The items used for secondary data analysis in the current study are described below.

Study Measures

i. *Demographics*

Variables such as gender, race, and age were assessed.

ii. *Cigarette Use*

Participants were asked whether they were current smokers (yes/no).

iii. *HIV status*

Participants were asked to report their HIV status. Participants were asked the following: "Have you ever been told that you were infected with the AIDS virus (HIV)?" (yes/no).

iv. *Healthcare visitation*

Participants were asked the following: "When was the last time you were seen by a doctor or went to a health clinic?". This measure was coded on a 0-3 scale, with 0=*less than 6 months ago*, 1=*within the last 6 months to 1 year*, 2=*within the last 1 to 5 years*, and 3=*within the last 5 to 10 years*.

v. *Homelessness*

Participants were asked the following: "Do you think of yourself as homeless?" (yes/no). Depending on the response to the previous question, participants were asked the following: "How long have you been homeless?". This question was open-ended asking for the response to be coded as either in *days*, *weeks*, *months*, or *years*.

vi. *Transportation*

Participants were asked the following: “Which methods of transportation do you use?”. This measure was coded on an 0-8 scale where 0= *drive my own car*, 1= *get a friend to drive*, 2=*pay for a ride*, 3=*MARTA train*, 4=*use a cab*, 5=*walk*, 6=*bicycle*, 7=*other*, and 8=*MARTA bus*.

vii. *Violence*

Participants were asked to report specific aggressive behaviors that may have happened to them. Participants were asked the following questions: “Has anyone used a weapon against you in the past 6 months in a way that might have caused you harm?” (yes/no) and “Have you been in a physical fight (no weapon) with anyone in the past 6 months?” (yes/no).

3.4 Statistical Analysis

Descriptive analyses were conducted for age, gender, race, cigarette use, HIV status, healthcare visitation, homelessness, transportation, and violence. Frequency distributions are presented for each categorical variable, both for the overall sample and stratified by HIV status and higher-risk vs. lower-risk areas (i.e., PLWH in high-risk areas, PLWH in lower-risk areas, people without HIV in high-risk areas, people without HIV in lower-risk areas). The Chi-square test of independence was used for categorical variables and the Wilcoxon signed-rank test was used for continuous variables. Fisher’s exact test was used to calculate *p*-values for cells of a contingency table that were below 5. Monte Carlo estimate of exact method was used to accommodate for the time consuming process of computing exact tests. Next, because some of the sub-samples were relatively small, analyses were conducted comparing participants in higher-versus lower-risk areas (collapsed across HIV status) and comparing PLWH to those without HIV (collapsed across risk areas). Then, logistic regression analyses were conducted to examine whether key variables (i.e., demographic variables, HIV status, higher-versus lower-risk areas, and specific stressors) were associated with smoking status, both in univariate and

multivariate models. Odds ratios are reported with 95% confidence intervals. All statistical analyses were performed using SAS version 9.4.

CHAPTER IV

RESULTS

4.1 Participant Characteristics

The sample included a total of 891 adult participants. See Table 1 for participant characteristics. Interviews indicated that 456 (52.3%) were male, 414 (46.5%) were female, and 11 (1.23) "other". The sample under analysis included 96.63% Black (African Americans), 0.67% Black (Caribbean), 1.01% White, 0.45% Hispanic (Black), 0.22% Hispanic (White), 0.11% Native American Indian/Alaskan Native, 0.11% Asian/Pacific Islander, 0.56% Mixed, and 0.22% Other. For the purpose of these analyses, any race or ethnicity other than Black (African American) was categorized as "other". The ages of the participants were not normally distributed, therefore the median (IQR) is presented. For this sample, the median age was 36 (24, 47). Over 50% of the sample visited a healthcare facility within the last 6 months, and about 25% used the MARTA Bus Transit. Approximately 74% of the total sample smoked, and 20% had engaged in physical violence. Roughly 3% of the sample reported a positive HIV status.

Findings of analyses examining difference in key variables by the four subgroups (i.e., PLWH in high-risk areas, PLWH in lower-risk areas, people without HIV in high-risk areas, people without HIV in lower-risk areas) are depicted in Table 1. There were statistically significant differences across the four subgroups in terms of age, gender, race, smoking, being threatened with a weapon, being homeless, and transportation (see Table 1). The results depicted that 95% of PLWH in higher-risk areas smoked. Being that the number of people living with HIV in lower-risk areas was relatively small (n=4), Fisher's exact test were used to calculate p-values to examine the association between the key variables and sub-samples. Monte Carlo (MC) estimate of exact p-values method was used to calculate two variables: visitations to healthcare

facilities and transportation. Computing *p*-values for these variables rendered slowly and required an extensive amount of time, which prompted the need for MC exact test.

4.2 Associations between higher-risks and lower-risk areas

Results of analyses examining differences in key variables by higher-versus lower-risk areas are shown in Table 2. Among the 891 participants, 467 (52.41%) lived in higher-risk areas and 424 (47.59%) lived in lower-risk areas. There was a significant association between higher vs. lower-risk areas and smoking smoking status, p=0.03. Whereas 77.04% of participants living in higher-risk areas reported smoking, 69.54% of those living in lower-risk areas smoked. In addition, there were significant differences in age, gender, race, being threatened with a weapon, being homeless between participants living in higher-versus lower risk areas (see Table 2). Specifically, people living in higher-risk areas tended to be older, were more likely to report "other" gender, and "other" races/ethnicities. One interesting finding was that approximately 25% of people living in higher-risk areas reported being homeless in comparison to about 8% of people living in lower-risk areas. There was also a significant difference between people living in higher-risk areas vs. lower-risk areas and transportation, p=<.0001. Whereas 17% of people living in lower-risk areas reported driving their own car, only 5% of people living in higher-risk areas reported driving their own car. In addition, 20% of people living in lower-risk areas reported getting a friend to drive them to their destinations, in comparison to 8% of people living in higher-risk areas.

4.3 Associations between PLWH and people living without HIV

As shown Table 3, HIV status was analyzed on all key variables using the Chi-square test of independence. Among the sample, 867 (97.3%) were HIV-negative and 24 (2.7%) were HIV-positive. As depicted in Table 3, gender and age were the only variables that were significantly

different between PLWH and people living without HIV, p=<0.0001 and p=0.0142, respectively. PLWH were more likely to report "other" gender (29.17%) than people living without HIV (0.46%). PLWH were also more likely to be older than people living without HIV (see Table 3). There was no significant difference between HIV status and race, smoking, engaging in physical violence, being threatened with a weapon, being homeless, visitations to healthcare facilities, nor lack of transportation.

4.4 Associations between key variables and smoking (unadjusted analyses)

Univariate logistic regression analyses examined associations between variables of interest and smoking (see Table 4). Crude odds ratios were calculated for each of the key variables and their association with smoking. Variables such as gender, age, homelessness, and transportation were statistically significant in predicting smoking. In regards to gender, males were more likely to smoke than females (*OR*: 1.716, 95% *CI*: 1.260-2.339, p=0.0019). In addition, being homeless significantly increased the odds of smoking (*OR*: 1.793, 95% *CI*: 0.2126-7.5449, p=0.0060). The odds of smoking among people who drove their own car is statistically different from those who use the MARTA bus (*OR*: 0.435, 95% *CI*: 0.263-0.719, p=0.0072).

4.5 Multivariate analysis of associations between key variables and smoking

Multivariate logistic regression analysis was performed to examine adjusted associations between key variables and smoking (see Table 5). After adjusting for all other variables, only age, gender, and transportation were significantly associated with odds of smoking. Older participants were more likely to be smokers (*AOR*: 1.024, 95% *CI*: 1.010 -1.309, p=0.0008). Men were more likely to smoke (*AOR*: 1.451, 95% *CI*: 1.048 -2.010, p=0.0250). In addition, after adjusting for other variables, participants who indicated driving their own car were less likely to

be smokers than people who use the MARTA Bus (*AOR*: 0.462, 95% *CI*: 0.276 -0.773, *p*=0.0033). Side-by-side comparison of unadjusted versus adjusted analyses predicting smoking status are shown in Table 6.

Table 1

Descriptive statistics stratified by HIV status and higher vs. lower-risk areas (N=891)

Variable	Total Sample (N = 891)	PLWH in lower-risk areas *n* (%) (*n* = 4)	PLWH in higher-risk areas *n* (%) (*n* = 20)	People living without HIV in lower-risk areas *n* (%) (*n* = 420)	People living without HIV in higher-risk areas *n* (%) (*n* = 447)	Statistical Tests (Wilcoxon Two-Sample test for continuous variables; Fisher's Exact test for categorical variables) and *p* values
Age, median (IQR)**	36 (24, 47)	39.5 (30.5, 48)	44.5 (31, 50.5)	30 (22,44)	40 (27,48)	Wilcoxon Two-Sample *p* = 0.0021
Gender***						
Male	466 (52.3)	2 (50.0)	6 (30.0)	230 (54.76)	228 (51.01)	Fisher's Exact
Female	414 (46.5)	1 (25.0)	8 (40.0)	190 (45.24)	215 (48.10)	*p* = <.0001
Other	11 (1.2)	1 (25.0)	6 (30.0)	0	4 (0.89)	
Race**						
Black (African American)	861 (96.63)	4 (100.0)	19 (95.0)	415 (98.81)	423 (94.63)	Fisher's Exact
Others	30 (3.37)	0	1 (5.0)	5 (1.19)	24 (5.37)	*p* = .0038
Smoking*						
Yes	623 (73.55)	3 (75.0)	19 (95.0)	271 (69.49)	330 (76.21)	Fisher's Exact
No	54 (6.38)	0	1 (5.0)	31 (7.95)	22 (5.08)	*p* = 0.0401
Don't know/Refuse to Answer	170 (20.07)	1 (25.0)		88 (22.56)	81 (18.71)	
Missing (n=44)						
Physical violence						
Yes	179 (20.09)	0	2 (10.0)	81 (19.29)	96 (21.48)	Fisher's Exact
No	712 (79.91)	4 (100.0)	18 (90.0)	339 (80.71)	351 (78.52)	*p* = 0.5157

Threatened with a weapon**						
Yes	137 (15.48)	0	2 (10.0)	47 (11.3)	88 (19.73)	Fisher's Exact
No	741 (83.73)	4 (100.0)	18 (90.0)	361 (87.0)	358 (80.27)	$p = 0.0015$
Not Asked	7 (0.79)		0	7 (1.7)	0	
Missing (n=6)						
Homelessness***						
Yes	153 (17.23)	0	7 (35.0)	35 (8.39)	111 (24.83)	Fisher's Exact
No	735 (82.77)	4 (100.0)	13 (65.0)	382 (91.61)	336 (75.17)	$p = <.0001$
Missing (n=3)						
Visitations to healthcare facilities						
Less than 6 months ago	467 (53.01)	2 (50.0)	14 (70.0)	205 (49.76)	246 (55.28)	Fisher's Exact Test
Within the last 6 months to 1 year	281 (31.90)	2 (50.0)	4 (20.0)	142 (34.47)	133 (29.89)	$p = 0.4882$
Within the last 1 to 5 years	113 (12.83)	0	2 (10.0)	52 (12.62)	59 (13.26)	
Within the last 5 to 10 years	12 (1.36)	0	0	7 (1.70)	5 (1.12)	
	1 (0.11)	0	0	0	1 (0.22)	
Not asked	4 (0.45)	0	0	4 (0.97)	0	
Don't know	3 (0.34)	0	0	2 (0.49)	1 (0.22)	
Missing (n=10)						
Transportation***						
Drive my own car	117 (13.19)	0	0	72 (17.27)	45 (10.09)	Fisher's Exact Test
Get a friend to drive	160 (18.04)	2 (50.0)	2 (10.0)	84 (20.14)	72 (16.14)	$p = <.0001$
Pay for a ride	33 (3.72)	0	1 (5.0)	11 (2.64)	21 (4.71)	
MARTA Train	96 (10.82)	0	3 (15.0)	33 (7.91)	60 (13.45)	
Use a cab	2 (0.23)	0	0	2 (0.48)	0	
Walk	199 (22.44)	0	12 (60.0)	64 (15.35)	123 (27.58)	
Bicycle	26 (2.93)	0	0	14 (3.36)	12 (2.69)	
Other	31 (3.49)	0	0	18 (4.32)	13 (2.91)	
MARTA Bus	220 (24.80)	2 (50.0)	2 (10.0)	116 (27.82)	100 (22.42)	
Not Asked	3 (0.34)	0	0	3 (0.72)	0	
Missing (n=4)						

Descriptive statistics calculated for the total sample and sub-samples
Fisher's exact test was used to account for the relatively low number of PLWH in lower-risk areas (n <5)

*$p < 0.05$; **$p < .01$; ***$p < .001$

Table 2

Descriptive statistics stratified by higher-risk vs. lower-risk areas (N=891)

Variable	People living in higher-risk areas *n* (%) (*n* = 467)	People living in lower-risk areas *n* (%) (*n* = 424)	Statistical Tests (Wilcoxon Two-Sample test for continuous variables; Chi-square for categorical variables; Fisher's Exact test for categorical variable) and *p* values
Age, median (IQR)***	40 (27, 48)	30 (22, 44)	Wilcoxon Two-Sample $p < 0.0001$
Gender*			
Male	234 (50.11)	232 (54.72)	χ^2 (2) = 7.7886
Female	223 (47.75)	191 (45.05)	$p = 0.0204$
Other	10 (2.14)	1 (0.24)	
Race***			
Black (African American)	442 (94.65)	419 (98.82)	χ^2 (1) = 11.9003
Others	25 (5.35)	5 (1.18)	$p = 0.0006$
Smoking*			
Yes	349 (77.04)	274 (69.54)	χ^2 (2) = 6.5123
No	23 (5.08)	31 (7.87)	$p = 0.0385$
Don't know/Refuse to Answer	81 (17.88)	89 (22.59)	
Missing (n=44)			
Physical violence			
Yes	98 (20.99)	81 (19.10)	χ^2 (1) = 0.4899
No	369 (79.01)	343 (80.90)	$p = 0.4840$

Threatened with a weapon***			
Yes	90 (19.31)	47 (11.22)	Fisher's Exact Test
No	376 (80.69)	365 (87.11)	$p = 0.0001$
Not Asked	0	7 (1.67)	
Missing (n=6)			
Homelessness***			
Yes	118 (25.27)	35 (8.31)	χ^2 (1) = 44.6256
No	349 (74.73)	386 (91.69)	$p = <0.0001$
Missing (n=3)			
Visitations to healthcare facilities			
Less than 6 months ago	260 (55.91)	207 (49.76)	Fisher's Exact Test
Within the last 6 months to 1 year	137 (29.46)	144 (34.62)	$p = 0.1062$
Within the last 1 to 5 years	61 (13.12)	52 (12.50)	
Within the last 5 to 10 years	5 (1.08)	7 (1.68)	
Not asked	1 (0.22)	0	
Don't know	0	4 (0.96)	
Missing (n=10)	1 (0.22)	2 (0.48)	
Transportation***			
Drive my own car	45 (5.07)	72 (17.10)	χ^2 (9) = 50.4750
Get a friend to drive	74 (8.34)	86 (20.43)	$p = <0.0001$
Pay for a ride	22 (2.48)	11 (2.61)	
MARTA Train	63 (7.10)	33 (7.84)	
Use a cab	0	2 (0.48)	
Walk	135 (15.22)	64 (15.20)	
Bicycle	12 (1.35)	14 (3.33)	
Other	13 (1.47)	18 (4.28)	
MARTA Bus	102 (11.50)	118 (28.03)	
Not Asked	0	3 (0.71)	
Missing (n=4)			

Wilcoxon Two-Sample test used for continuous variables with a skewed or non-normal distribution
Chi-square analyses was conducted for categorical variables

Monte Carlo Estimate for the Exact Test method was used to calculate Fisher's Exact Test
*$p < 0.05$; **$p < .01$; ***$p < .001$

Table 3

Descriptive statistics stratified by HIV status (N=891)

Variable	People living with HIV *n* (%) (*n*=24)	People living without HIV *n* (%) (*n* = 867)	Statistical Tests (Wilcoxon Two-Sample test for continuous variables; Chi-square for categorical variables; Fisher's Exact test for categorical variable) and *p* values
Age median (IQR)*	44.5 (31, 50.5)	36 (24, 47)	Wilcoxon Two-Sample 0.0142
Gender***			
Male	8 (33.33)	458 (52.83)	χ^2 (2) = 157.9930
Female	9 (37.50)	405 (46.71)	*p* = <0.0001
Other	7 (29.17)	4 (0.46)	
Race			
Black (African American)	23 (95.83)	838 (96.66)	Fisher's Exact Test
Others	1 (4.17)	29 (3.34)	*p* = 0.5653
Smoking			
Yes	22 (91.67)	601 (73.03)	Fisher's Exact Test
No	1 (4.17)	53 (6.44)	*p*=0.0878
Don't know/Refuse to Answer	1 (4.17)	169 (20.53)	
Missing (n=44)			
Physical violence			
Yes	2 (8.33)	177 (20.42)	Fisher's Exact Test
No	22 (91.67)	690 (79.58)	*p* = 0.1974

Threatened with a weapon			
Yes	2 (8.33)	135 (15.68)	Fisher's Exact Test
No	22 (91.67)	719 (83.51)	$p = 0.6373$
Not Asked	0	7 (0.81)	
Missing (n=6)			
Homelessness			
Yes	7 (29.17)	146 (16.90)	Fisher's Exact Test
No	17 (70.83)	718 (83.10)	$p = 0.1636$
Missing (n=3)			
Visitations to healthcare facilities			
Less than 6 months ago	16 (66.67)	451 (52.63)	Fisher's Exact Test
Within the last 6 months to 1 year	6 (25.00)	275 (32.09)	p=0.7631
Within the last 1 to 5 years	2 (8.33)	111 (12.95)	
Within the last 5 to 10 years	0	12 (1.40)	
Not asked	0	1 (0.12)	
Don't know	0	4 (0.47)	
Missing (n=10)	0	3 (0.35)	
Transportation			
Drive my own car	0	117 (13.56)	Fishers Exact Test
Get a friend to drive	4 (16.67)	156 (18.08)	$p = 0.1165$
Pay for a ride	1 (4.17)	32 (3.71)	
MARTA Train	3 (12.50)	93 (10.78)	
Use a cab	0	2 (0.23)	
Walk	12 (50.00)	187 (21.67)	
Bicycle	0	26 (3.01)	
Other	0	31 (3.59)	
MARTA Bus	4 (16.67)	216 (25.03)	
Not Asked	0	3 (0.35)	

Missing (n=4)

Wilcoxon Two-Sample test used for continuous variables with a skewed or non-normal distribution
Chi-square analyses was conducted for categorical variables
Monte Carlo Estimate for the Exact Test method was used to calculate Fisher's Exact Test
*$p < 0.05$; **$p < .01$; ***$p < .001$

Table 4

Associations between Key Variables and Smoking Status

Variable	Odds Ratio (OR)	Confidence Interval (CI%)	*p*-value
HIV			
Yes	1.962	(0.752, 5.114)	0.1681
No	Ref		
Risk-areas			
Higher-risk areas	1.117	(0.824, 1.512)	0.4764
Lower-risk areas	Ref		
Age***	1.026	(1.014, 1.039)	<0.0001
Gender*			
Male	1.716	(1.260, 2.339)	0.0006
Female	Ref		
Other	2.620	(0.631, 10.873)	0.1847
Race			
Black (African American)	0.962	(0.417, 2.221)	0.9285
Others	Ref		
Physical Violence			
Yes	0.974	(0.668, 1.422)	0.8931
No	Ref		
Threatened with a weapon			
Yes	1.073	(0.707, 1.629)	0.7401
No	Ref		
Not Asked	1.026	(0.192, 5.479)	0.9757
Missing (n=6)			

Homelessness**			
Yes	1.793	(0.2126, 7.5449)	0.0060
No	Ref		
Missing (n=3)			
Visitations to healthcare facilities			
Less than 6 months ago	0.465	(0.113, 1.908)	0.2878
Within the last 6 months to 1 year	0.545	(0.132, 2.258)	0.4028
Within the last 1 to 5 years	0.704	(0.163, 3.032)	0.6372
Within the last 5 to 10 years	Ref		
	1.000	(0.008, 124.719)	1.000
Not asked	1.000	(0.067, 14.848)	1.000
Don't know	0.064	(0.004, 1.032)	0.0526
Missing (n=10)			
Transportation**			
Drive my own car	0.435	(0.263, 0.719)	0.0012
Get a friend to drive	0.738	(0.459, 1.186)	0.2093
Pay for a ride	1.090	(0.459, 2.587)	0.8456
MARTA Train	1.042	(0.588, 1.845)	0.8892
Use a cab	0.210	(0.013, 3.364)	0.2704
Walk	1.264	(0.801, 1.996)	0.3142
Bicycle	1.196	(0.460, 3.107)	0.7134
Other	0.503	(0.222, 1.137)	0.0968
MARTA Bus	Ref		
Not Asked	0.399	(0.039, 4.121)	0.4406
Missing (n=4)			

Logistic regression analyses predicting smoking status from key variables in separate models (unadjusted)
*$p < 0.05$; **$p < .01$; ***$p < .001$

Table 5

Adjusted Association between Key Variables and Smoking Status

Variable	Adjusted Odds Ratio (OR)	CI%	*p*-value
HIV			
Yes	1.536	(0.517, 4.563)	0.4398
No	Ref	Ref	Ref
Risk-areas			
Higher-risk areas	0.878	(0.628, 1.227)	0.4455
Lower-risk areas	Ref	Ref	Ref
Age***	1.024	(1.010, 1.039)	0.0008
Gender*			
Male	1.451	(1.048, 2.010)	0.0250
Female	Ref	Ref	Ref
Other	1.603	(0.321, 8.013)	0.5654
Race			
Black (African American)	0.877	(0.365, 2.107)	0.7690
Others	Ref		
Physical Violence			
Yes	1.230	(0.800, 1.893)	0.3459
No	Ref	Ref	
Threatened with a weapon			
Yes	0.957	(0.600, 1.527)	0.8545
No	Ref		
Not Asked	<0.001	(<0.001, >999.999)	0.9794
Missing (n=6)			

Homelessness			
Yes	1.229	(0.768, 1.966)	0.3895
No	Ref		
Missing (n=3)			
Visitations to healthcare facilities			
Less than 6 months ago	0.598	(0.140, 2.557)	0.4878
Within the last 6 months to 1 year	0.641	(0.149, 2.760)	0.5505
Within the last 1 to 5 years	0.812	0.182, 3.632)	0.7857
Within the last 5 to 10 years	Ref	Ref	Ref
	0.619	(0.004, 91.576)	0.8506
Not asked	>999.999	(<0.001, >999.999)	0.9792
Don't know	0.090	(0.005, 1.622)	0.1026
Missing (n=10)			
Transportation**			
Drive my own car	0.462	(0.276, 0.773)	0.0033
Get a friend to drive	0.863	(0.530, 1.403)	0.5513
Pay for a ride	1.319	(0.539, 3.230)	0.5442
MARTA Train	0.932	(0.516, 1.684)	0.8162
Use a cab	2.668	(0.022, 321.705)	0.6881
Walk	1.000	(0.615, 1.627)	0.9989
Bicycle	0.784	(0.294, 2.089)	0.6262
Other	0.593	(0.250, 1.404)	0.2345
MARTA Bus	Ref	Ref	Ref
Not Asked	0.157	(0.009, 2.660)	0.1996
Missing (n=4)			

Multivariate logistic regression analysis predicting smoking status from key variables (all variables above included as covariates).
*$p < 0.05$; **$p < .01$; ***$p < .001$

Table 6

Side-by-Side Comparison of Unadjusted and Adjusted Analyses Predicting Smoking Status

Variable	Crude OR (95% Confidence Interval)	Adjusted OR (95% Confidence Interval)
HIV		
Yes	1.962 (0.752, 5.114)	1.536 (0.517, 4.563)
No	Ref	Ref
Risk-areas		
Higher-risk areas	1.117 (0.824, 1.512)	0.878 (0.628, 1.227)
Lower-risk areas	Ref	Ref
Age	1.026 (1.014, 1.039)	1.024 (1.010, 1.039)
Gender		
Male	1.716 (1.260, 2.339)	1.451 (1.048, 2.010)
Female	Ref	Ref
Other	2.620 (0.631, 10.873)	1.603 (0.321, 8.013)
Race		
Black (African American)	0.962 (0.417, 2.221)	0.877 (0.365, 2.107)
Others	Ref	Ref
Physical Violence		
Yes	0.974 (0.668, 1.422)	1.230 (0.800, 1.893)
No	Ref	Ref
Threatened with a weapon		
Yes	1.073 (0.707, 1.629)	0.957 (0.600, 1.527)
No	Ref	Ref
Not Asked	1.026 (0.192, 5.479)	<0.001 (<0.001, >999.999)
Missing (n=6)		

Homelessness		
Yes	1.793 (0.2126, 7.5449)	1.229 (0.768, 1.966)
No	Ref	Ref
Missing (n=3)		
Visitations to healthcare facilities		
Less than 6 months ago	0.465 (0.113, 1.908)	0.598 (0.140, 2.557)
Within the last 6 months to 1 year	0.545 (0.132, 2.258)	0.641 (0.149, 2.760)
Within the last 1 to 5 years	0.704 (0.163, 3.032)	0.812 (0.182, 3.632)
Within the last 5 to 10 years	Ref	Ref
	1.000 (0.008, 124.719)	0.619 (0.004, 91.576)
Not asked	1.000 (0.067, 14.848)	>999.999 (<0.001, >999.999)
Don't know	0.064 (0.004, 1.032)	0.090 (0.005, 1.622)
Transportation		
Drive my own car	0.435 (0.263, 0.719)	0.462 (0.276, 0.773)
Get a friend to drive	0.738 (0.459, 1.186)	0.863 (0.530, 1.403)
Pay for a ride	1.090 (0.459, 2.587)	1.319 (0.539, 3.230)
MARTA Train	1.042 (0.588, 1.845)	0.932 (0.516, 1.684)
Use a cab	0.210 (0.013, 3.364)	2.668 (0.022, 321.705)
Walk	1.264 (0.801, 1.996)	1.000 (0.615, 1.627)
Bicycle	1.196 (0.460, 3.107)	0.784 (0.294, 2.089)
Other	0.503 (0.222, 1.137)	0.593 (0.250, 1.404)
MARTA Bus	Ref	Ref
Not Asked	0.399 (0.039, 4.121)	0.157 (0.009, 2.660)
Missing (n=4)		

CHAPTER V

DISCUSSION AND CONCLUSION

Despite the advancement of smoking cessation programs and interventions, smoking is still the leading cause of preventable death in the United States (CDC, 2016a). Similarly, prevention medication such as Pre-Exposure Prophylaxis (PrEP) and Post-Exposure Prophylaxis (PEP) have been proven as effective, yet people still suffer from detrimental health outcomes related to HIV (Auerbach, Kinsky, Brown & Charles, 2015; Smith, Toledo, Smith, Adams & Rothenberg, 2012). Previous research suggests that PLWH have higher rates of smoking in comparison to the general population (Bean et al., 2016; CDC, 2017b; CDC, 2016c; Cui et al., 2010; Horvath et al., 2012). Extensive research has suggested the need for smoking cessation interventions for PLWH (Harris, 2010; Niaura et al., 2000; Pacek & Crum, 2015). When assessing the adverse health outcomes related to smoking, research has shown that in comparison to the general population, PLWH reported considerably higher incidences of non-AIDS-defining cancers such as Hodgkin lymphoma, melanoma, and colorectal cancer (Pacek & Crum, 2015; Patel et al., 2008). Studies have also suggested that smokers living with HIV are three times more likely to develop *pneumocystis carinii* pneumonia (PCP) in comparison to non-smokers living with HIV (Miguez-Burbano et al., 2005; Rahmanian et al., 2011).

This thesis examined the rates of smoking, visitations to healthcare facilities, and specific stressors among people living with and without HIV in higher-risk vs. lower-risk areas in 10 zip codes in Atlanta, GA. Higher-risk areas were determined based on the history of HIV reporting among participants at the start of Rothenberg and colleagues' (2017) study. Using an innovative research design (chain-link design), which is commonly used to reach vulnerable or hidden

populations (i.e., people who inject drugs, PLWH), researchers aimed to recruit participants who engaged in sexual behaviors that heightened the risk of HIV acquisition.

Overall, the rate of smoking was quite high in this study. Seventy-four percent of the sample smoked, which is almost five times the smoking rate among the general adult U.S. population (CDC, 2016a). There were significant differences in smoking rates across the four subgroups studied (i.e., PLWH in higher-risk areas, PLWH in lower-risk areas, people without HIV in higher-risk areas, people without HIV in lower-risk areas; Table 1). The smoking rate among PLWH in higher-risk areas (95%) was strikingly high, suggesting the need for interventions targeting this at-risk population.

Unexpectedly, there were not significant differences between subgroups in terms of rates of visitations to healthcare facilities. However, it is interesting to see that 70% of PLWH in higher-risk areas reported visiting a healthcare provider less than 6 months ago. Contrary to this finding, studies have suggested that there is an array of barriers that PLWH face in regards to HIV care (Williams, Amico & Konkle-Parker, 2011). Specifically, research has shown that African Americans living with HIV face financial barriers such as lack of adequate health insurance and low socioeconomic status (Williams et al., 2011). This sub-sample also accounted for the highest percentage of smoking rates. Future research is needed to understand factors that might promote higher healthcare visitations among African Americans living with HIV.

There were a number of differences between people living in higher-risk versus lower-risk areas. As depicted in Table 2, people living in lower-risk areas reported higher rates of driving their own car. Research has shown that approximately 12% of people living in Atlanta have incomes below the poverty line (Kalichman et al., 2012). Having the ability to drive their own car may not be a possibility for people living with lower SES. Homelessness was also

higher among people living in higher-risk vs. lower-risk areas. Studies have also suggested that smoking tends to become a habit common among people with lower socioeconomic status (Bolego, Poli & Paoletti, 2002). Being that homelessness was a predictor of smoking (see Table 4), future research should focus on the smoking rates among homeless persons and/or lower SES living in these higher-risk and lower-risk areas in Atlanta.

Unadjusted analyses examining associations between key variables and smoking suggested that being older, homeless, and male were significant predictors of smoking. People who drove their own car were less likely to smoke. These findings are consistent with past research. For example, research has shown that approximately 17% of men were current cigarette smokers in comparison to 13% of women (CDC, 2016c). In addition, the CDC reported that in 2015 approximately 17% of adults between the ages of 45 and 64 years old were current smokers (2016c). Once covariates were included, only age, gender, and transportation were significant predictors of smoking status.

The findings from this secondary analyses indicated that the rates of smoking were significantly higher among people living in higher-risk areas vs. lower-risk areas. Being homeless was also significantly different among people living in higher-risk areas vs. lower-risk areas. Having the ability to drive their own car, getting a friend to drive them, or catching the MARTA Bus was significantly higher among people living in lower-risk areas compared to people living in higher-risk areas. Visitations to healthcare facilities did not yield significant results among the four subgroups, when stratifying by higher-risk vs. lower-risk areas, nor when stratifying by HIV status. Despite this, research has shown that visits to healthcare providers are not only critical among PLWH, but also among smokers living with HIV (Burkhalter et al., 2005; Horvath et al., 2012; Niaura et al., 2000; Pacek & Crum, 2015). Utilization of healthcare

services are imperative to the health among PLWH (Bradford, Coleman, & Cunningham, 2007). Research suggests that healthcare provider-patient interactions are critical when aiming to increase smoking cessation among PLWH (Bradford et al., 2007; Horvath et al., 2012).

One significant strength of the present study was the relatively large sample size of 891 predominantly African Americans. Another strength of this study was the selection of the 30 seeds for initial contact. Researchers recruited 3 people in each of the 5 zip codes from both the higher-risk and the lower-risk areas (Rothenberg et al., 2017). One limitation of this study is that given the method used to collect sensitive information (one-on-one interviews) there is a chance for potential social desirability and recall biases, especially when discussing sexual matters. Research has shown that disclosing one's HIV status can lead to social isolation and rejection (Kalichman, DiMarco, Austin, Luke & DiFonzo, 2003). Another limitation of this study was the relatively low frequency of people who reported a positive HIV status (n=24). Thus, there was likely limited statistical power to detect differences between PLWH and people living without HIV. Sample sizes are even smaller when stratified by HIV status and higher vs. lower-risk areas. Future research might include higher proportions of participants living with HIV in higher and lower-risk areas to determine associations between both HIV status and geographic location and smoking.

Future research should also focus on the rates of smoking among people who disclose their HIV status. Additional research should assess the knowledge and utilization of healthcare services and smoking cessation programs specifically tailored towards people living with HIV. This can potentially increase patient-provider conversation regarding smoking cessation among smokers living with HIV. Furthermore, marginalized populations (i.e., ethnic minorities) are more susceptible to various adverse health outcomes such as HIV, and tobacco-related illnesses

in comparison to non-Hispanic whites (CDC, 2017c; CDC, 2016d). Research suggests that African Americans have higher rates of HIV, lower SES, and are more likely to have negative health outcomes related to smoking in comparison to non-Hispanic whites (CDC, 2017c; Stewart et al., 2011).

This study examined associations between HIV status, higher-versus lower-risk areas, demographic variables, stressors, and smoking in a primarily African American sample. My hypotheses were supported in part. Smoking rates were highest among people living with HIV in higher-risk areas (vs. lower-risk areas). In fact, 95% of people living with HIV in higher-risk areas reported smoking (which is over six times the rate of smoking among the general U.S. population; CDC, 2016a). In addition, being homeless and lacking transportation were associated with higher rates of smoking. However, there were not statistically significant relationships between visitations to healthcare facilities and smoking in this sample. Overall, this thesis highlights the urgent need to provide quality smoking cessation services to people living with HIV, particularly those living in higher-risk zip codes. In addition to providing smoking cessation services, it will be critical to address factors related to basic needs, safety, and transportation to promote health and quality of life in this population. Additional research is warranted to understand the rates of smoking and specific stressors among African Americans living with and without HIV in efforts to eliminate health disparities for this population.

CHAPTER VI

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