

**CIGARETTE SMOKING BEHAVIORS AMONG PEOPLE LIVING WITH HIV:
ASSOCIATIONS WITH INDIVIDUAL- AND SOCIAL-LEVEL
CHARACTERISTICS**

by
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ABSTRACT

INTRODUCTION: Smoking is endemic among people with HIV and associated with morbidity and mortality. Little research has been conducted among smokers with HIV. Research has focused on examining individual-level characteristics associated with smoking behaviors, with little examination of social-level factors. Aim 1 included a literature review concerning the intersection of HIV and smoking. Aims 2-4 explored individual- and social-level characteristics associated with current smoking (Aim 2), interest in quitting or cutting down (Aim 3), and lifetime quit attempts (Aim 4).

METHODS: Data for Aims 2-4 came from a study designed to examine social environmental influences on HIV-positive current/former drug users' health outcomes in Baltimore, Maryland. Logistic regression (Aims 2 and 4) and multinomial logistic regression (Aim 3) analyses were used to explore associations between covariates and outcomes.

RESULTS:

Aim 1: Literature concerning smoking among HIV-positive populations was reviewed. Topics included: morbidity, mortality, treatment and medication adherence outcomes; characteristics associated with smoking behaviors; evidence-based cessation interventions; findings from cessation interventions among smokers with HIV. Gaps in the literature and directions for future research were identified.

Aim 2: Most participants (75%) were smokers. Drug use (aOR=2.82, 95% CI=1.55-5.13), 12-step program participation (aOR=1.74, 95% CI=1.02-2.96), and having a main Supporter who smokes (aOR=2.01, 95% CI=1.14-3.54) were associated with current smoking.

Aim 3: Individuals who made lifetime quit attempts were more likely than those who had not to be interested in quitting (aRRR=3.50, 95% CI=1.39-8.30). Family encouragement to smoke was negatively associated with interest in cutting down (aRRR=0.09, 95% CI=0.01-0.86) and interest in quitting (aRRR=0.27, 95% CI=0.08-0.90).

Aim 4: Older age (45-49: aOR=3.44, 95% CI=1.60-7.39; 54-65: aOR=2.74, 95% CI=1.22-6.17), non-Black race (aOR=3.61, 95% CI=1.23-10.62), and having a main Supporter who had used NRT or medications for cessation (aOR=2.40, 95% CI=1.24-4.63) were positively associated with an increased likelihood of lifetime use of NRT or medications for smoking cessation.

CONCLUSIONS: Results corroborate research indicating that smoking is a significant public health problem among people with HIV. Results extend knowledge by suggesting that social- and individual-level characteristics are associated with smoking behaviors among people with HIV. Results have implications for cessation interventions among smokers with HIV.

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1. CHAPTER 1 - INTRODUCTION

1.1 Background

Cigarette smoking represents an enormous public health problem, and continues to be the leading preventable cause of death in the United States: approximately 443,000 persons die each year due to smoking-related causes (CDC, 2011a). Over the past several decades, public health interventions have been successful in reducing the overall prevalence of smoking; since the mid-1960s, the prevalence of cigarette smoking has fallen from 42.4% to 19.0% in 2011 (CDC, 2011b; CDC, 2013). Despite this success among the general population, smoking remains highly prevalent among certain vulnerable populations. For instance, the prevalence of smoking among people living with human immunodeficiency virus (HIV) is estimated to be 40-70% (Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010).

This elevated prevalence is associated with a variety of negative health- and treatment-related outcomes. To be more specific, elevated risks of chronic obstructive pulmonary disease (Lewden et al., 2005; Diaz et al., 2002; Crothers et al., 2006), bacterial pneumonia (Crothers et al., 2005; Lifson et al., 2010; Miguez-Burbano et al., 2005), lung cancer (Lifson et al., 2010; Kirk et al., 2007; Chaturvedi et al., 2007; Engels et al., 2006), and cardiovascular disease (Lifson et al., 2010; Lewden et al., 2005; Petoumenos et al., 2011; Barbaro et al., 2003; Friis-Møller et al., 2003; Savès et al., 2003), among other conditions, have been observed among HIV-positive smokers. Moreover, authors of a population-based Danish cohort study concluded that smokers with HIV lose more life-years to smoking than to HIV, and that the excess mortality of

smokers is tripled and the population-attributable risk of death associated with smoking is doubled among patients with HIV as compared to population controls (Helleberg et al., 2013). Additionally, in a study among females on highly active antiretroviral therapy (HAART), evidence has suggested that cigarette smokers are more likely than non-smokers to have poorer treatment outcomes, including poorer viral and immunologic responses, greater risks of virologic rebound, more frequent immunologic failure, and a higher risk of developing AIDS (Furber et al., 2007; Feldman et al., 2006). In some research, cigarette smoking has also been associated with poor adherence to or noncompliance with their HAART regimens (Feldman et al., 2006; Yuan et al., 2006; Shuter & Bernstein; Webb et al., 2009).

1.2 Gaps in Literature and Innovation of Present Research

The research contained within this dissertation has the potential to contribute to the extant literature and scientific knowledge concerning the epidemiology of cigarette smoking and cigarette smoking behaviors among people living with HIV, an area of research that has received increasing attention, and has begun to grow over the past decade. Additionally, research on cigarette smoking and HIV to date has focused primarily on the examination of characteristics associated with current smoking status. Though this research has undoubtedly yielded important findings, other smoking behaviors merit discussion and examination. This dissertation aims to explore characteristics associated with two additional, largely as of yet unexamined smoking behaviors: interest in cutting down on or quitting smoking and prior use of pharmacologic therapies for smoking cessation. In addition to exploring additional

smoking behaviors, this work makes the distinction between having an interest in simply cutting down on smoking versus having an interest in quitting smoking, a distinction often not made in previous research.

Furthermore, the present research extends previous work by considering social environmental characteristics in the analyses, in addition to individual-level characteristics. Though individual-level characteristics (i.e., demographic characteristics, substance use, etc.) are undoubtedly important, social environmental characteristics (i.e., the presence of smoking in one's environment, significant others' smoking, family opinions regarding smoking, etc.) may play an important role in influencing smoking behaviors. Given that smoking behavior in the general population has been consistently found to be associated with social network characteristics, it is very plausible that social environmental characteristics are associated with cigarette smoking behaviors among HIV-positive persons as well (Christakis & Fowler, 2008; Alexander et al., 2001; Unger & Chen, 1999; Mermelstein et al., 1986).

1.3 Theoretical Foundation

A visual depiction of the theoretical framework for this dissertation can be found in Figure 1. The theoretical foundation for the present proposal is based on the combination of two different conceptual frameworks: the Ecological Model for Health Promotion and Social Cognitive Theory. The Ecological model for Health Promotion was proposed by McLeroy and colleagues (1988), and was derived from Bronfenbrenner's Ecological Systems Theory (1979). According to this model, behavior is viewed as being determined by a variety of different levels of influence: Intrapersonal;

Interpersonal; Institutional; Community; and Public policy factors. Not all levels of the ecological model are represented within the present work, but two are: Interpersonal factors and Intrapersonal factors. Intrapersonal factors are defined as individual characteristics that influence behavior (McLeroy et al., 1988). Thus, in relation to the present work, intrapersonal factors include individual-level characteristics like socio-demographic characteristics, drug use, psychiatric comorbidity, and so on. Interpersonal factors, on the other hand, consist of interpersonal processes and characteristics of primary groups including family, friends, and peers that provide social identity, support, and role definition (McLeroy et al., 1988). Within the present work, interpersonal factors include smoking behaviors of an individual's significant others, smoking within an individual's family, and so on. Though Institutional, Community, and Public Policy factors are not represented in the model concerning the current work, definitions and examples of each level of influence are as follows: Institutional factors are those that relate to the rules and regulations for operations within institutions and organizations (e.g., smoking bans within the workplace); Community factors are characteristics of the community as a geographic space (e.g., the presence of tobacco outlets in a defined neighborhood or community); Public policy factors include local, state, and national laws and policies (e.g., laws regarding determining the price of or taxation of cigarettes).

In addition to the Ecological Model for Health Promotion, this work draws on elements of Social Cognitive Theory (SCT), which posits that behavior is influenced by (and can reciprocally influence) personal characteristics as well as the environment (Bandura, 1986). Moreover, portions of an individual's knowledge acquisition can be directly related to observing others within the context of social interactions, experiences,

and outside media influences. In other words, individuals do not necessarily have to acquire knowledge or initiate behaviors based solely on personal trial and error. Depending upon behaviors witnessed in the social environment, and subsequent consequences of the witnessed behaviors, individuals may model others' behaviors. This type of knowledge acquisition is known as vicarious learning (Bandura, 1986). In terms of fitting into the overall conceptual framework, aspects of SCT are nested within the Intrapersonal and Interpersonal spheres of influence of the Ecological Model for Health Promotion. As can be seen in Figure 1, personal characteristics (i.e., Intrapersonal factors in the Ecological Model for Health Promotion) and behavior share reciprocal influences, as do behavior and environmental characteristics (i.e., Interpersonal factors in the Ecological Model for Health Promotion). Within the context of this dissertation, particular emphasis was placed on the vicarious learning aspect of SCT (i.e., the influences that environmental/Interpersonal factors have on behavior). Correspondingly, one hypothesis was that observing the smoking behavior of significant others could influence an individual's behavior. For instance, individuals with significant others who smoke will be more likely to be smokers themselves, possibly at least in part due to vicarious learning.

1.4 Overview of the Dissertation

This thesis is an attempt to address the current gaps in the literature by utilizing data from a community-based study sample of people living with HIV and presenting findings concerning various smoking behaviors among this sample. It provides the opportunity to examine and distinguish between the individual-level and social

environmental-level characteristics associated with the various smoking behaviors. Because it is known that cigarette smoking is highly prevalent among HIV-positive populations and is associated with significant morbidity and mortality, yet relatively little research exists to examine the intersection of HIV and smoking, this represents a meaningful area of investigation. **Chapter 2** contains a comprehensive critical review of the literature concerning cigarette smoking among people living with HIV. In **Chapter 3**, we examine the association between individual- and social-environmental characteristics and current smoking status. In **Chapter 4**, we examine the association between individual- and social-environmental characteristics and two outcomes: 1) current interest in cutting down on smoking; and 2) current interest in quitting smoking. In **Chapter 5**, we examine the association between individual- and social-environmental characteristics and prior use of nicotine replacement therapy or medications for smoking cessation. Finally, in **Chapter 6**, we summarize the main conclusions from our investigations.

Findings from this thesis have the potential to inform the development and implementation of smoking cessation interventions among a special, at-risk population, and subsequently to inform policies regarding best practices for smoking cessation. Recommendations are also provided for future research.

1.5 Specific Aims and Hypotheses

Aim 1: Provide a comprehensive critical review of the literature concerning cigarette smoking among people living with HIV.

Aim 2: Explore the individual-level and social environmental-level characteristics associated with current smoking status among a sample of people living with HIV.

Aim 2 Hypothesis: In addition to previously identified individual-level characteristics, a variety of social environmental-level characteristics will be associated with current smoking status. In particular, the presence of cigarette smoking in an individual's social network (i.e., partner, Supporter, or family smoking), as well as family members' more favorable views regarding smoking will be positively associated with Index participants' smoking status.

Aim 3: Explore the individual-level and social environmental-level characteristics associated with current interest in cutting down on or quitting smoking among a sample of smokers living with HIV.

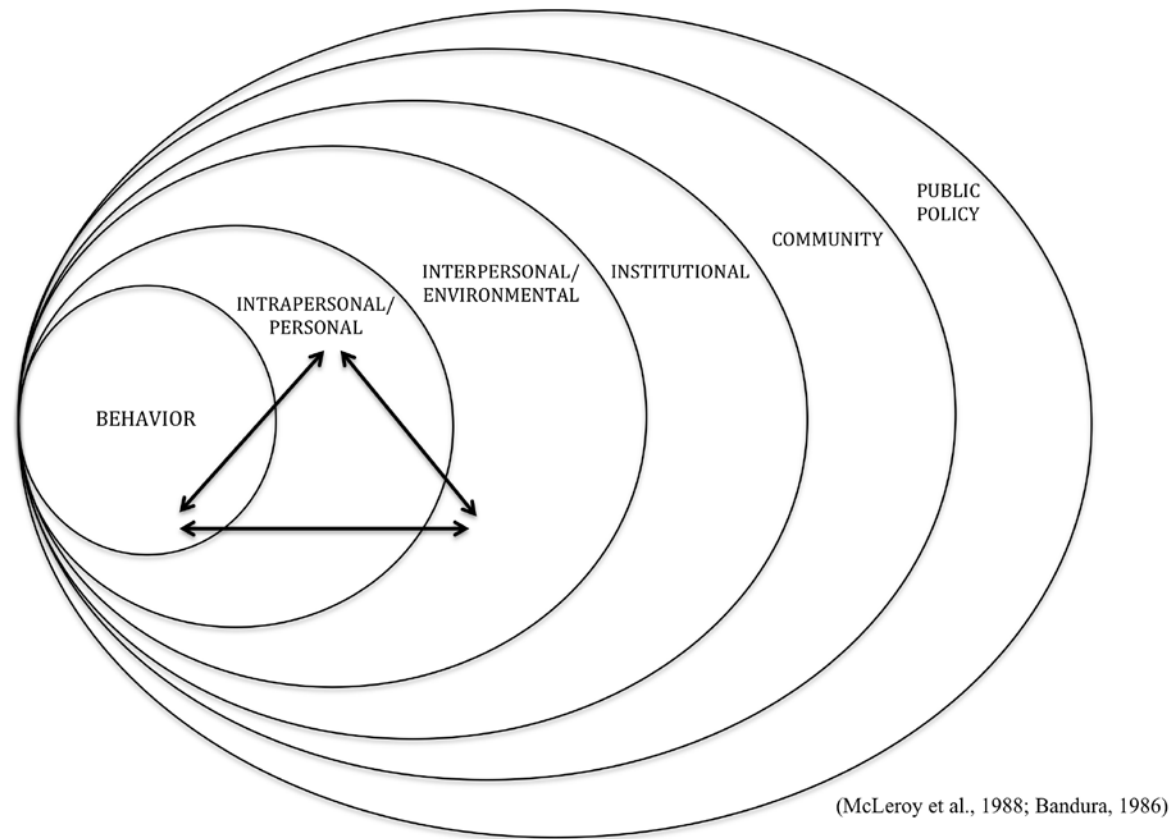
Aim 3 Hypothesis: Both individual-level and social environmental-level characteristics will be associated with an interest in cutting down on or an interest in quitting smoking. In particular, having a significant other (i.e., a main Supporter) who is interested in quitting or cutting down or who have made prior quit attempts will be associated with an interest in quitting or cutting down, as will receiving encouragement from family members to quit smoking. Furthermore, the associated individual-level and social environmental-level characteristics will differ between those with an interest in cutting down versus an interest in quitting smoking.

Aim 4: Explore the individual-level and social environmental-level characteristics associated with prior use of nicotine replacement therapy or medications for smoking cessation among a sample of smokers living with HIV.

Aim 4 Hypothesis: Both individual-level and social-environmental level characteristics will be associated with prior use of nicotine replacement therapy or medications for smoking cessation. In particular, having a main Supporter who has made prior quit attempts using pharmacologic therapies will be associated with prior use of such cessation aids, as will receiving encouragement from family members to quit smoking.

1.6 FIGURES

Figure 1.1 Overview of the Ecological Model for Health Promotion and Social Cognitive Theory models



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2. CHAPTER 2 – A REVIEW OF THE LITERATURE CONCERNING HIV AND CIGARETTE SMOKING: MORBIDITY AND MORTALITY, ASSOCIATIONS WITH INDIVIDUAL- AND SOCIAL-LEVEL CHARACTERISTICS, AND SMOKING CESSATION EFFORTS (Aim 1)

The prevalence of cigarette smoking has been on the decline in the United States general population since the 1960's, and is currently approximately 20% (CDC, 2011a). Despite the public health intervention successes in reducing smoking overall, certain subgroups of the population still exhibit an unduly high prevalence of cigarette smoking. For instance, among persons living with human immunodeficiency virus (HIV), the prevalence of cigarette smoking has been estimated to be 40-70% (Pines et al., 2011; Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010). In the past, little research attention was paid to the intersection of HIV and smoking. However, the widespread availability and use of highly active antiretroviral therapy (HAART) has resulted in increased life expectancies for persons living with HIV (Palella et al., 1998). In fact, recent estimates indicate that the life expectancy for an individual diagnosed with autoimmune deficiency syndrome (AIDS) is approximately 15 years (Walensky et al., 2006), while the life expectancy for individuals newly diagnosed with HIV can exceed 35 years (Lohse et al., 2007). Along with increased life expectancies, the causes of death have changed significantly in the HAART era: mortality due to AIDS-related conditions has decreased and deaths due to non-AIDS-defining illnesses have increased (Palella et al., 2006). Many of these conditions—such as cardiovascular disease, pulmonary conditions, and lung cancer—are associated with cigarette smoking. These aforementioned statistics suggest that targeting cigarette smoking, a modifiable risk factor for these non-AIDS-related conditions, could potentially improve the quality of life and further increase the life expectancies of

individuals with HIV/AIDS. In this review, we summarize the effects of cigarette smoking on a number of health outcomes that are relevant to people living with HIV and discuss issues related to smoking behavior and smoking cessation.

2.1 SMOKING AND ASSOCIATED MORBIDITY, MORTALITY, AND MEDICAL ADHERENCE AND TREATMENT OUTCOMES

2.1.1 Cardiovascular disease

Cardiovascular conditions have become a source of morbidity for HIV-positive patients. Compared to individuals without HIV, individuals living with HIV have an increased risk of developing cardiovascular disease (CVD) (Lifson et al., 2010; Lewden et al., 2005; Petoumenos et al., 2011; Barbaro et al., 2003; Friis-Møller et al., 2003; Savès et al., 2003). The high prevalence of cigarette smoking in this population may further contribute to the development of CVD. In an attempt to explain the disproportionately high risk for CVD among people living with HIV, research has indicated that the use of protease inhibitors as a part of combination antiretroviral therapy may increase the risk of cardiovascular-related events. Barbaro and colleagues (2003) conducted a study in which patients were given a HAART regimen either with or without a protease inhibitor and then monitored for the incidence of cardiovascular events. Findings indicated that the cumulative annual incidence of CVD was higher in the group receiving protease inhibitors (Barbaro et al., 2003). Additionally, although different classes of HAART medications and cigarette smoking both contribute to the increased risk of CVD among people living with HIV, findings from one study indicate that current cigarette smoking is associated with greater risk for myocardial infarction than protease inhibitor therapy (Friis-Møller et al., 2007).

2.1.2 Respiratory conditions

Research has shown that people living with HIV have elevated risks of numerous respiratory-related conditions, such as chronic obstructive pulmonary disease (Lewden et al., 2005; Diaz et al., 2002; Crothers et al., 2006) and bacterial pneumonia (Crothers et al., 2005; Lifson et al., 2010; Miguez-Burbano et al., 2005). In a multicenter prospective study of women living with HIV, the most prominent clinical risk factor for the development of bacterial pneumonia in the HAART era was current cigarette smoking status (Kohli et al., 2006). Miguez-Burbano and colleagues (2003) found that, after controlling for confounders, cigarette smoking doubled the risk for developing *Pneumocystis carinii* pneumonia (PCP), and that long-term smoking increased the risk of developing tuberculosis.

2.1.3 Cancer

The incidence of several types of non-AIDS-defining cancers has been found to be significantly higher among people living with HIV than among the general population, including: anal cancer, vaginal cancer, Hodgkin lymphoma, liver cancer, melanoma, oropharyngeal cancer, leukemia, colorectal cancer, renal cancer, and lung cancer (Patel et al., 2008). Additionally, anal and cervical cancers have a higher prevalence among people living with HIV who are smokers than among those living with HIV who do not smoke (Palefsky et al., 1994; Palefsky et al., 1999). Lung cancer is of particular interest given the clear association between this type of malignancy and cigarette smoking, as well as the fact that lung cancer is now the third most commonly diagnosed cancer

among people living with HIV, behind the AIDS-defining cancers Kaposi sarcoma and non-Hodgkin lymphoma (Kirk et al., 2007). Compared to the general population, people living with HIV exhibit an elevated risk of lung cancer (Chaturvedi et al., 2007; Lifson et al., 2010). Numerous studies have explored the relationship between lung cancer and HIV infection. Though a few concluded that the increased prevalence of lung cancer among this population was attributable to heavy smoking among people living with HIV (Levine et al., 2010; Clifford et al., 2012), others have identified a potentially more complex relationship between HIV and lung cancer. For instance, in separate analyses, Engels and colleagues (2006), Kirk and colleagues (2007), and Sigel and colleagues (2012) found that the risk of developing lung cancer among people living with HIV was elevated as compared to people without HIV, even after controlling for smoking status.

2.1.4 Immunosuppression

Studies have shown that cigarette smoking has immunosuppressive effects: Smoking has broad immunosuppressive effects on host cell-mediated and humoral immune responses (Arcavi & Benowitz, 2004; Huttunen et al., 2011). As discussed in a review by Sopori (2002), some studies have shown that cigarette smoking modifies CD4+ lymphocyte counts, though there have been inconsistencies in establishing a negative relationship between smoking and the course of HIV/AIDS (Furber et al., 2007). These findings regarding smoking and negative effects on the immune system are troubling, regardless of the population under investigation. However, they are of particular concern among a group of people who are facing a condition that suppresses the immune system, such as HIV.

2.1.5 Medication adherence and treatment outcomes

Though only a few studies have included cigarette smoking in analyses as a potential correlate of medication adherence, among the few studies that have, findings indicate that cigarette smoking is associated with decreased adherence to highly active antiretroviral therapy (HAART). For instance, Feldman and colleagues (2006) found that smokers were significantly more likely to report noncompliance with their HAART regimens within the past 6 months as compared to non-smokers (32.3% vs. 23%). Additionally, Yuan and colleagues (2006) showed that discontinuation of an initial HAART regimen was significantly positively associated with current cigarette smoking. Furthermore, among females receiving HAART in the Women's Interagency HIV Study (WIHS), cigarette smoking was shown to be significantly associated with decreased HAART adherence (Lazo et al., 2007). Similarly, Shuter and Bernstein (2008) found current cigarette smoking to be an important and significant marker of inferior HIV medication adherence. An additional cross-sectional study (Webb et al., 2009) found smoking to be negatively associated with decreased HAART adherence, and proposed that the relationship may be mediated by depression.

In terms of adverse treatment outcomes some reports suggest that cigarette smoking can decrease the response to highly active antiretroviral therapy (HAART) by 40% (Miguez-Burbano et al., 2003). In the Women's Interagency HIV Study (WIHS), a cohort study of females on HAART, findings from two analyses indicate that smokers are more likely than non-smokers to have poorer treatment outcomes, including poorer viral and immunologic responses, greater risks of virologic rebound, more frequent

immunologic failure, and a higher risk of developing AIDS (Furber et al., 2007; Feldman et al., 2006).

2.1.6 Quality of life

In addition to various morbidities, cigarette smoking is associated with decreased quality of life among people living with HIV. In one analysis concerning people living with HIV (Turner et al., 2001), cigarette smokers were found to have lower health-related quality of life than non-smokers. Specifically, cigarette smoking was associated with lower scores for general health perception, physical functioning, bodily pain, energy, role functioning, and cognitive functioning. After adjusting for confounders, Crothers and colleagues (2005) found that cigarette smoking was associated with significantly lower quality of life as compared with never smokers.

2.1.7 Death

Cigarette smoking remains the leading preventable cause of death among the general population, resulting in approximately 443,000 deaths annually (CDC, 2011b). Correspondingly, in addition to the aforementioned morbidity, research has shown that cigarette smoking is associated with death among people living with HIV. In a United States-based cohort of people living with HIV receiving clinical care, current cigarette smoking, in addition to a low baseline CD4 cell count and older age, was an independent predictor of mortality (Modrich et al., 2010). Additionally, Pines and colleagues (2011) showed that, compared to never smokers, current smokers were at greater risk of all-cause mortality. Crothers and colleagues (2005) examined more than 800 veterans in the United States living with HIV who were taking HAART and found that the mortality rate

for smokers was twice that of nonsmokers after adjusting for confounding factors like age, CD4 cell count, and viral load. Additionally, authors of a large cohort study estimated that 24% of deaths among people living with HIV in the modern HAART era are attributable to tobacco use (Lifson et al., 2010). Furthermore, results from a population-based Danish cohort study showed that smokers living with HIV lose more life-years to smoking than to HIV itself, and that the excess mortality of smokers is tripled and the population-attributable risk of death associated with smoking is doubled among patients with HIV as compared to population controls (Helleberg et al., 2013).

2.2 FACTORS INFLUENCING PATTERNS OF CIGARETTE SMOKING

Several highly interactive factors prominently associated with cigarette smoking patterns and behaviors can be observed among people living with HIV, including certain sociodemographic, drug and alcohol use, psychiatric comorbidity, and access to treatment characteristics.

2.2.1 Individual-level characteristics

2.2.1.1 Sociodemographic characteristics

Research among people living with HIV has fairly consistently identified several sociodemographic characteristics that are associated with current cigarette smoking status. For instance, men are more likely than women to be current smokers among people living with (Mamary et al., 2002; Stewart et al., 2012). Findings regarding age have been mixed, with some research indicating that younger individuals were more likely to be current smokers (Gritz et al., 2004), while some implicates older age (Tesoriero et al., 2010). Additionally, Gritz and colleagues (2004) and Chander and

colleagues (2012) found that the prevalence of current cigarette smoking decreased as age increased. Gritz and colleagues (2004) also found that White participants were significantly more likely than Hispanic participants to be current smokers.

2.2.1.2 Drug and alcohol use

Characteristics such as heavy drinking (Gritz et al., 2004) and illegal drug use (Gritz et al., 2004; Burkhalter et al., 2005; Marshall et al., 2011) have been found to be associated with current smoking status among people living with HIV. Additionally, in a study examining people with and without HIV who are injection drug users, Marshall and colleagues (2011) found that compared to former injectors, current injectors had a higher smoking prevalence, greater daily cigarette consumption, and slightly higher scores on the Fägerstrom Test for nicotine dependence. In addition to associations with current smoking status, one study found that among HIV-positive smokers, greater current illegal drug use is associated with being less ready to quit smoking and being less interested in quitting (Burkhalter et al., 2005).

2.2.1.3 Psychiatric comorbidity

The prevalence of depression among people living with HIV ranges from 22-32% (Bing et al., 2001; Ferrando & Freyberg, 2008; Rabkin et al., 1997), two to three times higher than what is observed in the general population. Research has shown an association between depression and smoking behaviors among people living with HIV. Stewart and colleagues (2010) found that having depression predicted participants' current smoking status. Additionally, research has shown that higher rates of cigarette

smoking, greater nicotine dependence, and abuse of other substances are associated with a variety of mental health conditions, in addition to depression, such as schizophrenia and anxiety disorders (Niaura & Abrams, 2002; Ziedonis et al., 2008). Greater levels of emotional stress have also been found to be associated with less readiness to quit smoking and less interest in quitting (Burkhalter et al., 2005).

2.2.1.4 Supporting beliefs

In addition to the aforementioned individual-level characteristics, the beliefs held by people living with HIV may be important in determining or sustaining smoking behaviors. For instance, self-efficacy has been found to be important in influencing cessation and dependence. Vidrine and colleagues (2006) found that self-efficacy mediated the efficacy of cessation treatment. Additionally, low-self efficacy to resist temptations and triggers to smoke has been found to be associated with nicotine dependence (Lloyd-Richardson et al., 2008). Furthermore, some research has shown that people living with HIV believe that they will not live long enough to suffer the health risks of tobacco use, or they think that they are at decreased health risk for continued smoking (Burkhalter et al., 2005; Reynolds et al., 2004). As a result, these individuals may be less concerned with smoking cessation.

2.2.2 Social-level characteristics

To date, among people living with HIV, research examining the association between social environmental characteristics and cigarette smoking behaviors has been lacking. Research among the general population has shown that social-level

characteristics influence smoking behaviors. For instance, the presence of smoking in an individuals' social network is associated with current smoking status and age of smoking initiation (Alexander et al., 2001; Unger & Chen, 1999). In terms of smoking cessation, Christakis and Fowler (2008) found that groups of interconnected smokers tend to quit in concert. Additionally, receiving high levels of support from partners, as well as perceived availability of support were associated with cessation and short-term abstinence, while the presence of smoking in one's social network was a hindrance to maintaining abstinence in the long-term (Mermelstein et al., 1986). Based on this research conducted among the general population, it is possible that social-level characteristics are associated with cigarette smoking behaviors among people living with HIV, and have the potential to serve as important points for interventions.

2.3 SMOKING CESSATION IN HIV

2.3.1 Interest in quitting/readiness to quit

In light of the high prevalence of smoking among people living with HIV, and the deleterious health concerns associated with it, it is perhaps not surprising that many smokers with HIV report being counseled to quit smoking. One study reported that 81% of current smokers recalled receiving medical advice to quit smoking within the past year (Burkhalter et al., 2005). Additionally, some studies have shown that a significant proportion of smokers living with HIV report being currently interested in quitting smoking, or are currently thinking about quitting. For instance, Mamary and colleagues (2002) and Tesoriero and colleagues (2010) reported that 63% and 75% of smokers, respectively, were interested in quitting. Additionally, among South African HIV clinic

attendees, 42% reported that they had intentions to quit smoking within the next year, and an additional 55% reported a desire to quit, but without having a concrete plan for cessation (Shapiro et al., 2011). Though interest in quitting appears to be high among HIV-positive smokers, individuals may have differing perceptions of what “quitting” means. For instance, in a sample of smokers living with HIV recruited from outpatient clinics in San Francisco, less than half (45%) of respondents chose total abstinence as a smoking cessation treatment goal (Humfleet et al., 2009). Other responses included quitting smoking with the possibility of relapse (32.2%), abstaining for a time (5.6%), smoking in a controlled manner (4.4%), while the remaining respondents indicated that they would like to smoke occasionally (2.2%), had no clear goal (4.4%), or had some other goal (6.1%) (Humfleet et al., 2009). In addition to examining interest in quitting, Burkhalter and colleagues (2005) and Gritz and colleagues (2004) found that 18% and 34% of smokers living with HIV in their respective cohorts were in the preparation or action stages of quitting cigarette smoking. These estimates can be contrasted with findings from a study conducted by Shuter and colleagues (2012a) where approximately two-thirds of participants with HIV surveyed at an infectious disease clinic in New York City indicated that they were in the preparation or action stages. Thus, though it appears that interest in quitting smoking among HIV-positive smokers is high, actual readiness to quit tends to vary.

In addition to exploring interest in smoking cessation, several studies have explored the smoking cessation modalities preferred by smokers living with HIV. In one study (Shuter et al., 2012a), more than half of smokers reported interest in each of the following types of cessation interventions: nicotine replacement therapy (NRT) (64.4%),

individual counseling (64.4%), group counseling (55.9%), and using telephone quit lines (52.5%). Slightly less than half of the sample reported interest in making use of a “buddy system”-type intervention (49.2%) or oral medications for smoking cessation (40.7%) (Shuter et al., 2012a). Similar to the aforementioned findings, a study conducted by Shapiro and colleagues (2011) in South Africa found that the most highly endorsed cessation modality was free NRT (91%); much less endorsement was received for NRT that participants would have to pay for (28%). Similarly, 91% of smokers reported being interested in utilizing free prescription medications for smoking cessation, while 26% would be interested in using prescription medications if they had to pay for it (Shapiro et al., 2011). Additionally, many were interested in utilizing the following counseling-based cessation methods: talking with a doctor or nurse (83%), participating in a support group (85%), and participating in a support group for smoking cessation that is restricted to persons with HIV (87%) (Shapiro et al., 2011). Participants also reported an interest in using telephone quit lines (61%) and text message-based cessation support (65%) (Shapiro et al., 2011). Mamary and colleagues (2002) reported that, among smokers with HIV currently thinking about quitting, 69% were interested in participating in a group smoking cessation program, 82% were interested in nicotine replacement therapy, and 56% were interested in receiving both nicotine replacement therapy and group therapy for smoking cessation. HIV-positive cigarette smokers have reported interest in a variety of types of smoking cessation aids and interventions, with endorsement of the same modalities varying between studies. It is possible that the popularity of certain smoking cessation methods may vary based on the region in which the study was conducted, or other sample characteristics.

Some research has also documented prior quit attempts made by cigarette smokers living with HIV. In general, a significant proportion (33-82%) of smokers reported having made at least one quit attempt in the past (Benard et al., 2007; Mamary et al., 2002; Shapiro et al., 2011; Encrenaz et al., 2010). Mamary and colleagues (2002) have found that prior quit attempts among smokers with HIV may vary based on gender: twice as many men reported making past quit attempts compared to women (81% versus 40%). Some research also indicates that many smokers (42-65%) made their quit attempts following receipt of their HIV diagnosis (Benard et al., 2007; Burkhalter et al., 2005).

2.3.2 Barriers to cessation

2.3.2.1 Patient characteristics

Despite significant interest in quitting, people living with HIV, as a group, bear numerous characteristics that may serve as barriers to smoking cessation (Moadel et al., 2012). For instance, smokers living with HIV have high rates of substance use and comorbid psychiatric conditions (Shuter et al., 2012a). Additionally, they are exposed to a variety of other stressors including poverty, racism/discrimination, stigmatization, loneliness, and health concerns (Encrenaz et al., 2010; Goldberg et al., 2010; Shuter et al., 2012a; Riley et al., 2007; Boarts et al., 2008; Bogart et al., 2008; Reynolds et al., 2004). As a result, these factors tend to decrease the likelihood that smoking cessation interventions, especially brief and “simple” interventions, will be successful among cigarette smokers living with HIV.

Beliefs held by smokers may also influence smoking cessation. For instance, Shuter and colleagues (2012a) asked smokers with HIV how much they felt that cigarette

smoking helps them with a variety of factors. A majority of participants felt that smoking helped “somewhat” or “a lot” with the following activities: controlling anxiety, controlling anger, controlling depression, and relaxing. Slightly less than half of participants believed that smoking helped with weight control (44%), regulating bowel movements (39%), enhancing the high from other drugs (35.6%), increasing social contact (39%), and being accepted by other smokers (42.4%). Belief that cigarette smoking may confer positive benefits, such as those discussed above may hamper smokers’ willingness to engage in smoking cessation.

Additionally, one study also identified several factors, related to low socioeconomic status, associated with difficulties in participating in a cessation program utilizing cellular telephones: lack of access to a working telephone, high number of household moves, and lack of transportation (Lazev et al., 2004). Furthermore, the potential for increased toxicities, side effects and drug–drug interactions between antiretroviral therapies and medications for smoking cessation may complicate care.

2.3.2.2 Provider characteristics

In addition to characteristics of the smokers living with HIV themselves, characteristics of healthcare providers may provide barriers to cessation as well. In general, smoking cessation among people with HIV has received less attention from practitioners. This decreased emphasis may be due to the focus on acute treatment of HIV, perceived high mortality rate, lack of cessation treatment tailored to this population, and the perceived lack of relevance of smoking to treatment outcome and survival (Gritz et al., 2007). HIV care providers may be less aware of cigarette smoking among their

patients than providers in the general population (Crothers et al., 2007). This decreased awareness of the prevalence of smoking has the potential to impact the promotion of smoking cessation among people living with HIV.

Additionally, some research shows that HIV care providers were less confident in their ability to achieve smoking cessation in their patients (Shuter et al., 2012b; Horvath et al., 2012). For instance, in one study assessing HIV provider attitudes and practices regarding smoking-related services, 55% of providers surveyed reported that they were not confident in their ability to provide resources and advice regarding cessation to their patients (Horvath et al., 2012). In another study of HIV care providers, 24.9% of practitioners reported that they either agreed or strongly agreed that their efforts to get HIV-positive smokers to quit are unlikely to succeed (Shuter et al., 2012b).

This lack of confidence may stem from a variety of sources. For instance, a majority of providers (60%) believe that their patients know that smoking is a problem, but do not want to quit (Horvath et al., 2012). Additionally, approximately one-third (35.9%-38%) of practitioners report feeling as though they do not have adequate time to address smoking cessation among people living with HIV during clinic visits (Horvath et al., 2012; Shuter et al., 2012b). Conversely, this diminished confidence could be due to a lack of training in tobacco treatment and counseling methods (Shuter et al., 2012b). In a survey of providers listed in the HIV medicine Association, only 22.9% reported that they had ever received formal training or clinical education on this topic (Shuter et al., 2012b). Furthermore, a potentially troubling statistic indicates that only 29.2% of providers from this sample (Shuter et al., 2012b) and less than one-third of physician

providers from another sample (Horvath et al., 2012) would be interested in obtaining additional smoking-related training and educational opportunities.

2.3.3 Cessation interventions

2.3.3.1 Evidence-based smoking cessation interventions

Each year, a significant proportion of smokers in the general population make quit attempts; more than half of adult smokers made a quit attempt in 2010 (CDC, 2011c). Success in these quit attempts varies, at least in part, based on whether or not an individual employs some method to aid cessation. Research has shown that, on average, smokers seeking cessation assistance have twice the success with smoking cessation at 12 months than do smokers who did not seek such assistance (Zhu et al., 2000). Evidence-based smoking cessation methods are varied, but can include counseling interventions, nicotine replacement therapy, and non-nicotine replacement therapy interventions, and are described below.

Counseling interventions can include, but are not necessarily limited to, individual, group, telephone, or online counseling. Research has shown that the most successful counseling interventions tend to be those that are more intensive (i.e., longer in duration and occur over multiple visits) (Fiore et al., 2008). For instance, brief interventions lasting 3 minutes resulted in abstinence rates of 13% compared to longer interventions lasting 10 minutes or more, which resulted in abstinence rates of 22% (Reus & Smith, 2008; Fiore et al., 2008). One advantage of utilizing counseling interventions is that they can be provided by a variety of types of providers: physicians, nurses, social workers, health educators, and so on (Kwong & Bouchard-Miller, 2010).

Nicotine replacement therapy (NRT) provides small doses of nicotine to the user, and is intended to replace the nicotine that one would receive from smoking cigarettes. NRT is available in several forms, including patch, gum, lozenges, inhaler, and nasal spray. The patch, gum, and lozenges are available over-the-counter, without a prescription while nicotine inhalers and nasal sprays require prescriptions. The amount of nicotine delivered by NRT varies based on the exact method used. Moreover, the method of nicotine delivery from NRT products is different than when smoking cigarettes. As a result, NRT can reduce, but not necessarily eliminate craving or withdrawal symptoms (Kwong & Bouchard-Miller, 2010). Nevertheless, a Cochrane review reported that any form of NRT was more effective than placebo in helping smokers to quit (Stead et al., 2008).

Non-nicotine replacement therapy (NNRT) includes prescription medications that do not contain nicotine for the purpose of smoking cessation. Two such NNRT medications that are often prescribed for smoking cessation include sustained-release bupropion (bupropion SR) and varenicline. Bupropion SR acts as a nicotinic acetylcholine receptor antagonist, is used to reduce the severity of nicotine cravings and withdrawal symptoms, and is recognized as a first-line pharmacotherapy for smoking cessation in the United States and Europe (Slemmer et al., 2000; Fiore, 2000; Tønnesen et al., 2007). Varenicline on the other hand, is a nicotinic receptor partial agonist (Mihalak et al., 2006), and is used to reduce cigarette cravings as well as to decrease the pleasurable effects of cigarettes and other tobacco products. Despite carrying a U.S. Food and Drug Administration mandated black box warning (Food and Drug Administration, 2009), both bupropion SR and varenicline have generally been shown to

be safe, and to be more efficacious than placebo (Oncken et al., 2006; Jorenby et al., 2006; Gonzales et al., 2006) or nicotine patch (Aubin et al., 2008) in randomized controlled trials (RCT). Existing RCTs have also shown varenicline to be more effective than bupropion SR for enabling both short- and long-term cessation (Jorenby et al., 2006; Gonzales et al., 2006).

2.3.3.2 Smoking cessation interventions conducted among smokers living with HIV

Despite the high prevalence of cigarette smoking and the significant associated health-related consequences, as well as evidence that 40-63% (Mamary et al., 2002; Burkhalter et al., 2005) of cigarette smokers living with HIV are at least contemplating smoking cessation, very few studies have investigated the effectiveness of smoking cessation interventions among people living with HIV. This lack of emphasis on smoking cessation may be attributable to a variety of factors: the desire of practitioners/patients to focus on acute treatment of a life-threatening illness, a perceived lack of relevance of smoking to treatment outcome and survival, a lack of interventions tailored to the population, or the belief that other substance use treatment issues should be addressed first. However, the somewhat limited existing research concerning smoking cessation shows promise for the use of smoking cessation strategies among smokers living with HIV.

See Table 2.1 for a summary of smoking cessation trials conducted among samples of people living with HIV. Several trials have been conducted to examine the effectiveness of counseling-based approaches to smoking cessation among smokers living with HIV. For instance, a feasibility study examining a cell phone-delivered

counseling intervention found that, at the end of a 2-week time period, 75% of smokers were abstinent (Lazev et al., 2004). In two larger, more extensive trials of cell phone-delivered smoking cessation interventions, smokers living with HIV receiving the phone-delivered intervention were significantly more likely than individuals in the usual care group to quit smoking at 3 months (Vidrine et al., 2006: 36.8% vs. 10.3%; Vidrine et al., 2011: 8.9% vs. 2.9%). Moadel and colleagues (2012) found that HIV-positive smokers receiving a group-based smoking cessation intervention were more likely than smokers randomized to receive standard care to be abstinent from smoking at the 3-month follow-up time period (19.2% vs. 9.7%).

Additionally, studies have also examined the use of NRT for smoking cessation. Findings from a pilot study, conducted by Elzi and colleagues (2006), showed that smokers living with HIV who received counseling plus NRT, as compared to the self-help control condition, were more likely to quit smoking (38% vs. 7%). Similarly, another pilot study found that smokers with HIV receiving a nurse-delivered individual cessation counseling plus NRT reported greater abstinence rates at 8 weeks (62.5% vs. 0%) than a control group of smokers (Wewers et al., 2000). Additionally, Ingersoll and colleagues (2009) randomized smokers living with HIV to receive self-guided reading plus the nicotine patch or motivational interviewing plus the nicotine patch. No significant group differences were observed, although the percentage of smoking days were reduced by 41% among both groups combined, and 22% of all participants were abstinent at follow-up, indicating that the nicotine patch is potentially a viable smoking cessation aid option for HIV-positive smokers. Furthermore, Lloyd-Richardson and colleagues (2009) randomized a group of smokers living with HIV to receive standard care plus the nicotine

patch or motivationally enhanced counseling along with the nicotine patch. Again, although no group differences were observed, 6-month abstinence rates of 9-10% were observed for both groups.

Furthermore, several non-randomized studies have examined the effectiveness of pharmacological therapies for smoking cessation among cigarette smokers living with HIV. In one small study, in conjunction with physician advice participating smokers were given the choice of utilizing varenicline, bupropion, NRT, or no cessation aids. At the end of 12 months, 25% of the sample was verified to be abstinent from smoking (Fuster et al., 2009). In one study, among 21 smokers administered bupropion, 38% self-reported abstinence from smoking at the 12-month follow-up visit (Pedro-Clotet et al., 2006). Two additional studies explored the effectiveness of varenicline among HIV-positive smokers: Tornero and Mafé (2006) found that 24% of smokers administered varenicline were biochemically verified to be abstinent at 6 months, while Cui and colleagues (2011) found 42% of smokers given varenicline to be abstinent at 3 months. Thus, though non-significant differences were observed between intervention and control groups in some of the trials, and abstinence rates in intervention groups varied (8.9%-75%), smoking cessation interventions show promise among cigarette smokers who have HIV.

2.4 CONCLUSION

People living with HIV display a high prevalence of cigarette smoking, and are disproportionately affected by smoking-related conditions, such as cardiovascular and respiratory conditions, lung cancer, immunosuppressive effects, poor quality of life, and

adverse HIV treatment outcomes. Despite the burden of cigarette smoking in this group, and the associated adverse health outcomes, relatively little research has been conducted among cigarette smokers living with HIV. Additionally, among the existing research, much of the emphasis has been placed on examining individual-level characteristics (e.g., sociodemographics, psychiatric comorbidity) and their associations with patterns of cigarette smoking behaviors. The extant literature has identified a variety of individual-level characteristics, such as sociodemographics, substance use, psychiatric comorbidity, and supporting beliefs that are associated with current smoking status, interest in quitting, and barriers to cessation. Though these types of characteristics are undoubtedly important in helping to elucidate patterns of smoking, barriers to cessation, and so on, additional research should be conducted to examine social-level characteristics and their associations with cigarette smoking among people living with HIV. The omission of social-level characteristics in extant research is notable, given that prior research among the general population has shown such characteristics to be associated with cigarette smoking behaviors. Additionally, much of the existing research has focused on examining characteristics associated with current cigarette smoking status among people living with HIV. Again, though this is certainly a behavior of much interest, other cigarette smoking behaviors are worthy of investigation as well. Future research should include the examination of characteristics associated with additional smoking behaviors, such as quit attempts and cessation success.

Prior research has also examined and identified numerous provider-related characteristics that may serve as barriers to smoking cessation among smokers with HIV. Some of the most notable and troubling findings concern HIV care providers' lack of

training in smoking cessation and counseling methods, as well as physicians' lack of interest in participating in such educational programs in an attempt to receive more training. Given the nearly ubiquitous nature of cigarette smoking among HIV-positive persons, it would seem prudent to include some form of smoking cessation-related training as part of HIV care providers' education, regardless of their level of interest in such education. Having experience with this type of training may increase providers' self-efficacy for successfully providing smoking cessation advice and therapy to their patients, and subsequently increase cessation attempts and eventual cessation among smokers living with HIV.

Furthermore, few published studies and randomized controlled trials exist concerning smoking cessation interventions among people living with HIV. Additional research is needed in this area to determine which smoking cessation modalities are effective in this population, as well as to investigate the potential for adverse drug-drug interactions when using pharmacological therapies for smoking cessation, as few studies have looked into this among people living with HIV. In addition to investigating the effectiveness of smoking cessation therapies, given the high prevalence of smoking and the deleterious associated health consequences, the feasibility and cost-effectiveness of integrating smoking cessation therapy within HIV care settings should be investigated. Furthermore, the belief that addressing cigarette smoking is not a priority is prevalent among people living with HIV as well as among their healthcare providers. Such issues suggest the need for educational efforts to inform providers and patients about the healthcare, adherence, and treatment risks associated with cigarette smoking among people with HIV.

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Table 2.1. Summary of studies investigating evidence-based smoking cessation modalities among samples of persons living with HIV

Study	R/NR	Intervention(s)	<i>n</i>	Follow-up	Outcome - abstinence
Cui, 2011	NR	Varenicline	36	3 months (BCV)	42% (15/36)
Elzi, 2006	NR	Counseling + NRT; no treatment control	34; 383	12 months (SR)	38% (13/34); 7% (27/383)
Fuster, 2009	NR	Varenicline, bupropion, NRT, no aids	6; 12; 8; 3	12 months (BCV)	25% (8/32)
Ingersoll, 2009	R	NRT + self help; NRT + motivational interviewing	18; 22	3 months (BCV)	22% (9/40) overall; ns group difference
Lazev, 2004	NR	Cell phone counseling	19	2 weeks (SR)	75% (15/19)
Lloyd-Richardson, 2009	R	NRT + motivational interviewing; NRT + standard care	232; 212	6 months (BCV)	9% (21/232); 10% (21/212) – ns group difference
Moadel, 2012	R	Group treatment; standard care	73; 72	3 months (BCV)	19.2% (14/73); 9.7% (7/72)
Pedro-Clotet, 2006	NR	Bupropion	21	12 months (SR)	38% (8/21)
Tornero, 2009	NR	Varenicline	22	6 months (BCV)	24% (5/21)
Vidrine, 2006	R	Cell phone counseling; standard care	48; 47	3 months (BCV)	36.8% (14/38); 10.3% (4/39)
Vidrine, 2011	R	Cell phone counseling; standard care	236; 238	3 months (BCV)	8.9% (21/236); 2.9% (7/238)
Wewers, 2000	R	Peer-led intervention + NRT; no treatment control	8; 7	8 weeks (BCV)	62.5% (5/8); 0% (0/7)

Definitions of abbreviations: R/NR = randomized/non-randomized; BCV = biochemically verified; SR = self-report; NRT = nicotine replacement therapy; ns = non significant

3. CHAPTER 3 – THE ASSOCIATION OF INDIVIDUAL-LEVEL AND SOCIAL-LEVEL CHARACTERISTICS WITH CURRENT CIGARETTE SMOKING STATUS AMONG A SAMPLE OF PEOPLE LIVING WITH HIV (Aim 2)

Abstract: Cigarette smoking is endemic among people living with HIV and is related to substantial morbidity and mortality. Research has largely focused on individual-level characteristics associated with smoking, with less attention to social factors. We aimed to explore individual- and social-level characteristics associated with current cigarette smoking among people living with HIV. Data came from 358 individuals on antiretroviral therapy interviewed in a study on informal HIV caregiving conducted in Baltimore, Maryland. Most participants (75%) were current smokers and 45% reported current drug use. In adjusted logistic regression analyses, current drug use (adjusted odds ratio (aOR)=2.82, 95% confidence interval (CI)=1.55-5.13), 12-step program participation (aOR=1.74, 95% CI=1.02-2.96), and having a main Supporter who is a current smoker (aOR=2.01, 95% CI=1.14-3.54) were associated with current smoking. Findings reveal the importance of social-level factors in cigarette smoking among HIV-positive drug users and have implications for developing targeted smoking cessation interventions for HIV-positive smokers.

3.1 Introduction

Cigarette smoking is the leading preventable cause of death in the United States (US) (CDC, 2011a). While the prevalence of smoking among the general population is approximately 20% (CDC, 2011b), the prevalence of smoking is estimated to be 40-70% among people living with HIV (Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010). This disparity is potentially reflective of the higher prevalence of cigarette smoking among substance using populations (70-90%) in the United States (Richter et al., 2002; Clarke et al., 2001), a group that bears a disproportionate burden of HIV in the US (CDC 2011c; CDC, 2002).

As life expectancies among people living with HIV continue to increase due to advancements in treatments for HIV, greater attention has been directed to the intersection of tobacco use and HIV. Along with increased life expectancies, an increased incidence of non-AIDS-related conditions has been observed in this population, many of which are associated with cigarette smoking. Elevated risks of chronic obstructive pulmonary disease (Lewden et al., 2005; Diaz et al., 2002; Crothers et al., 2006), bacterial pneumonia (Crothers et al., 2005; Lifson et al., 2010; Miguez-Burbano et al., 2005), lung cancer (Lifson et al., 2010; Kirk et al., 2007; Chaturvedi et al., 2007; Engels et al., 2006), and cardiovascular disease (Lifson et al., 2010; Lewden et al., 2005; Petoumenos et al., 2011; Barbaro et al., 2003; Friis-Møller et al., 2003; Savès et al., 2003) have been observed among populations of persons living with HIV. Furthermore, cigarette smoking among people living with HIV is associated with significant mortality. Authors of a population-based Danish cohort study concluded that smokers with HIV lose more life-years to smoking than to HIV, and that the excess mortality of smokers is

tripled and the population-attributable risk of death associated with smoking is doubled among patients with HIV as compared to population controls (Helleberg et al., 2013). Additionally, as discussed in a review by Sopori (2002), some studies have shown that cigarette smoking modifies CD4+ lymphocyte counts, though there have been inconsistencies in establishing a negative relationship between smoking and the course of HIV/AIDS (Furber et al., 2007). Nonetheless, in a study among females on highly active antiretroviral therapy (HAART), evidence has suggested that cigarette smokers are more likely than non-smokers to have poorer treatment outcomes, including poorer viral and immunologic responses, greater risks of virologic rebound, more frequent immunologic failure, and a higher risk of developing AIDS (Furber et al., 2007; Feldman et al., 2006).

Although prior research has explored factors associated with cigarette smoking among people living with HIV, the studies have largely been limited to the examination of individual-level characteristics. For example, demographic characteristics such as sex (Stewart et al., 2012; Mamary et al., 2002), age (Gritz et al., 2004; Tesoriero et al., 2010), race/ethnicity (Gritz et al., 2004), education (Gritz et al., 2004; Chander et al., 2012) and comorbid depression (Stewart et al., 2012), as well as behavioral characteristics such as heavy drinking (Gritz et al., 2004) and illegal drug use (Gritz et al., 2004; Burkhalter et al., 2005) have been found to be associated with current cigarette smoking among people living with HIV. To date, research examining the influence of social environmental characteristics such as dyadic-level (i.e., characteristics relating to interactions or relationships between two individuals, the smallest possible social group) and family-level characteristics, and their association with current cigarette smoking among people with HIV has yet to be explored. Examination of such social environmental factors has

the potential to ultimately yield information helpful in the development of smoking cessation interventions for people living with HIV.

In the general population, smoking behaviors are consistently associated with social network factors (Christakis & Fowler, 2008). Research among adolescent smokers has shown that the presence of smoking in an individual's network increases their risk of smoking (Alexander et al., 2001) and is associated with an earlier age of smoking initiation (Unger & Chen, 1999) as compared to adolescents whose network does not contain smokers. Social factors also appear to play a role in smoking cessation. Social network analysis indicates that groups of interconnected individuals quit smoking in concert (Christakis & Fowler, 2008). Additionally, specific social factors may function at different times within the quitting process to help or hinder cessation maintenance. For instance, high levels of support from partners, as well as perceived availability of support are associated with cessation and short-term abstinence (Mermelstein et al., 1986). Conversely, having social network members who were smokers was a hindrance to maintaining abstinence in the long-term (Mermelstein et al., 1986). It is likely that these social factors are also influential of smoking among people living with HIV, given their previously observed association with smoking behaviors among the general population (Christakis & Fowler, 2008; Alexander et al., 2001; Unger & Chen, 1999; Mermelstein et al., 1986).

In light of the aforementioned gaps in the literature, the aim of the present study was to examine individual and social environmental characteristics and their association with current cigarette smoking among a sample people living with HIV. The theoretical foundation for these analyses is based on a combination of the Ecological Model for

Health Promotion (McLeroy et al., 1988) and Social Cognitive Theory (SCT; Bandura, 1986). The Ecological Model for Health Promotion and SCT both posit that various levels of influence can impact an individual's behavior. For instance, within the Ecological Model, two levels of influence include Intrapersonal (i.e., individual-level characteristics) and Interpersonal characteristics (i.e., characteristics of primary groups such as family, friends, and peers). Additionally, in SCT, an individual's behavior is influenced by (and can reciprocally influence) personal characteristics of the individual as well as by the environment. In light of these conceptual frameworks and findings from prior research, we hypothesized that individual-level characteristics such as current substance use, and social environmental factors such as the presence of smoking in dyadic relationships and norms regarding smoking in the network would be associated with current cigarette smoking. The association of individual- and social-level factors with smoking may represent important targets for smoking cessation interventions.

3.2 Methods

3.2.1 Data Source

Data were from the 6-month follow-up assessment of the BEACON (BEing Active & CONnected) Study, a longitudinal study with three semi-annual visits aimed at examining social environmental influences on former and current drug users' HIV medication adherence and health outcomes. The study (2006-2012) was conducted in Baltimore, Maryland, US. Follow-up rates were 94% and 86% at the 6- and 12-month follow-up visits, respectively. The study enrolled Index participants on antiretroviral therapy, recruited from clinic and community venues; and up to two of Indexes' main

supportive ties whom the Indexes authorized our recruitment, with recruitment selection priority based on degree of providing the Index emotional support and instrumental assistance. Index participants were considered eligible if they were HIV-positive and either current or former injection drug users, 18 years of age or older, and were on HIV treatment at the time of study enrollment. Supporter participants were considered eligible if they were 18 years of age or older, and were verified to not be professionals whose only relationship with the Index was in the capacity of service provider. Index participants were recruited from the Johns Hopkins University Moore Clinic for HIV Care, the largest HIV care provider in Maryland, as well as via targeted street-outreach. Data were collected by trained interviewers and via audio computer-assisted self-interviewing (ACASI). Index and Supporter dyads were administered questionnaires at similar time points. Information regarding the characteristics of Index and Supporter participants was self-reported by the Indexes and Supporters, respectively.

The questionnaire for each of the three semi-annual visits gathered information on medication adherence, illegal drug use, and mental health variables. However, the 6-month follow-up visit contained more extensive information regarding cigarette smoking than either the baseline visit or 12-month follow-up visit. As a result, the present study utilized data from the 6-month follow-up visit. The sample for the present analysis comprised 358 Index participants (94% of the baseline sample); one Index case was excluded because of missing data. The Institutional Review Board at Johns Hopkins University Bloomberg School of Public Health approved this study.

3.2.2 Measures

3.2.2.1 Individual-level variables

Sociodemographic variables - Sociodemographic variables selected for this analysis includes sex, age, race, past month income, and marital status. Sex was dichotomized (male/female), and age was categorized into approximate quartiles (28-44; 45-49; 50-53; 54-65). Race was dichotomized as “Black” or “non-Black” due to sample distribution. Past month income from all sources, including food stamps was dichotomized (<\$500 versus >\$500). Marital status was also dichotomized as “not married” or “married or in a committed relationship”.

Drug and alcohol use - Individuals were dichotomized based on self-reported use of alcohol within the past month. Participants were also asked about the frequency with which they use other substances for extramedical purposes (i.e., stimulants, opiates, tranquilizers or barbiturates, marijuana, heroin, cocaine or crack, hallucinogens, prescription drugs, and “other drugs” within the past month). Participants that reported using any of these substances at least once within the past month were categorized as past-month users for each substance. A dichotomous composite variable was also created for “any past month drug use”, not including alcohol. Additionally, individuals were dichotomized based on self-reported injection drug use in the past 6 months.

Depressive symptoms - The Center for Epidemiologic Studies Depression Scale (CES-D) is a short (20 item) self-report scale designed to measure depressive symptomatology in the general population (Radloff, 1977). The items of the scale correspond to symptoms that are associated with major depressive disorder, which have been used in previously validated longer scales. Possible range of scores is 0 to 60, with higher scores indicating the presence of more symptomatology. A score of 16 or higher has been used to identify individuals with clinically meaningful depressive symptoms

(Radloff, 1977). The CES-D has been shown to be valid among a sample of low socioeconomic status, primarily African American individuals (Thomas et al., 2001), and has been used widely among samples similar to the one utilized for the present work (Yang et al., 2013; Latkin et al., 2012). The CES-D has been shown to have very good internal consistency reliability (>0.85) and acceptable test-retest reliability (Radloff, 1977; Hann et al., 1999). Additionally, it has been shown to have moderate-good (0.44-0.75) concurrent validity compared with other scales measuring depressive symptoms (Radloff, 1977), good discriminant validity (Weissman, 1977), and sensitivity of 0.95 and specificity of 0.70 when compared with the Diagnostic Interview Schedule for DSM-IV (Thomas et al., 2001).

HIV primary care visits & drug treatment utilization - Based on the distribution in exploratory analyses, the number of HIV primary care visits in the past 6 months was categorized as approximate tertiles (0-2; 3-4; 5+). Utilization of 12-step programs was also used as a dichotomous variable (yes/no).

Cigarette smoking - Participants were asked whether they had smoked cigarettes in the past 30 days. A dichotomous variable (yes/no) was created based on the responses, and individuals reporting past 30 day smoking were considered to be current smokers. Current smokers were also questioned about the number of cigarettes that they smoke per day (i.e., cigarettes per day (CPD): <1, 1-10, 11-20, 21+), how soon after waking they smoke their first cigarette of the day (i.e., time to first cigarette (TTFC): <5 minutes, 6-30 minutes, 31-60 minutes, and 60+ minutes), as well as prior use of nicotine replacement therapy (yes/no), and prior use of medications or pills for the purpose of smoking cessation (yes/no).

Additionally, the Heaviness of Smoking Index (HSI) (Heatherton et al., 1989), a measure of nicotine dependence was created using the CPD and TTFC measures. Scores for the HSI range from a possible 0 to 6, with higher scores indicating a higher level of probable dependence. As done in prior research (Chaiton et al., 2007), the HSI was categorized into a 3-category variable: low (0-1), medium (2-4), and high (5-6). The HSI has been shown to have good test-retest reliability (0.72) over a 3-year period (Borland, 2010), good sensitivity (0.79) and specificity (0.96), and good concordance (Cohen's kappa=0.74) with the Fagerström Test for Nicotine Dependence (Heatherton et al., 1989), the most widely used measure of nicotine dependence (Chabrol et al., 2005).

3.2.2.2 Dyadic-level variables

A dichotomous variable was created based on participants' responses to a question asking if their main partner currently smoked. Another dichotomous variable was created based on Supporters' responses to a question asking if they currently smoked. Supporters were administered questionnaires similar to those given to Index participants, described previously, and contained information regarding sociodemographic characteristics, cigarette smoking, HIV status, and drug and alcohol use.

Not all participants reported having a main partner or a main Supporter: 192 (54%) Indexes reported having a main partner and 229 Index participants (64%) had a corresponding main Supporter. In order to utilize the full sample (n=358), the two dyadic-level variables were coded as "0" (i.e., "no") for individuals without partners or Supporters. This was deemed reasonable, since the Index participants without main partners or Supporters would not have had the influence of cigarette smoking by partners

or Supporters at that point in their lives. Sensitivity analyses were also performed that justify this decision.

3.2.2.3 Family-level variables

Several dichotomous (yes/no) variables were created based on Index participants' responses to questions regarding the following topics: prevalence of smoking among family members; encouragement to smoke by family members; family members' belief that smoking causes health problems; whether family members dislike cigarette smoking; and whether family members have rules regarding where someone can or cannot smoke within their homes.

3.2.3 Statistical Analysis

Chi-square (χ^2) tests were used to assess the statistical significance of relationships between current cigarette smoking status and individual-level, dyadic-level, and family-level variables. Unadjusted and adjusted logistic regression analyses were used to calculate odds ratios (ORs), adjusted odds ratios (aORs), and 95% confidence intervals (CI). Variable selection for the adjusted model was based on evidence from prior literature, *a priori* theory, or χ^2 p-values of <0.05. Variables selected for the adjusted model included: sex, age, marital status, income, past 30 day alcohol use, any past 30 day drug use, depressive symptoms, past 6 month participation in a 12-step program, family smoking, main partner smoking, and main supporter smoking.

Of the 359 individuals followed up at the 6-month interview, 358 provided information on current smoking status. These 358 individuals comprised the study sample for the present analysis. Analyses were also performed among only those individuals who had a main Supporter in an effort to assess how the decision to code the

two dyadic-level variable for Supporter smoking status as “0” (i.e., “no”) for individuals without Supporters affected results. All analyses were performed using STATA SE statistical software version 12.0 (StataCorp, 2011).

3.3 Results

3.3.1 Index participant characteristics

Participant characteristics are shown in Table 3.1. Three-quarters (75%) of the sample reported current cigarette smoking. The majority of the sample were male (61.8%), Black (92.2%), reported a past month income of \$500 or more (82.5%), and were not married (68.2%). More than a quarter of the sample was between the ages of 45-49 (27.3%), and the mean age was 48.9 years (SE=0.33). Approximately 38% of the sample had a CESD score of 16 or greater, indicating clinically meaningful depressive symptoms. In the past 6 months, 43.6% reported making 0-2 visits to their HIV primary care physician, 23.6% made 3-4 visits, and the remaining 32.9% reported making 5 or more visits. Additionally, 52.8% of participants reported engaging in a 12-step program in the past 6 months. A sizeable portion of the sample (37.9%) reported consuming alcohol in the past month, and the prevalence of alcohol use differed by current smoking status, with current smokers being more likely to report alcohol use ($\chi^2(1, N = 358) = 3.87, p = 0.049$). Current smokers were also more likely than non-smokers to report any past month drug use ($\chi^2(1, N = 358) = 15.98, p < 0.001$) as well as past 6-month injection drug use ($\chi^2(1, N = 358) = 5.16, p = 0.023$).

Of the full sample, forty-one percent of the sample reported having a main partner who smoked, though this did not differ by Index smoking status. Conversely, current

cigarette smokers were more likely to have a main Supporter who was also a smoker than were non-smokers ($\chi^2(1, N = 358) = 6.67, p = 0.010$).

A majority of the sample reported that their family contains current smokers (83.2%), and current smokers were more likely than non-smokers to have smokers in their family (85.5% vs. 76.4%, respectively) ($\chi^2(1, N = 358) = 3.97, p = 0.046$). Despite this, the majority of the sample reported that their family believed that smoking causes health problems (96.9%), dislikes cigarette smoke (89.4%), and has rules about where people can and cannot smoke in their houses (87.4%). Few participants reported receiving encouragement from their family members to smoke (8.4%).

3.3.2 Smoking characteristics

Cigarette smoking characteristics are shown in Table 3.2. The majority of the current sample (74%) reported current cigarette smoking. Of the 267 current smokers, most (76%) reported smoking 1-10 cigarettes per day (CPD), and smoking their first cigarette of the day within 5 minutes of waking (34%). More than half (64%) of the current smokers exhibited a medium-level of nicotine dependence, as assessed by the HSI. Fifty-seven percent of smokers reported previous experience with nicotine replacement therapy, and 9% reported previously using pills or medication for smoking cessation.

3.3.3 Drug use

Detailed information on drug use is shown in Table 3.3. Approximately 28% and 21% of the sample reported using cocaine/crack cocaine and heroin, respectively, in the past 30 days; current smokers were significantly more likely to report both cocaine/crack cocaine use ($\chi^2(1, N = 358) = 11.21, p = 0.001$) and heroin use ($\chi^2(1, N = 358) = 4.99, p$

= 0.026) than were non-smokers. Smaller proportions of the sample reported using stimulants other than cocaine/crack cocaine (0.8%) and opiates other than heroin (13.1%). Tranquilizers and/or barbiturates were used in the past 30 days by 4.5% of the sample, with smokers being more likely to report use ($\chi^2(1, N = 358) = 5.54, p = 0.019$). One-fifth (20.1%) of the sample reported past month use of marijuana, and once again, current smokers were significantly more likely to report marijuana use than were non-smokers ($\chi^2(1, N = 358) = 7.37, p = 0.007$). Few participants reported past month use of hallucinogens (0.1%), prescription drugs (3.3%), or other drugs (0.8%).

3.3.4 Logistic regression analyses

See Table 3.4 for information regarding unadjusted and adjusted logistic regression models. Logistic regression analyses were all completed with current smoking status as the outcome. After including all covariates in the adjusted logistic regression model, several individual-level factors were found to be statistically significant. Participation in a 12-step program was found to be significantly associated with current cigarette smoking (aOR=1.74, 95% CI=1.02-2.96). Additionally, any drug use in the past 30 days continued to be significantly associated with current smoking (aOR=2.90, 95% CI=1.59-5.31) in the adjusted model. Among dyadic-level characteristics assessed, having a main supporter who smokes also continued to be associated with current cigarette smoking (aOR=1.91, 95% CI=1.08-3.82) in the final adjusted logistic regression model. Other dyadic-level characteristics, specifically smoking status of a main partner, were not associated with the smoking status of the Index participant (aOR=1.04, 95% CI=0.56-1.93).

3.3.5 Supporter characteristics

In light of findings from the adjusted logistic regression analyses, we explored characteristics of Supporter individuals. See Table 3.5 for information regarding Supporter characteristics. The majority of Supporters were female (58.1%), with a mean age of 47.8 years (SE=0.73). The majority of Supporters were Black (92.6%), had a past month income of \$500 or greater (74.1%), and approximately half were married (47.2%) and had HIV (46.6%). Approximately 41% of Supporters live with their Index. In terms of type of relationship to their Index participant, 43.2% of Supporters were their Index's partner, 27.1% were kin, and 29.3% were of some "other" relationship (i.e., friend, neighbor, etc.) to their Index. Furthermore, 35.8% of Supporter-Index relationships were same sex dyads (i.e., male Supporter, male Index), and the remaining 64.2% were opposite sex dyads (i.e., male Supporter, female Index). Approximately half (48.5%) of Supporters reported using alcohol in the past month, and 40.8% reported past month drug use.

3.3.6 Sensitivity analyses

In adjusted analyses, when restricting the sample to the 229 individuals who had a main Supporter, the finding pertaining to 12-step program utilization was no longer statistically significant, though the association remained positive (aOR=1.45, 95% CI=0.72-2.92). Drug use within the past 30 days (aOR=2.65, 95% CI=1.18-5.94) and Supporter smoking status (aOR=4.12, 95% CI=1.96-8.67) continued to be positively and statistically significantly associated with Index current cigarette smoking status. No other differences were observed between findings from the full sample (n=358) and the restricted sample (n=229).

3.4 Discussion

Findings from the present study identified several characteristics, both individual and social environmental, that are associated with current cigarette smoking in adjusted models among a sample of people living with HIV. In terms of individual-level characteristics, past month use of illicit drug use was strongly associated with current cigarette smoking among this sample of people with HIV. This finding is consistent with prior research conducted in both HIV-positive (Gritz et al., 2004; Burkhalter et al., 2005) and general populations (Richter et al., 2002). Additionally, individuals reporting utilization of a 12-step program in the past 6 months were significantly more likely to be current smokers than were those not engaging in such programs. One potential explanation for this finding is that within some treatment communities, major life changes during the early portions of the recovery process are discouraged for fear of triggering relapse, and the treatment culture has accepted that quitting tobacco use would constitute a major life change (Sussman, 2002; Joseph et al., 2002). Additionally, in some treatment organizations, smoking is a part of the staff culture, where staff members take smoking breaks with one another, and sometimes even with their clients (Ziedonis et al., 2006). Interestingly, a sizeable proportion of the sample reported engaging in recent contact with an HIV care provider or a 12-step program. Each of these interactions with healthcare professionals represents a unique opportunity to address smoking cessation.

A novel finding in the present analyses included the observed association between cigarette smoking between a main Supporter and current smoking of Index participants. Smoking by a main Supporter was associated with a nearly two-fold increased odds of

current smoking relative to Index participants whose Supporter was a non-smoker. Interestingly, the same findings did not hold when examining the association between main partner smoking and current smoking by Index participants. This disparity may arise due to the differing social roles filled by main partners and main Supporters. Main Supporters, as defined in this study, are those individuals who are most supportive of the Index in their living with HIV; while main partners tend to be individuals with whom Index participants are engaged in a sexual relationship (i.e., boyfriend/girlfriend, husband/wife). It should also be noted that some main partners and main Supporters are the same individual for a specific Index participant: 43% of main Supporters are also their respective Index participant's main partner. Given that Supporters' smoking status is associated with Indexes' smoking status, this relationship may present an important potential point for implementing smoking cessation interventions.

Findings from sensitivity analyses, whereby the sample was restricted to only those individuals who had a Supporter, yielded minimal differences from analyses utilizing the full sample. One exception is that in analyses from the full sample, 12-step program participation was positively associated with current smoking, while in the restricted sample, this association was not statistically significant. This discrepancy may be due to loss of statistical power when reducing the sample size. This lack of observed differences in findings between the full and restricted samples potentially indicates that the decision to use the full sample in order to increase statistical power was justified.

The present study has several limitations that should be acknowledged. For instance, this research utilizes cross-sectional data; therefore temporal relationships between variables cannot be clearly determined. Also, generalizability of the findings

may be limited due to the unique nature of the population. Additionally, all data were collected via self-report, which carries the inherent possibility for social desirability bias. In attempt to mitigate this possibility, data were collected using audio computer-assisted self-interviewing (ACASI), which has been shown to improve the likelihood of valid reporting of sensitive information (Macalino et al., 2002). Furthermore, the survey does not contain sociometric social network data (i.e., data in which the entire community, or as many as possible, are interviewed, and all respondents are asked about their contacts within the community) (Wasserman & Faust, 1994). With sociometric data, one might be able to obtain additional information, including the density of smoking in the network, the types of relationships between smokers and Index participants, and the specific support provided by smokers. Finally, the survey does not include information on duration of smoking, or past smoking behaviors, and also did not collect information on the prevalence of cigarette smoking in the Index participant's larger social network, outside of their family, main partner, or main supporter.

Notwithstanding these limitations, the study possesses several strengths. Results from this study contribute to the extant literature concerning factors that are associated with cigarette smoking among people living with HIV—a population exhibiting an high prevalence of cigarette smoking and, consequently, bearing a disproportionate burden of smoking-related morbidity—by investigating social environmental variables associated with smoking. Additionally, this study focuses on and provides information on a prevalent and typically hard-to-reach population.

In summary, this study confirms prior research that indicates that cigarette smoking is highly prevalent among people living with HIV, and corroborates previous

research findings showing that individual-level factors, such as recent illicit drug use, are associated with cigarette smoking among people with HIV. Findings from this study also extend existing research by demonstrating that social factors, specifically that a main Supporting individual's smoking behavior is associated with Index participants' current smoking status. These findings are significant in that they contribute to an increased understanding of the factors that are related to smoking among a high-risk population. Furthermore, they have potential implications for the development of smoking cessation treatment interventions. Given the high prevalence of smoking among people living with HIV, it may be prudent to integrate smoking cessation efforts with HIV primary care settings. Findings from this study also emphasize that members of an individual's social network may strongly influence their smoking behaviors. Smoking cessation interventions with a social component, namely ones that involve main Supporter individuals, may prove to be effective, and should be explored in future investigations.

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Table 3.1. Characteristics of people living with HIV, stratified by smoking status, BEACON, 2006-2012 (n=358)

Characteristic	Total Sample (n = 358)	Current smoking		p-value
		No (n=89) n (%)	Yes (n=269) n (%)	
<i>Individual-Level</i>				
Sex				
Male	222 (61.8)	59 (66.3)	163 (60.6)	0.337
Female	137 (38.2)	30 (33.7)	106 (39.4)	
Age				
28-44	87 (24.2)	20 (22.5)	66 (24.5)	0.239
45-49	98 (27.3)	23 (25.8)	75 (27.9)	
50-53	89 (24.8)	18 (20.2)	71 (26.4)	
54+	85 (23.7)	28 (31.5)	57 (21.2)	
Age (Mean (SE))	48.9 (0.33)	49.5 (0.70)	48.6 (0.37)	0.240
Race				
Black	330 (92.2)	86 (96.6)	244 (90.7)	0.071
Non-black	28 (7.8)	3 (3.4)	25 (9.3)	
Income				
<\$500	64 (17.5)	13 (14.6)	51 (19.0)	0.353
\$500+	302 (82.5)	76 (85.4)	218 (81.0)	
Marital status				
Not married	244 (68.2)	60 (67.4)	184 (68.4)	0.863
Married/committed relationship	114 (31.8)	29 (32.6)	85 (31.6)	
CESD Score				
<16	223 (62.3)	60 (67.4)	163 (60.6)	0.250
16+	135 (37.7)	29 (32.6)	106 (39.4)	
HIV Primary Care Visits^a				
0-2	156 (43.6)	42 (47.2)	114 (42.4)	0.641
3-4	84 (23.6)	18 (20.2)	66 (24.5)	
5+	118 (32.9)	29 (32.6)	89 (33.1)	
12-Step Program^a	189 (52.8)	40 (44.9)	149 (55.4)	0.087
Alcohol^b	136 (37.9)	26 (29.2)	110 (40.9)	0.049
Any drug use^b	162 (45.1)	24 (27.0)	138 (51.3)	<0.001
Injection drug use^a	65 (18.1)	9 (10.1)	56 (20.8)	0.023
<i>Dyadic-Level</i>				
Main partner smokes	150 (41.0)	33 (37.08)	117 (43.5)	0.288
Main Supporter smokes	170 (46.4)	30 (33.7)	133 (49.4)	0.010
<i>Family-Level</i>				
Smokers in family	298 (83.2)	68 (76.4)	230 (85.5)	0.046
Family encouragement to smoke	30 (8.4)	6 (6.7)	24 (8.9)	0.520
Smoking causes health	345 (96.9)	84 (95.4)	261 (97.4)	0.363

problems^c				
Family dislikes smoking	320 (89.4)	80 (89.9)	240 (89.2)	0.859
Family has rules about smoking^d	313 (87.4)	79 (88.8)	234 (87.0)	0.661

^a Within the past 6 months

^b Within the past 30 days

^c Belief held by family/friends

^d Rules about where people can and cannot smoke in the home

Table 3.2. Cigarette smoking characteristics of smokers living with HIV, BEACON, 2006-2012 (n=269)

Smoking characteristics	n	%
CPD^a		
<1	2	0.7
1-10	203	75.8
11-20	60	22.4
21-30	1	0.4
31+	2	0.7
Time to first cigarette		
<5 minutes	91	34.0
6-30 minutes	81	30.2
31-60 minutes	25	9.3
60+ minute	71	26.5
HSI^b		
Low	93	34.7
Medium	172	64.2
High	3	1.1
<i>Methods used in previous cessation attempts</i>		
Nicotine replacement^c		
No	114	42.4
Yes	155	57.6
Pills/medications^d		
No	246	91.4
Yes	23	8.6

^a CPD = cigarettes per day

^b HSI = Heaviness of Smoking Index

^c Includes products like gum, Nicorette, patches, inhalers, and lozenges

^d Includes products like Zyban, Wellbutrin, and Chantix (Bupropion or Varenicline)

Table 3.3. Drug and alcohol use characteristics of people living with HIV, BEACON, 2006-2012 (n=358)

Past 30 Day Drug and Alcohol Use	Total sample (n=358)	Non-Smokers (n=89)	Smokers (n=269)	p-value
Cocaine/crack cocaine	102 (28.5)	13 (14.6)	89 (33.1)	0.001
Heroin	74 (20.7)	11 (12.4)	63 (23.4)	0.026
Stimulants^a	3 (0.8)	0 (0.0)	3 (1.1)	0.317
Opiates^b	47 (13.1)	8 (9.0)	39 (14.5)	0.182
Tranquilizers/barbiturates	16 (4.5)	0 (0.0)	16 (5.9)	0.019
Marijuana	72 (20.1)	9 (10.1)	63 (23.4)	0.007
Hallucinogens	1 (0.3)	0 (0.0)	1 (0.4)	0.565
Prescription drugs	12 (3.3)	2 (2.2)	10 (3.7)	0.504
Other	3 (0.8)	0 (0.0)	3 (1.1)	0.317
Any drug use^c	162 (45.2)	24 (27.0)	138 (51.3)	<0.001
Alcohol	136 (37.9)	26 (29.2)	110 (40.9)	0.049

^a Other than cocaine/crack cocaine

^b Other than heroin

^c Not including alcohol

Table 3.4. Unadjusted and adjusted odds ratios to assess the association of characteristics with current cigarette smoking among a sample of people living with HIV, BEACON, 2006-2012 (n=358)

Characteristics	OR ^a (95% CI ^b)	aOR ^{c,d} (95% CI)
<i>Individual-Level</i>		
Sex		
Male	1.0	1.0
Female	1.28 (0.77-2.11)	1.48 (0.85-2.59)
Age		
28-44	1.0	1.0
45-49	0.99 (0.50-1.96)	1.23 (0.58-2.57)
50-53	1.19 (0.58-2.45)	1.62 (0.73-3.57)
54-65	0.62 (0.31-1.21)	1.05 (0.49-2.25)
Race		
Black	1.0	1.0
Non-black	2.84 (0.86-9.97)	2.96 (0.83-10.61)
Income		
<\$500	1.0	1.0
\$500+	0.73 (0.38-1.42)	0.82 (0.40-1.66)
Marital status		
Not married	1.0	1.0
Married/committed relationship	0.96 (0.57-1.59)	0.84 (0.46-1.54)
CESD Score		
<16	1.0	1.0
16+	1.35 (0.81-2.23)	1.11 (0.64-1.93)
12-Step Program ^e	1.52 (0.94-2.46)	1.74 (1.02-2.96)
Alcohol ^f	1.68 (1.00-2.81)	1.27 (0.70-2.33)
Any drug use ^f	2.85 (1.69-4.83)	2.90 (1.59-5.31)
<i>Dyadic-Level</i>		
Main partner smokes	1.31 (0.80-2.14)	1.04 (0.56-1.93)
Main supporter smokes	1.92 (1.17-3.17)	1.91 (1.08-3.82)
<i>Family-Level</i>		
Smokers in family	1.82 (1.00-3.30)	1.20 (0.61-2.36)

^a OR = odds ratio

^b CI = confidence interval

^c aOR = adjusted odds ratio

^d Adjusted for sex, age, race, marital status, income, past 30 day alcohol use, any past 30 day drug use, depressive symptoms, 12-step program participation, family smoking, main partner smoking, main supporter smoking

^e Within the past 6 months

^f Within the past 30 days

Table 3.5. Characteristics of main Supporter individuals, BEACON, 2006-2012 (n=229)

<i>Characteristic</i>	n (%)
Sex	
Male	96 (41.9)
Female	133 (58.1)
Age (Mean (SE^a))	47.8 (0.73)
Race	
Black	212 (92.6)
Non-black	17 (7.4)
Marital status	
Not married	121 (52.8)
Married	108 (47.2)
Income	
<\$500	59 (25.9)
\$500+	169 (74.1)
Supporter has HIV	
No	110 (53.4)
Yes	96 (46.6)
Supporter lives with Index	
No	134 (58.5)
Yes	95 (41.5)
Dyad type	
Same-sex	82 (35.8)
Opposite-sex	147 (64.2)
Relationship of Supporter to Index	
Partner	99 (43.2)
Kin	62 (27.1)
Other	68 (29.3)
Alcohol use^b	
No	118 (51.5)
Yes	111 (48.5)
Any drug use^b	
No	135 (59.2)
Yes	93 (40.8)

^a SE = standard error^b Within the past 30 days

4. CHAPTER 4 – QUITTING AND CUTTING DOWN ON SMOKING: INTEREST AMONG CIGARETTE SMOKERS LIVING WITH HIV (Aim 3)

Abstract: Cigarette smoking is prevalent among people living with HIV, and is associated with negative health sequelae. Most smokers with HIV report receiving medical advice to quit, and many are interested in quitting. Prior research has examined characteristics associated with an interest in quitting, with emphasis on individual-level characteristics. Research is needed to examine social-level characteristics, and distinguish between an interest in cessation and interest in cutting down/quitting. Data to assess this aim came from a study designed to examine social environmental influences on current and former drug users' HIV medication and health outcomes. This analysis is comprised of 267 individuals living with HIV who are current smokers. Fisher's exact tests were used to describe the sample, and multinomial logistic regression analyses were used to explore associations between covariates and outcomes. Family encouragement to smoke was negatively associated with interest in cutting down (aRRR=0.09, 95% CI=0.01-0.86) and interest in quitting (aRRR=0.27, 95% CI=0.08-0.90). Additionally, participants who had made prior quit attempts were more likely to be currently interested in quitting smoking (aRRR=3.50, 95% CI=1.39-8.30). Results corroborate prior findings that a majority of HIV-positive smokers are interested in smoking cessation. Results further our knowledge by suggesting that individual- as well as social-level characteristics are associated with an interest in quitting smoking among smokers living

with HIV. Findings have implications for developing targeted smoking cessation interventions for smokers with HIV.

4.1 Introduction

Cigarette smoking is highly prevalent among people living with HIV (Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010), and is two to three times higher than what is observed in the general population (20%; CDC, 2011). This disproportionately high prevalence is problematic when taken at face value, but especially when considering that people with HIV are experiencing increased life expectancies due to improved and more effective therapies for the treatment of HIV. Along with increased life expectancies, an increased incidence of non-AIDS-related medical conditions (e.g., cardiovascular disease, bacterial pneumonia, chronic obstructive pulmonary disease, lung cancer) have been observed in this population, many of which are associated with cigarette smoking (Lewden et al., 2005; Diaz et al., 2000; Crothers et al., 2006; Lifson et al., 2010; Miguez-Burbano et al., 2005; Kirk et al., 2007; Chaturvedi et al., 2007; Engels et al., 2006; Petoumenos et al., 2011; Barbaro et al., 2003; Friis-Moller et al., 2003; Savès et al., 2003). Additionally, a recent study found that smokers living with HIV are now losing more life-years to cigarette smoking than to HIV. Moreover, the excess mortality of smokers is tripled compared to non-smokers and the population-attributable risk of death associated with smoking is doubled among persons with HIV as compared to the general population (Helleberg et al., 2012).

Given the gravity of these health conditions and concerns, it is understandable and prudent that smokers with HIV are often advised against smoking. In one study, 81% of current smokers living with HIV reported ever receiving medical advice to quit smoking in the past (Burkhalter et al., 2005), compared to 48%-70% of smokers in the general

population (Lucan & Katz, 2006; Doescher & Swer 2000; Denny et al., 2003). In addition to receiving advice to quit, some studies indicate that a majority (63%-75%) of smokers living with HIV report being currently interested in quitting smoking or are currently thinking about quitting smoking (Mamary et al., 2002; Tesoriero et al., 2010).

Prior research exploring the factors associated with an interest in quitting smoking is lacking among smokers with HIV, though some studies have been conducted among other underserved populations (Arnsten et al., 2004; Clarke et al., 2001; Nahvi et al., 2006). In extant research, a variety of factors have been found to be associated with an interest in quitting smoking. For instance, among one sample of smokers living with HIV, greater current illegal drug use, greater levels of emotional distress, and lower number of prior quit attempts were associated with being less ready to quit and less interested in quitting smoking (Burkhalter et al., 2005). In other marginalized populations—such as homeless individuals, injection drug users, and methadone maintenance recipients—factors such as self-efficacy for quitting, smoking-related symptoms like cough and shortness of breath (Arnsten et al., 2004), older age, the absence of alcohol abuse (Clarke et al., 2001), lower levels of nicotine dependence, and prior use of smoking cessation pharmacotherapy (Nahvi et al., 2006) have been found to be associated with an interest in quitting smoking.

Despite the aforementioned research, several gaps in the literature are apparent. First, relatively little research has focused on HIV-positive smokers overall; even less has explored factors that are associated with an interest in quitting smoking. Also, in previous work, among both people with HIV and other marginalized populations, the focus has been placed on individual-level characteristics such as age and prior quit

attempts, to the exclusion of social-level factors, which have been shown to be associated with other behaviors like illegal drug use as well as HIV and psychiatric medication adherence (Bohnert et al., 2009; Knowlton et al., 2006; Magura et al., 2011), and thus may also influence an interest in quitting smoking. Furthermore, previous research has not made a distinction between individuals having an interest in quitting smoking versus having an interest in cutting down on smoking.

In light of these gaps in the literature, the aim of the present study was to explore and compare individual- and social-level factors associated with an interest in cutting down on cigarette smoking as well as an interest in quitting cigarette smoking among a sample of cigarette smokers living with HIV. An additional aim was to describe the types of smoking cessation interventions that current cigarette smokers were interested in utilizing. Two conceptual frameworks guided these analyses: The Ecological Model for Health Promotion (McLeroy et al., 1988) and Social Cognitive Theory (Bandura, 1986). Both of these theories state that individual behavior is influenced by personal (i.e., individual-level) and environmental (i.e., social-level) factors. As a result, it was hypothesized that individual-level characteristics, such as prior quit attempts, and social-level characteristics, such as family encouragement to quit smoking, would be associated with both an interest in cutting down on and an interest in quitting cigarette smoking.

4.2 Methods

4.2.1 Data Source

Data for this dissertation aim came from the BEACON (BEing Active & CONnected) Study. BEACON is a longitudinal study comprised of three visits

conducted at 6-month intervals. Data were collected between the years 2006-2012 in Baltimore, Maryland, US. The study allowed for the enrollment of two types of participants: Index and Supporter participants. Index participants were recruited from clinic-based venues, such as the Johns Hopkins University Moore Clinic for HIV care, as well as via targeted street outreach and were considered to be eligible if they were HIV-positive, 18 years of age or older, current/former injection drug users, and on HIV treatment at the time of study enrollment. Being “on HIV treatment” was defined as having taken at least one HIV treatment medication at least one time during the past 30 days. Index participants were also asked to designate a main Supporter (i.e., a main supportive tie who provides the Index with emotional support and instrumental assistance in living with their HIV diagnosis), whom, with permission from the Index participant, was invited to participate in the study as well. Eligibility criteria for Supporter participants is as follows: 18 years of age or older, know that their Index has HIV, and verification that they were not professionals whose only relationship with the Index was in the capacity of service provider. All data were collected by trained interviewers and via audio computer-assisted self-interviewing (ACASI). Index and Supporter dyads were administered questionnaires at similar time points. Information regarding the characteristics of Index and Supporter participants was self-reported by the Indexes and Supporters, respectively.

Questionnaires for the three semi-annual visits gathered information on a variety of topics, including medication adherence, illegal drug use, and mental health variables. The questionnaire used at the 6-month follow-up visit contained the most information regarding cigarette smoking as compared to either the baseline or 12-month follow-up

visits. Because of the present study's focus on smoking behaviors, we utilized data from the 6-month visit. The sample size at the 6-month visit was 358 Index participants. The sample was further reduced to include only current cigarette smokers who provided information on interest in cutting down on or quitting smoking, leaving a final sample of 267 for the present analyses. The Johns Hopkins University Bloomberg School of Public Health Institutional Review Board approved this study.

4.2.2 Measures

4.2.2.1 Individual-level variables

Sociodemographic variables - Sex was dichotomized (male/female), and age was categorized into approximate quartiles (28-44; 45-49; 50-53; 54-65). Race was dichotomized as "Black" or "non-Black" due to the sample distribution. Past month income from all sources (including food stamps) and marital status were dichotomized (<\$500 versus >\$500; "not married" versus "married or in a committed relationship", respectively).

Drug and alcohol use – Data from participants were dichotomized based on self-reported use of alcohol and extramedical use of a variety of illegal substances (i.e., stimulants, opiates, tranquilizers or barbiturates, marijuana, heroin, cocaine or crack, hallucinogens, prescription drugs, and "other drugs") within the past month. A dichotomous composite variable was created for "any past month drug use", excluding alcohol. A dichotomous variable was also created based on self-reported injection drug use in the past 6 months.

Depressive symptoms – The Center for Epidemiologic Studies Depression Scale (CES-D), a short (20 item) self-report scale (Radloff, 1977), was used to assess

depressive symptoms. Possible scores range from 0 to 60, with higher scores indicating the presence of greater symptomatology. A score of 16 or higher identifies individuals with clinically meaningful depressive symptoms (Radloff, 1977). In terms of psychometric properties, the CES-D has been shown to have very good internal consistency reliability (>0.85) and acceptable test-retest reliability (Radloff, 1977; Hann et al., 1999). Additionally, it has moderate-good (0.44-0.75) concurrent validity (Radloff, 1977), good discriminant validity (Weissman, 1977), and sensitivity of 0.95 and specificity of 0.70 when compared to the Diagnostic Interview Schedule for DSM-IV (Thomas et al., 2001). In addition to having good psychometric properties, the CES-D has been shown to be of utility among samples similar to the one utilized for the present work: low socioeconomic status, primarily African American (Thomas et al., 2001), urban substance using samples (Yang et al., 2013; Latkin et al., 2012).

HIV primary care visits & drug treatment utilization – The number of HIV primary care visits in the past 6 months was categorized as approximate tertiles (0-2; 3-4; 5+). Utilization of 12-step programs in the past 6 months was dichotomized (yes/no).

Cigarette smoking – All participants were asked whether they had smoked cigarettes in the past 30 days. A dichotomous variable (yes/no) was created based on the responses, and those individuals reporting past 30 day smoking were considered to be current smokers and were administered additional smoking-related questions. Smokers were asked about how soon they smoke their first cigarette upon waking (i.e., time to first cigarette; TTFC) (<5 minutes, 6-30 minutes, 31-60 minutes, and 60+ minutes), the number of cigarettes that they smoke per day (i.e., cigarettes per day; CPD) (<1, 1-10, 11-20, 21+), as well as about prior use of nicotine replacement therapy (NRT; yes/no) or

medications/pills for the purpose of smoking cessation (yes/no). The latter two variables were combined to create a single dichotomous variable assessing past use of either NRT or medications/pills for smoking cessation (yes/no).

Additionally, using the CPD and TTFC questions, the Heaviness of Smoking Index (HSI; Heatherton et al., 1989) was created. The HSI is a measure of nicotine dependence, with scores ranging from 0-6, with higher scores indicating a higher level of nicotine dependence. The HSI was conceptualized as a categorical variable with 3 levels: low (0-1), medium (2-4), and high (5-6) dependence, consistent with prior research (Chaiton et al., 2007). However, based on the distribution of responses from the present sample, a dichotomous variable was used in the analyses (i.e., low versus medium-high dependence). When examining the measure's psychometric properties, the HSI has been shown to have good test-retest (0.72) reliability over a 3-year period (Borland, 2010), good sensitivity (0.79) and specificity (0.96), and good concordance (Cohen's kappa=0.74) with the Fagerström Test for Nicotine Dependence (Heatherton et al., 1989), the most widely used measure of nicotine dependence (Chabrol et al., 2005).

4.2.2.2 Dyadic-level variables

Based on Index participants' responses to a question asking if their main partner currently smoked, a dichotomous variable (yes/no) was created. Additionally, based on Supporters' responses to a question asking if they currently smoked, an additional dichotomous variable (yes/no) was created. Supporters who endorsed current smoking were also questioned as to whether they had previously used NRT or medications/pills for smoking cessation, or if they were currently interested in quitting smoking; dichotomous variables were created based on responses to both of these questions

(yes/no).

However, not all Index participants reported having a main partner or had a main Supporter join the study: 145 (54%) reported having a main partner, and 169 (63%) of Index participants had a main Supporter who joined the study. In order to make use of the full sample (n=267), the two dyadic-level variables were coded as “0” (i.e., “no”) for individuals without partners or Supporters. This was deemed reasonable, since Index participants without main partners or Supporters would not have had the influence of cigarette smoking by partners or Supporters at that point in their lives. Moreover, sensitivity analyses were performed that helped to justify this decision.

4.2.2.3 Family-level variables

Index participants were questioned on the following topics: the prevalence of smoking among family members; encouragement to smoke by family members; encouragement to quit smoking by family members; family members’ belief that smoking causes health problems; whether family members dislike cigarette smoking; and whether family members have rules regarding where someone can or cannot smoke within their homes. Dichotomous (yes/no) variables were created based on Index participants’ responses to these questions.

4.2.3 Statistical Analysis

Fisher’s exact tests were used to assess the statistical significance of relationships between an interest in cutting down on smoking, quitting smoking, and no interest in either cutting down on or quitting smoking with individual-level, dyadic-level, and family-level variables. Unadjusted and adjusted logistic regression analyses were used to calculate relative risk ratios (RRRs), adjusted relative risk ratios (aRRRs), and

corresponding 95% confidence intervals (CI). Variable selection for the adjusted model was based on a combination of evidence from the prior literature, *a priori* theory, and Fisher's exact p-values of <0.05. Variables selected for the adjusted model included: sex, age, race, income, marital status, past 30 day drug use, family encouragement to smoke, nicotine dependence, prior cessation attempts using pharmacologic smoking cessation aids, main partner smoking, main Supporter smoking, and main Supporter's interest in quitting smoking.

A final sample of 267 current smokers who had provided information regarding having an interest in cutting down on or quitting smoking was retained for the adjusted analyses. Additional sensitivity analyses were also performed among only those current smokers who had a main Supporter (n=169) in an effort to assess how the decision to code the two dyadic-level variable for Supporter smoking status as "0" (i.e., "no") for individuals without Supporters affected results. All analyses were performed using STATA SE statistical software version 12.0 (StataCorp, 2011).

4.3 RESULTS

4.3.1 Participant characteristics

Characteristics of this sample of smokers with HIV can be found in Table 4.1. Nearly three-quarters of the sample (74%) reported being interested in quitting smoking and an additional 15% were interested in cutting down on smoking. The remaining 11% reported no interest in either quitting or cutting down on smoking. Sixty percent of the sample was male, 24.7% were between the ages of 28-44, 27.7% between the ages of 45-49, 26.2% between the ages of 50-53, and 21.4% of the sample was between the ages of

54-65. The majority of the sample was black (90.6%), reported a monthly income of \$500 or greater (81.7%), were unmarried (68.2%), and did not meet criteria for clinically meaningful depressive symptomatology as identified by the CESD (61.0%). Forty-two percent of participants reported making between 0-2 HIV primary care visits in the past 6 months, while 24.7% and 33.0% reported making 3-4 and 5-30 visits, respectively. Approximately half of participants reported engaging in 12-step programs in the past 6 months (55.8%) as well as past month drug use (50.9%). Forty-one percent of the sample reported past month alcohol use. Nearly 60% of the sample reported having made prior cessation attempts using pharmacologic smoking cessation aids, with those interested in quitting (64.3%) and those interested in cutting down (56.4%) being more likely to report past cessation attempts than those who are not currently interested in quitting or cutting down (31.0%).

Forty-four percent of the sample reported having a main partner who also smokes, while 49.4% had a main Supporter who was a current smoker. Approximately 37% of the sample had a main Supporter who was currently interested in quitting smoking, and 24.5% had a main Supporter who reported having made prior cessation attempts using pharmacologic smoking cessation aids.

A majority of Indexes reported that their family and/or friends smoked (85.4%), their family believed that smoking causes health problems (97.4%), dislike smoking (89.1%), have rules about where one can and cannot smoke in their homes (86.9%), and encourage the Index participant to quit smoking (85.1%). However, a few participants reported that their family encourages them to smoke (8.2%), though individuals who were not interested in quitting or cutting down (20.7%) were more likely than either those

who were interested in cutting down on (2.6%) or quitting smoking (7.5%) to report having family members who encourage them to smoke ($p=0.029$).

4.3.2 *Smoking characteristics*

Cigarette smoking characteristics are shown in Table 4.2. Most smokers (75.7%) reported smoking 1-10 cigarettes per day (CPD), and approximately one-third reported smoking their first cigarette of the day within 5 minutes of waking (33.7%). More than half (64.1%) of the current smokers exhibited a medium-level of nicotine dependence, as assessed by the HSI. Fifty-seven percent of smokers reported previous experience with nicotine replacement therapy, and 8.6% reported previously using pills or medication for smoking cessation, for a combined total of 59.6% of participants with prior experience using pharmacologic smoking cessation aids. Significant differences were found between individuals with varying levels of interest in modifying their smoking behaviors; individuals interested in quitting reported the greatest prior use of NRT or medications for cessation (64.3%), followed by individuals interested in cutting down on smoking (56.4%), and individuals not interested in cutting down or quitting smoking (31.0%) $\chi^2 (1, N = 267) = 11.83, p = 0.003$.

4.3.3 *Drug use*

Detailed information on drug use can be found in Table 4.3. Approximately half (51%) of the sample reported any drug use in the past 30 days. The most commonly used substances within the past month were cocaine/crack cocaine (33.0%), heroin (23.2%), marijuana (23.2%), and other opiates (14.2%). Significant differences were found on the basis of past month heroin use between individuals interested in cutting down (23.1%), quitting (20.6%), and those with no interest in quitting or cutting down (41.4%) ($\chi^2 (1, N$

= 267) = 6.13, $p = 0.047$). Smaller proportions of the sample reported other drug use: other stimulants (1.1%), tranquilizers/barbiturates (6.0%), hallucinogens (0.4%), and prescription drugs (3.7%).

4.3.4 Interest in smoking cessation modalities

Information regarding interest in various smoking cessation modalities can be found in Table 4.4. Of the 267 persons in this sample, 238 (89.1%) expressed an interest in either cutting down on (n = 29; 11%) or quitting smoking (n = 199; 74%). Of those who had not previously utilized NRT and were interested in quitting or cutting down (n=92), 36.9% indicated that they might be interested in trying NRT and an additional 33.7% said that they would be interested in trying NRT. Similarly, of those who had not previously utilized pills/medications for smoking cessation and were interested in either quitting or cutting down (n=217), 33.6% might be interested in trying pills/medications and an additional 29.1% were interested in trying pills/medications. A majority of participants reported an interest in participating in a smoking cessation intervention with a family member (67.6%), a friend (71.7%), with a main partner (73.6%), in a group setting (76.4%), or in a group setting with someone that they know (88.9%)

4.3.5 Multinomial logistic regression analyses

Information on associations between interest in cutting down on smoking and the covariates is presented in Table 4.5. In adjusted analyses, only one association remained statistically significant. Participants who received encouragement to smoke from their family members were significantly less likely than those who did not to be interested in cutting down on smoking (aRRR=0.09, 95% CI=0.01-0.86). Despite not achieving statistical significance, strong positive associations with an interest in cutting down were

found for two additional factors: having a main partner who is a smoker (aRRR=2.20, 95% CI=0.67-7.25) and having a main Supporter who is interested in quitting smoking (aRRR=2.55, 95% CI=0.51-12.77).

Information on associations between interest in quitting smoking and various covariates is presented in Table 4.5. After controlling for covariates in the adjusted model, family encouragement to smoke remained significantly associated with an interest in quitting smoking: Participants who received encouragement to smoke from family members were significantly less likely than those who did not to be interested in quitting smoking (aRRR=0.27, 95% CI=0.08-0.90). Additionally, individuals who had made prior quit attempts using NRT or medications were significantly more likely than those who had not made prior quit attempts using such pharmacotherapies to be currently interested in quitting smoking in the adjusted model (aRRR=3.50, 95% CI=1.39-8.30). Furthermore, though not achieving statistical significance in adjusted analyses, several other factors had strong associations with having an interest in quitting smoking. For instance, older age (45-49: aRRR=2.53, 95% CI=0.81-7.92; 50-53: aRRR=2.23, 95% CI=0.68-7.30; 54-65: aRRR=4.14, 95% CI=0.96-17.94) was positively associated with an interest in quitting smoking. Additionally, having a main Supporter who was interested in quitting (aRRR=2.38, 95% CI=0.58-9.77) was associated with having an interest in quitting.

4.3.6 Sensitivity analyses

In adjusted analyses, when restricting the sample to smokers who had a main Supporter (n=169), main findings did not differ markedly from findings from analyses utilizing the full sample (n=267). Participants who received encouragement to smoke

from their family members were significantly less likely than those who did not to be interested in cutting down on smoking (aOR=0.06, 95% CI=0.01-0.81). Additionally, participants who received encouragement to smoke from family members were significantly less likely than those who did not to be interested in quitting smoking (aOR=0.09, 95% CI=0.01-0.60). Participants who had made prior quit attempts using NRT or medications were significantly more likely than those who had not made prior quit attempts using such pharmacotherapies to be currently interested in quitting smoking (aOR=6.24, 95% CI=1.42-27.39). No discrepant findings between the full and restricted samples were observed.

4.4 DISCUSSION

Findings from this study identified individual- and social-level characteristics associated with an interest in cutting down on as well as an interest in quitting smoking among a sample of cigarette smokers living with HIV. Specifically, prior use of pharmacologic smoking cessation aids was positively associated with having a current interest in quitting smoking. This finding, in addition to being congruent with prior research (Nahvi et al., 2006), is perhaps not all that surprising. Given that, among the general population, actual quit attempts are frequently found to be associated with prior quit attempts (Zhou et al., 2009; Hagimoto et al., 2009; Vangeli et al., 2011), and that it would logically follow that quit attempts are associated with an interest in quitting, one could fairly easily extrapolate that past quit attempts would also be associated with interest in quitting. Additionally, prior research (Clarke et al., 2001) has found older age to be positively associated with interest in quitting smoking. Though not achieving

statistical significance in this sample, when comparing individuals age 54-65 to the youngest age group (28-44) a trend for significance was observed when examining an interest in quitting smoking ($p=0.057$). Failure to achieve significance may be the result of limited power due to a relatively small sample size ($n=267$). In terms of social-level factors, a novel finding included having family members who encourage smoking was significantly negatively associated with having an interest in cutting down on smoking as well as having an interest in quitting smoking. Additionally, though not achieving significance in adjusted models, strong associations were found between other social-level factors and interest in cutting down on or quitting smoking: strong, albeit statistically non-significant, associations were found between persons with a main partner who smokes, as well as persons with a Supporter who is interested in quitting and having an interest in cutting down on smoking. Additionally, strong associations were found between having a Supporter who is interested in quitting and having an interest in quitting smoking. Similar to the age findings discussed above, failure of these social-level characteristics to achieve statistical significance may be due to limited power.

It is possible that vastly different characteristics associated with the two outcomes were not observed due to the similar nature of both outcomes: both were concerned with reduction in cigarette smoking. Additionally, findings from sensitivity analyses, whereby the sample was restricted to only those individuals who had a Supporter, yielded no overall differences from analyses utilizing the full sample. The lack of differences between the full and restricted samples helps to justify the decision to utilize the full sample in the interest of increasing statistical power.

In addition to findings from the adjusted model, participants expressed interest in a variety of smoking cessation modalities. Though interest was expressed for most modalities, interventions involving a social component received particularly high endorsement. Nearly 70% of smokers reported that they would be interested participating in interventions with a family member, and more than 70% were in favor of interventions taking place with a friend, main partner, in a group setting, or in a group setting with someone that the smoker knows. These findings are similar to those reported by Marmy and colleagues (2002), who found that 69% of smokers sampled at an HIV clinic were interested in participating in group-based smoking cessation programs. These reported interests, coupled with the finding from this study that receiving encouragement to smoke from family members is associated with a decreased interest in quitting or cutting down underscores the importance of social factors in association with smoking behaviors among cigarette smokers with HIV.

Several limitations should be acknowledged. First, all data were collected via self-report, which creates the possibility for social desirability bias. To reduce the possibility for this type of bias, data were collected using audio computer-assisted self-interviewing (ACASI), which has been shown to improve the likelihood of honest reporting of sensitive information (Macalino et al., 2002). Second, data were cross-sectional and observational; therefore causal relationships between variables cannot be inferred. Third, the survey also assessed interest in cutting down on smoking or quitting smoking with two questions, without assessing degree of interest in cutting down/quitting, or intentions to cut down/quit within a specified time period. Fourth, the survey does not contain sociometric social network data (i.e., data in which the entire

community, or as many as possible, are interviewed, and all respondents are asked about their contacts within the community) (Wasserman & Faust, 1994). With sociometric data, one might be able to obtain additional information, including the density of smoking in the network, the role relationship of smokers, and the specific support provided by smokers. Finally, some of the subgroup sample sizes were relatively small, with reduced power. Despite this, to our knowledge, this study represents one of the only studies to assess social-level characteristics in an HIV-positive population.

Notwithstanding the aforementioned limitations, this study possesses several strengths that merit acknowledgement. Results from these analyses make a contribution to the body of literature concerning characteristics that are associated with cigarette smoking behaviors, specifically interest in quitting or cutting down on smoking, among people with HIV—a population exhibiting an unduly high prevalence of cigarette smoking and, consequently, bearing a disproportionate burden of smoking-related morbidity. The majority of existing research regarding cigarette smoking and HIV has focused on exploring the characteristics associated with current smoking status, while the present study has focused on a cigarette smoking behavior about which not much is known in this population: current interest in quitting or cutting down on smoking. Additionally, the present study extends the literature by investigating social environmental variables associated with smoking in addition to individual-level characteristics. This study focuses on and provides information on a typically hard-to-reach population among which cigarette smoking is a significant public health concern.

In summary, findings from the present study corroborate previous research findings showing that individual level-factors, like prior smoking cessation attempts, are

associated with an interest in quitting smoking among smokers living with HIV. Additionally, findings from this study extend existing knowledge by demonstrating that social-level factors, specifically that encouragement to smoke by family members, are associated with a decreased interest in cutting down on or quitting smoking. These findings are significant in that they contribute to an increased understanding of the factors that are related to smoking behaviors among a high-risk population. Furthermore, they have potential implications for the development of smoking cessation treatment interventions. Given the high prevalence of smoking among persons with HIV, it may be prudent to integrate smoking cessation efforts with HIV primary care settings. Findings from this study also emphasize that members of an individual's social network, namely family members, may strongly influence their smoking behaviors. Based on findings from adjusted models, as well as self-reported interest in various smoking cessation modalities, smoking cessation interventions with a social component, such as ones that involve family or other network members, may prove to be effective and should be explored in future investigations.

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Table 4.1. Characteristics of cigarette smokers living with HIV, stratified by interest in cutting down or quitting smoking, BEACON, 2006-2012 (n=267)

Characteristic	Total Sample (n=267)	No interest in cessation (n=29)	Interested in cutting down (n=39)	Interested in quitting (n=199)	p-value
	n (%)	n (%)	n (%)	n (%)	
<i>Individual-Level</i>					
Sex					
Male	161 (60.3)	17 (58.6)	22 (56.4)	122 (61.3)	0.799
Female	106 (39.7)	12 (41.4)	17 (43.6)	77 (38.7)	
Age					
28-44	66 (24.7)	13 (44.8)	14 (35.9)	39 (19.6)	0.013
45-49	74 (27.7)	7 (24.1)	11 (28.2)	56 (28.1)	
50-53	70 (26.2)	6 (20.7)	11 (28.2)	53 (26.6)	
54-65	57 (21.4)	3 (10.4)	3 (7.7)	51 (25.6)	
Race					
Black	242 (90.6)	26 (89.7)	36 (92.3)	180 (90.4)	1.000
Non-black	25 (9.4)	3 (10.3)	3 (7.7)	19 (9.6)	
Income					
<\$500	49 (18.3)	5 (17.2)	6 (15.4)	38 (19.1)	0.899
\$500+	218 (81.7)	24 (82.8)	33 (84.6)	161 (80.9)	
Marital status					
Not married	182 (68.2)	18 (62.1)	23 (59.0)	141 (70.8)	0.252
Married/committed relationship	85 (31.8)	11 (37.9)	16 (41.0)	58 (29.2)	
CESD^a					
<16	163 (61.0)	19 (65.5)	24 (61.5)	120 (60.3)	0.873
16+	104 (39.0)	10 (34.5)	15 (38.5)	79 (39.7)	
HIV primary care visits^b					
0-2	113 (42.3)	13 (44.8)	20 (51.3)	80 (40.2)	0.355

3-4	66 (24.7)	4 (13.8)	10 (25.6)	52 (26.1)	
5-30	88 (33.0)	12 (41.4)	9 (23.1)	67 (33.7)	
12-Step program participation^b	149 (55.8)	15 (51.7)	26 (66.7)	108 (54.3)	0.332
Drug use^c	136 (50.9)	19 (65.5)	23 (59.0)	94 (47.2)	0.105
Alcohol use^c	110 (41.2)	12 (41.4)	20 (51.3)	78 (39.2)	0.381
Prior quit attempts^d	159 (59.5)	9 (31.0)	22 (56.4)	128 (64.3)	0.003
<i>Dyadic-Level</i>					
Main partner smokes	117 (43.8)	12 (41.4)	24 (61.5)	81 (40.7)	0.054
Main Supporter smokes	132 (49.4)	11 (37.9)	24 (61.5)	97 (48.7)	0.149
Main Supporter interested in quitting smoking	99 (37.1)	5 (17.2)	18 (46.1)	76 (38.2)	0.041
Main Supporter made quit attempts in past^d	65 (24.3)	5 (17.2)	14 (35.9)	46 (23.1)	0.160
<i>Family-Level</i>					
Family encouragement to smoke (yes)	22 (8.2)	6 (20.7)	1 (2.6)	15 (7.5)	0.029
Smoking causes health problems^e	259 (97.4)	27 (96.4)	39 (100.0)	193 (97.0)	0.663
Family dislikes smoking	238 (89.1)	26 (89.7)	34 (87.2)	178 (89.4)	0.945
Family rules about smoking^f	232 (86.9)	24 (82.8)	35 (89.7)	173 (86.9)	0.717

^a CESD = Centers for Epidemiological Studies Depression scale

^b Within the past 6 months

^c Within the past 30 days

^d Quit attempts using nicotine replacement therapy or pills/medications

^e Belief held by family/friends

^f Rules about where people can and cannot smoke in the home

Table 4.2. Smoking characteristics of current cigarette smokers living with HIV, BEACON, 2006-2012 (n=267)

Characteristic	Total Sample (n=267)	No interest in cessation (n=29)	Interested in cutting down (n=39)	Interested in quitting (n=199)	p-value
	n (%)	n (%)	n (%)	n (%)	
Cigarettes per day					
<1	2 (0.7)	0	0	2 (1.0)	0.074
1-10	202 (75.7)	18 (62.1)	26 (66.7)	158 (79.4)	
11-20	60 (22.5)	11 (37.9)	12 (30.8)	37 (18.6)	
21-30	1 (0.4)	0	1 (2.6)	0	
31+	2 (0.7)	0	0	2 (1.0)	
Time to first cigarette					
<5 minutes	90 (33.7)	13 (44.8)	12 (30.8)	65 (32.7)	0.224
6-30 minutes	81 (30.3)	7 (24.1)	18 (46.1)	56 (28.1)	
31-60 minutes	25 (9.4)	3 (10.3)	3 (7.7)	19 (9.5)	
60+ minute	71 (26.6)	6 (20.7)	6 (15.4)	59 (29.6)	
Nicotine dependence^a					
Low	93 (34.8)	9 (31.0)	9 (23.1)	75 (37.7)	0.380
Medium	171 (64.1)	20 (69.0)	29 (74.4)	122 (61.3)	
High	3 (1.1)	0	1 (2.5)	2 (1.0)	
Prior use of NRT^b	155 (57.7)	9 (31.0)	20 (51.3)	125 (62.8)	0.004
Prior use of pills/medications for cessation^c	23 (8.6)	2 (6.9)	4 (10.3)	17 (8.5)	0.885
Prior use of any cessation aids^d	159 (59.6)	9 (31.0)	22 (56.4)	128 (64.3)	0.003

^a According to the Heaviness of Smoking Index

^b Includes products like nicotine gum, nicotine patches, inhalers, or lozenges

^c Includes products for reducing cigarette cravings, like Zyban, Wellbutrin, or Chantix (Bupropion or Varenicline)

^d Use of either nicotine replacement therapy or pills/medications

Table 4.3. Interest in various smoking cessation methods among current smokers living with HIV who are currently interested in cutting down on or quitting smoking, BEACON, 2006-2012 (n=238)

<i>Smoking Cessation Method</i>	n	%
Nicotine replacement^{a,b}		
No	27	29.4
Maybe	34	36.9
Yes	31	33.7
Pills/medicine^{c,d}		
No	81	37.3
Maybe	73	33.6
Yes	63	29.1
With a family member		
No	77	32.4
Yes	161	67.6
With a friend		
No	67	28.3
Yes	170	71.7
With main partner		
No	37	26.4
Yes	103	73.6
In a group		
No	56	23.6
Yes	181	76.4
Group + someone you know		
No	20	11.1
Yes	161	88.9

^a Includes products like nicotine gum, nicotine patches, inhalers, or lozenges

^b Among those who were interested in quitting/cutting down on smoking and had not tried nicotine replacement methods in the past

^c Includes products for reducing cigarette cravings, like Zyban, Wellbutrin, or Chantix (Bupropion or Varenicline)

^d Among those who were interested in quitting/cutting down on smoking and had not tried pills/medicine in the past

Table 4.4. Drug and alcohol use characteristics of cigarette smokers living with HIV, BEACON, 2006-2012 (n=267)

Past 30 Day Drug Use	Total	No interest in cessation (n=29)	Interest in cutting down (n=39)	Interest in quitting (n=199)	p-value
Cocaine/crack cocaine	88 (33.0)	13 (44.8)	17 (43.6)	58 (29.1)	0.076
Heroin	62 (23.2)	12 (41.4)	9 (23.1)	41 (20.6)	0.047
Stimulants^a	3 (1.1)	0 (0.0)	1 (2.6)	2 (1.0)	0.582
Opiates^b	38 (14.2)	2 (6.9)	7 (17.9)	29 (14.6)	0.419
Tranquilizers/barbiturates	16 (6.0)	2 (6.9)	2 (5.1)	12 (6.0)	0.954
Marijuana	62 (23.2)	10 (34.5)	6 (15.4)	46 (23.1)	0.182
Hallucinogens	1 (0.4)	1 (3.4)	0 (0.0)	0 (0.0)	0.016
Prescription drugs	10 (3.7)	1 (3.4)	2 (5.1)	7 (3.5)	0.886
Other	3 (1.1)	0 (0.0)	0 (0.0)	3 (1.51)	0.595
Any drug use	136 (50.9)	19 (65.5)	23 (59.0)	94 (47.2)	0.102
Alcohol	110 (41.2)	12 (41.4)	20 (51.3)	78 (39.2)	0.374

^a Other than cocaine/crack cocaine

^b Other than heroin

Table 4.5. Unadjusted and adjusted multinomial logistic regression analyses for characteristics that are associated with an interest in quitting smoking and an interest in cutting down on smoking, as compared to no interest in quitting or cutting down among current cigarette smokers living with HIV, BEACON, 2006-2012 (n=267)

Characteristic	Interest in cutting down vs. no interest RRR ^a (95% CI ^b)	Interest in cutting down vs. no interest aRRR ^{c,d} (95% CI ^b)	Interest in quitting vs. no interest RRR ^a (95% CI ^b)	Interest in quitting vs. no interest aRRR ^{c,d} (95% CI ^b)
<i>Individual-Level</i>				
Sex				
Male	1.0	1.0	1.0	1.0
Female	1.09 (0.41-2.90)	0.89 (0.30-2.68)	0.91 (0.30-2.72)	0.98 (0.39-2.47)
Age				
28-44	1.0	1.0	1.0	1.0
45-49	1.46 (0.43-4.90)	1.74 (0.44-6.80)	1.78 (0.45-7.00)	2.53 (0.81-7.92)
50-53	1.70 (0.49-5.93)	1.36 (0.33-5.57)	1.47 (0.36-6.04)	2.23 (0.68-7.30)
54-65	0.93 (0.16-5.45)	0.76 (0.11-5.25)	0.90 (0.13-6.26)	4.14 (0.96-17.94)
Race				
Black	1.0	1.0	1.0	1.0
Non-black	0.72 (0.13-3.87)	0.42 (0.07-2.63)	0.42 (0.07-2.64)	0.73 (0.17-3.07)
Income				
<\$500	1.0	1.0	1.0	1.0
\$500+	1.14 (0.31-4.20)	1.26 (0.31-5.20)	1.12 (0.28-4.53)	0.84 (0.27-2.65)
Marital status				
Not married	1.0	1.0	1.0	1.0
Married/committed relationship	1.14 (0.42-3.05)	0.63 (0.19-2.03)	0.61 (0.19-1.99)	0.57 (0.27-2.65)
Drug use^{e,f}				
Prior quit attempts ^g	2.87 (1.05-7.89)	2.66 (0.88-8.07)	2.90 (0.96-8.80)	3.50 (1.39-8.80)
Nicotine dependence^h				
Low	1.0	1.0	1.0	1.0
Medium-High	1.50 (0.51-4.43)	1.37 (0.42-4.39)	1.33 (0.41-4.23)	0.71 (0.28-1.82)
<i>Dyadic-Level</i>				
Main partner smoking	2.27 (0.85-6.04)	2.20 (0.67-7.25)	2.24 (0.69-7.35)	1.23 (0.45-3.34)
Main Supporter	2.62 (0.97-7.04)	1.16 (0.27-5.00)	2.28 (0.35-14.96)	0.93 (0.28-3.09)

smoking				
Main Supporter interested in quitting smoking	4.11 (1.30-13.01)	2.55 (0.51-12.77)	2.96 (1.08-8.10)	2.38 (0.58-9.77)
<i>Family-Level</i>				
Family encouragement to smoke	0.10 (0.01-0.89)	0.09 (0.01-0.86)	0.08 (0.01-0.82)	0.27 (0.08-0.90)

^a RRR = relative risk ratio

^b aRRR = adjusted relative risk ratio

^c CI = confidence interval

^d Multivariate model adjusted for sex, age, race, income, marital status, drug use, family encouragement to smoke, nicotine dependence, prior cessation attempts, main partner smoking, main Supporter smoking, main Supporter's interest in quitting

^e Not including alcohol

^f Within the past 30 days

^g Quit attempts using nicotine replacement therapy or pills/medications

^h Nicotine dependence according to the Heaviness of Smoking Index

5. CHAPTER 5 – PRIOR SMOKING CESSATION ATTEMPTS USING NICOTINE REPLACEMENT OR MEDICATION THERAPIES: ASSOCIATIONS WITH INDIVIDUAL AND SOCIAL CHARACTERISTICS AMONG SMOKERS LIVING WITH HIV (Aim 4)

Abstract: Cigarette smoking is highly prevalent among people living with HIV, and is associated with an elevated risk of a variety of negative health outcomes, including death. Little research exists to explore characteristics associated with smoking behaviors, such as past quit attempts, among smokers living with HIV. Moreover, the little research that does exist has focused on individual-level characteristics, to the neglect of social environmental characteristics. We aimed to explore individual- and social-level characteristics associated with prior use of nicotine replacement (NRT) or medications for smoking cessation. Data to assess this aim came from 269 current smokers on antiretroviral therapy interviewed in a study on informal caregiving conducted in Baltimore, Maryland. Logistic regression analyses were used to examine associations between individual- and social-level characteristics with prior use of NRT or medications for smoking cessation. Approximately half (51.3%) of participants reported current drug use. Older age (45-49: adjusted odds ratio (aOR)=3.44, 95% confidence interval (CI)=1.60-7.39; 54-65: aOR=2.74, 95% CI=1.22-6.17), non-Black race (aOR=3.61, 95% CI=1.23-10.62), and having a main Supporter who has used NRT or medications for cessation in the past (aOR=2.40, 95% CI=1.24-4.63) were positively associated with an increased likelihood of prior use of NRT or medications for smoking cessation. Findings corroborate prior research concerning individual-level characteristics, and also reveal the importance of social-level characteristics in association with prior use of NRT or medications for cessation. These findings have implications for the development and

implementation of targeted smoking cessation interventions for cigarette smokers living with HIV.

5.1 Introduction

Despite the fact that the prevalence of cigarette smoking has been on the decline among the United States (US) general population since the 1960's (CDC, 2012) and is currently approximately 19% (CDC, 2011a), smoking is still highly prevalent among certain subgroups. Among people living with HIV, for example, the prevalence of cigarette smoking is estimated to be 40-70% (Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010). In addition to being pervasive, cigarette smoking is associated with a variety of morbidities, as well as mortality among smokers with HIV. The introduction of new antiretroviral therapy regimens in recent years has resulted in a decrease in AIDS-related mortality and increase in life expectancies, transforming HIV from a death sentence into a chronic, medically manageable disease (Institute of medicine, 2001; Palella et al., 1998). Along with increased life expectancies, non-AIDS-related conditions have had the time to emerge among this group. Many smoking-related conditions, such as chronic obstructive pulmonary disease (Lewden et al., 2005; Diaz et al., 2002; Crothers et al., 2006), bacterial pneumonia (Crothers et al., 2005; Lifson et al., 2010; Miguez-Burbano et al., 2005), lung cancer (Lifson et al., 2010; Kirk et al., 2007; Chaturvedi et al., 2007; Engels et al., 2006), and cardiovascular disease (Lifson et al., 2010; Lewden et al., 2005; Petoumenos et al., 2011; Barbaro et al., 2003; Friis- Møller et al., 2003; Savès et al., 2003), among other conditions, are observed with increasing frequency among people living with HIV. In fact, lung cancer is the third most commonly diagnosed cancer among HIV-positive persons, behind the AIDS-defining cancers Kaposi sarcoma and non-Hodgkin lymphoma (Kirk et al., 2007). Moreover, cigarette smoking is associated

with death among people living with HIV HIV: smokers with HIV lose more life-years to smoking than they do to HIV (Helleberg et al., 2013). When considering the deleterious nature of these health consequences, encouraging smoking cessation and understanding the processes that underlie cessation in this population are of importance.

In 2010, 52.4% of adult smokers attempted to quit smoking (CDC, 2011b). Cessation attempt success can vary, based at least in part on the cessation method or methods employed. Smoking cessation methods can include, but are not limited to, counseling/therapy interventions, nicotine replacement therapy (NRT; e.g., the nicotine patch, nicotine gum), pills or medications (e.g., varenicline/Chantix, bupropion/Zyban) and quitting “cold turkey”—quitting all at once without the use of therapy, NRT, or medications. Research has shown that smokers who seek assistance (i.e., utilize counseling/therapy, NRT, or medications) have more than twice the success with cessation at 12 months compared to smokers who did not seek assistance (Zhu et al., 2000). Despite evidence indicating the efficacy of conventional smoking cessation modalities (i.e., behavioral and medication treatments, alone and in combination) in healthy smokers, research on smoking cessation among people living with HIV is scarce, and results have been mixed (Niaura et al., 2012). Differences in effectiveness of cessation interventions between healthy smokers with HIV may arise from a variety of sources: additional obstacles to cessation among those with HIV including comorbid psychiatric conditions, comorbid substance use, lower socioeconomic status, and diminished access to care (Reynolds, 2009; Humfleet et al., 2009); the continued perception of providers that smoking cessation is not a priority among individuals living with HIV; reluctance to utilize medication therapies for cessation due to existing pill

burden; and adverse drug-drug interactions. Understanding the determinants of stopping smoking, and the determinants of choosing to utilize smoking cessation aids and the subsequent effectiveness of these cessation aids, is critical to designing and continuing to improve interventions (Vangeli et al., 2011) and improving the life expectancy and quality of life of smokers with HIV.

Research examining factors associated with smoking cessation attempts has largely been conducted in the general population, and findings from these studies have been mixed. Findings can be considered mixed in the sense that the same characteristics have not been consistently identified from study to study, and furthermore, even when the same characteristics are identified, the direction of the associations are not necessarily consistent (Vangeli et al., 2011). Nevertheless, some studies have identified demographic characteristics such as gender (Zhou et al., 2009), age (Hatziandreu et al., 1990; Li et al., 2010; Li et al., 2011), race/ethnicity (Fu et al., 2005; Li et al., 2010; Li et al., 2011), education (Hatziandreu et al., 1990; Li et al., 2011), and income (Li et al., 2011) as being associated with making prior quit attempts. Additionally, studies have shown that factors such as intention to quit (Li et al., 2010; Li et al., 2011; Zhou et al., 2009; Hagimoto et al., 2009; West et al., 2001; Emmons et al., 2000), motivation to quit (Zhou et al., 2009; West et al., 2001), and confidence in success in quitting (Li et al., 2010; Li et al., 2011; Hagimoto et al., 2009), as well as characteristics related to smoking itself like enjoyment of smoking too much to try to quit (Li et al., 2010; Li et al., 2011; Fidler et al., 2010), the number of cigarettes smoked per day (Li et al., 2010; Li et al., 2011; Hagimoto et al., 2009; Hellman et al., 1991; Cokkinides et al., 2005), and the presence of nicotine dependence (Li et al., 2011; Zhou et al., 2009; Hagimoto et al.,

2009; Emmons et al., 2000). Additionally, past quit attempts are consistently identified as being significantly associated with making further attempts (Norman et al., 1999; Balmford et al., 2010; Li et al., 2010; Zhou et al., 2009; Hagimoto et al., 2009; West et al., 2001; Vangeli et al., 2011), with those making a quit attempt in the past year being more than twice as likely to make a subsequent attempt (Vangeli et al., 2011).

Though factors associated with making quit attempts, and specifically using NRT or pills/medications, have been explored in the general population, little is known about how factors influence quit attempt behaviors among people living with HIV. Moreover, existing research is lacking in terms of investigations into social level characteristics that are associated with quit behaviors. Increased knowledge of such characteristics may aid in the development, implementation, and continued improvement of smoking cessation interventions that are tailored toward people living with HIV.

To address the gaps in the literature, the aim of the present paper was to explore and identify the individual- and social-level characteristics associated with prior quit attempts using NRT or medications for smoking cessation among a sample of current cigarette smokers living with HIV. We hypothesized that individual-level characteristics, similar to those found among research in the general population (e.g., age, race), as well as social-level characteristics (e.g., significant others' past use of NRT or medications) would be associated with prior quit attempts using NRT or medications for smoking cessation. The aforementioned hypotheses, in addition to being shaped by prior research findings, were based on elements of two existing conceptual frameworks: Social Cognitive Theory (SCT; Bandura, 1986) and the Ecological Model for Health Promotion (McLeroy et al., 1988). SCT is a learning theory that posits that individual behavior,

personal characteristics (i.e., individual-level characteristics), and environmental characteristics (i.e., social-level characteristics) can all reciprocally influence one another. Similarly, the Ecological Model for Health Promotion states that behavior is influenced by a variety of levels of influence, including Intrapersonal and Interpersonal factors (i.e., individual- and social-level characteristics, respectively). This theoretical background points to the possibility for significant associations between individual- as well as social-level characteristics and past quit attempts with NRT/medications.

5.2 Methods

5.2.1 Data Source

Data for this dissertation aim came from the BEACON (BEing Active & CONnected) study, a study conducted in Baltimore, Maryland (2006-2012) aimed at examining social environmental influences on former and current drug users' HIV medication adherence and health outcomes. The study had three visits (baseline, 6-, and 12-month follow-up visits) and recruited two different types of participants: Index participants and Supporter participants. Index participants were recruited from clinic and community venues, and had to be HIV-positive, 18 years of age or older, and receiving HIV treatment (i.e., having taken at least one medication for HIV treatment at least one time within the past month) at the time of study enrollment. In addition to self-reporting information, Index participants nominated their main Supporter (i.e., their main supportive tie who provides assistance in living with the Index's HIV diagnosis), and with approval from the Index, Supporters were invited to take part in the study as well. Supporter participants had to be 18 years of age or older, know that the Index has HIV,

and not be a paid service provider to the Index. Data were collected by trained interviewers via audio computer-assisted self-interviewing (ACASI). Index and Supporter dyads were administered questionnaires at the same time points.

The questionnaires administered at each of the time points gathered information on a variety of topics, including but not limited to: medication adherence, illegal drug use, and mental health variables. Since the 6-month follow-up visit contained more extensive information regarding cigarette smoking than either the baseline visit or 12-month follow-up visit the present study used data from the 6-month follow-up visit. The Institutional Review Board at Johns Hopkins University Bloomberg School of Public Health approved this study.

5.2.2 Measures

5.2.2.1 Individual-level variables

Sociodemographic variables - Sex was dichotomized (male/female), and age was categorized into approximate quartiles (28-44; 45-49; 50-53; 54-65). Race was dichotomized as “Black” and “non-Black” due to sample distribution. Past month income from all sources, including food stamps was dichotomized (<\$500 versus >\$500). Marital status was also dichotomized as “not married” versus “married or in a committed relationship”.

Drug and alcohol use – Dichotomous variables (yes/no) were created for past month use of alcohol, and extramedical use of opiates, marijuana, tranquilizers or barbiturates, stimulants, heroin, cocaine or crack, prescription drugs, hallucinogens, and “other drugs”. A dichotomous variable (yes/no) was also created for “any past month

drug use”, not including alcohol, as well as for past 6-month injection drug use.

Depressive symptoms – Depressive symptoms were measured using the Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D is a (20 item) self-report scale designed to measure depressive symptomatology in the general population (Radloff, 1977). Possible scores range from 0 to 60, with higher scores indicating the presence of greater symptomatology. A score of 16 or higher was used to identify individuals with clinically meaningful depressive symptoms (Radloff, 1977). In prior studies, the CES-D has been shown to have good psychometric properties: for instance, it has demonstrated very good internal consistency reliability (>0.85) and acceptable test-retest reliability (Radloff, 1977; Hann et al., 1999) as well as moderate-good (0.44-0.75) concurrent validity compared with other scales measuring depressive symptoms (Radloff, 1977), good discriminant validity (Weissman, 1977), and sensitivity of 0.95 and specificity of 0.70 when compared with the Diagnostic Interview Schedule for DSM-IV (Thomas et al., 2001). Moreover, the CES-D has been shown to be valid and of utility among samples similar to the one used in the present work (Thomas et al., 2001; Yang et al., 2013; Latkin et al., 2012).

HIV primary care visits & drug treatment utilization – The number of HIV primary care visits made in the past 6 months was used as a categorical variable with three levels (0-2; 3-4; 5+). Utilization of 12-step programs in the past 6 months was dichotomized (yes/no).

Cigarette smoking - Participants were asked whether they had used NRT or pills/medications for the purpose of smoking cessation in the past. A dichotomous

(yes/no) variable was created based on the responses. Participants were also asked about the number of cigarettes that they smoke per day (i.e., cigarettes per day; CPD) (<1; 1-10; 11-20; 21+), as well as how soon after waking they smoke their first cigarette of the day (i.e., time to first cigarette; TTFC) (<5 minutes; 6-30 minutes; 31-60 minutes; and 60+ minutes).

The Heaviness of Smoking Index (HSI; Heatherton et al., 1989), a measure of nicotine dependence was created using the CPD and TTFC measures. Scores for the HSI range from 0 to 6, with higher scores indicating higher levels of nicotine dependence. Congruent with prior research (Chaiton et al., 2007), the HSI was categorized into a 3-category variable: low (0-1), medium (2-4), and high (5-6). When considering the psychometric properties of this measure, the HSI has been shown to have good sensitivity (0.79) and specificity (0.96), good test-retest (0.72) reliability over a 3-year period (Borland, 2010), and good concordance (Cohen's kappa=0.74) with the Fagerström Test for Nicotine Dependence (Heatherton et al., 1989), the most widely used measure of nicotine dependence (Chabrol et al., 2005).

5.2.2.2 Dyadic-level variables

Dichotomous variables were created based on Index participants' responses to a question asking if their main partner currently smoked (yes/no), as well as based on Supporters' responses to a question asking if they currently smoked (yes/no). Supporters who were current smokers were asked two additional questions, from which two dichotomous (yes/no) variables were created: (1) whether the main Supporter was currently interested in quitting smoking and; (2) whether the main Supporters had used

NRT or pills/medications for the purpose of smoking cessation in the past. Not all participants reported having a main partner or a main Supporter. Approximately half (54%) of smokers reported having a main partner and 63% had a main Supporter participant. In order to utilize the full sample of current smokers (n=269), the two dyadic-level variables were coded as “0” (i.e., “no”) for individuals without partners or Supporters. This was deemed reasonable, since the Index participants without main partners or Supporters would not have had the influence of cigarette smoking by partners or Supporters in their lives. Additional sensitivity analyses were performed to assess whether this assumption was reasonable.

5.2.2.3 Family-level variables

Index participants were questioned about the following topics: prevalence of smoking among family members; encouragement to smoke by family members; family members’ belief that smoking causes health problems; whether family members dislike cigarette smoking; and whether family members have rules regarding where someone can or cannot smoke within their homes. Dichotomous (yes/no) variables were created based on responses to each of the aforementioned questions.

5.2.3 Statistical Analysis

Descriptive statistics were used to describe the sample. Chi-square (χ^2) tests were used to assess the statistical significance of relationships between current cigarette smoking status and individual-level, dyadic-level, and family-level variables. Unadjusted and adjusted logistic regression analyses were used to calculate odds ratios (ORs), adjusted odds ratios (aORs), and corresponding 95% confidence intervals (CI). Variable

selection for the adjusted model was based on a combination of findings from the prior literature, *a priori* theory, and χ^2 p-values of <0.05. Variables selected for the adjusted model included: sex, age, race, marital status, income, nicotine dependence, and main Supporter's past use of NRT and/or pills/medications for smoking cessation.

Of the 359 individuals followed up at the 6-month time point, 269 were current smokers and had provided information on prior use of NRT and pills/medications for smoking cessation. These 269 individuals were retained for the present analysis.

Additional analyses were also performed among only those current smokers who had a main Supporter (n=169) in an effort to assess how the decision to code the two dyadic-level variable for Supporter smoking status as "0" (i.e., "no") for individuals without Supporters may have affected results. All analyses were performed using STATA SE statistical software version 12.0 (StataCorp, 2011).

5.3 Results

5.3.1 Sample characteristics

Detailed sample characteristics can be found in Table 5.1. Most (59.5%) of participants reported having made a prior smoking cessation attempt using NRT or medications. The majority of the sample (60.6%) was male, Black (90.7%), and approximately 48.6 years of age (SE=0.37). Most (81.0%) reported a past month income greater than \$500 and were unmarried (68.4%). Significant differences between participants who had used NRT/medications for cessation in the past and those who had no prior use were observed on the basis of sociodemographic characteristics. For instance, participants who had used NRT or medications in the past were more likely than

those who had not to report non-Black race ($\chi^2(1, N = 269) = 4.81, p = 0.028$).

Additionally, individuals who had made prior quit attempts with NRT or medications were more likely than those who had not to have a Supporter who was interested in quitting ($\chi^2(1, N = 269) = 5.99, p = 0.014$). And lastly, participants who had made prior quit attempts using NRT or medications were more likely than those who had not made attempts to have a main Supporter who had also made quit attempts using NRT or medications ($\chi^2(1, N = 269) = 5.85, p = 0.016$).

5.3.2 Cigarette smoking characteristics

Cigarette smoking characteristics are listed in Table 5.2. A majority of smokers (75.8%) reported smoking a half a pack of cigarettes or less (1-10) per day, and 34% smoked their first cigarette of the day within 5 minutes of waking. According to the HSI, more than half (64.2%) of smokers were deemed to have a medium-level of nicotine dependence. When dichotomized by past use of NRT/medications for smoking cessation, no significant differences were found between groups on the basis of smoking characteristics.

5.3.3 Drug use

Information regarding drug and alcohol use characteristics can be found in Table 5.3. Forty percent of participants used alcohol within the past month. Additionally, approximately half of participants (51.3%) reported past month use of any drug(s), not including alcohol. The most commonly used substances in this sample were cocaine/crack cocaine (33.1%), heroin (23.4%), and marijuana (23.4%). In terms of

differences in substance use prevalence between those who had made quit attempts using NRT or medications and those who had not, individuals who had made prior quit attempts using NRT or medications were more likely than those who had not made such prior attempts to have used tranquilizers/barbiturates in the past month ($\chi^2 (1, N = 269) = 5.54, p = 0.019$). Conversely, individuals who had not made a past quit attempt were more likely than those who had to have used marijuana in the past month ($\chi^2 (1, N = 269) = 4.80, p = 0.028$).

5.3.4 Logistic regression analyses

Information on associations between past smoking cessation attempts using NRT or medications and various covariates is presented in Table 5.4. In adjusted analyses, though not observed for all age subgroups, older age (45-49: aOR=3.44, 95% CI=1.60-7.39; 54-65: aOR=2.74, 95% CI=1.22-6.17) was positively associated with having made prior smoking cessation attempts using NRT or medications. Individuals of non-Black race were significantly more likely to have made prior cessation attempts using NRT or medications than were individuals of Black race (aOR=3.61, 95% CI=1.23-10.62). Additionally, individuals with a main Supporter who had made prior cessation attempts using NRT or medications were significantly more likely to have made prior cessation attempts using NRT or medications themselves (aOR=2.40, 95% CI=1.24-4.63).

5.3.5 Sensitivity analyses

In adjusted analyses, when restricting the sample to smokers who had a main Supporter (n=169), main findings did not differ markedly from findings from analyses utilizing the full sample (n=269). To be more specific, in the restricted sample, older age (age 45-49: aOR=3.28, 95% CI=1.28-8.39; age 50-53: aOR=2.85, 95% CI=1.05-7.76)

and non-Black race (aOR=6.59, 95% CI=1.32-32.79) were positively associated with prior use of NRT or medications for smoking cessation. Additionally, having a Supporter who used NRT or medications for cessation in the past significantly increased the likelihood that the Index had used NRT or medications for cessation in the past (aOR=2.24, 95% CI=1.08-4.62). There were no discrepant findings observed between findings from the full and restricted samples.

5.4 Discussion

Findings from the present study identified individual- and social-level characteristics associated with past smoking cessation attempts using NRT or medications among a sample of cigarette smokers living with HIV. In terms of individual-level characteristics, older age and non-Black race were associated with an increased likelihood of having made a prior attempt using NRT or medications. Both findings are consistent with prior research. For example, Li and colleagues (2010; 2011) found that older individuals were more likely to have made a prior quit attempt, while Fu and colleagues (2005) and Zhu and colleagues (2000) found that individuals of Black and Hispanic race/ethnicities were less likely than Whites to have used NRT or medications during a quit attempt in the past year. Findings related to age are rather intuitive: though we cannot verify length of smoking history, older smokers presumably have a longer smoking history than do younger smokers, thereby allowing for more time during which smoking cessation aids could be utilized. In addition, older adults may be more likely to have developed medical sequelae related to smoking that may have prompted them to attempt to quit. The racial disparities observed in this analysis were not explained by

sociodemographic (e.g., sex, age, income, marital status) or physiologic (e.g., level of nicotine dependence) factors measured in this study. In other samples, findings related to race/ethnicity may reflect issues related to access to healthcare settings in which use of NRT or medications for cessation are provided and recommended as well as other issues like knowledge of and comfort using medication for smoking cessation. This, however, seems unlikely in a sample in which all participants are actively engaged in HIV primary care. However, some research has found racial disparities in use of services and physician treatment even among Medicare recipients (Gornick et al., 1996) and other individuals with apparent access to care (Bach et al., 2004). Additionally, factors related to physician characteristics and training, interest and understanding of the importance of smoking and medical illness among people living with HIV, and whether it is considered a priority related to other medical problems among people with HIV may be factors to consider that may explain some of these differences. Additional research is needed to explore and explain racial/ethnic disparities in utilization of NRT or medications for smoking cessation.

A novel outcome was observed in terms of social-level characteristics and their association with use of NRT or medications in the past. We found that Index participants who had a main Supporter who had previously used NRT or medications for smoking cessation were more likely to have made a cessation attempt using NRT or medications themselves. Such a finding points to the potential importance of social environmental characteristics in influencing smoking behaviors among HIV-positive cigarette smokers, and has implications for the development of smoking cessation interventions. Though, given the cross-sectional nature of the study, we are unable to assert whether Supporter

cessation attempts influenced Index cessation attempts or vice versa, interventions that include a social component, namely ones including participation of Supporter individuals, may be of utility.

Findings from the present study should be interpreted in the context of several limitations. As mentioned above, this research utilizes cross-sectional data; therefore causal relationships between variables cannot be determined. All data were collected via self-report, which allows for the possibility for social desirability and recall biases to be a concern. Additionally, the survey did not contain questions to allow for the collection of sociometric social network data (i.e., survey data where the entire community is interviewed, and all members are questioned regarding their contacts within the community) (Wasserman & Faust, 1994). With this sort of data, it would have been possible to obtain additional information about this sample, including the prevalence of cigarette smoking within the extended network, the types of relationships that smokers in the network have with the Index participants, and the specific kind of support provided by smokers in the network. The survey also did not contain questions about past quit attempts using other assisted cessation methodologies (e.g., therapy/counseling, etc.) unassisted attempts (i.e., quitting “cold turkey”), or the relative success of past quit attempts, which would have been useful. Finally, some of the analyses may have had limited statistical power.

Despite these limitations, the present study has a number of strengths that should be noted as well. Results from this study make a contribution to the extant literature concerning factors that are associated with cigarette smoking behaviors among a population exhibiting an unduly high prevalence of cigarette smoking. Moreover, the

vast majority of prior work in this area has focused on characteristics associated with current smoking status, while the present study focused on examining another cigarette smoking behavior about which not much is known in this population: prior smoking cessation attempts using NRT or medications. This study further extends the literature by investigating and identifying social environmental variables associated with smoking behaviors, in addition to previously researched individual-level characteristics. Moreover, this study focuses on and provides information on a typically hard-to-reach population among which cigarette smoking is a significant public health concern.

Findings from this study confirm prior research among the general population showing that various individual-level characteristics, such as age and race/ethnicity, are associated with having made prior quit attempts using NRT or medications. The results from the present study also extend existing research by demonstrating that social-level characteristics, like prior use of NRT or medications for cessation by main Supporters, are also associated with smoking behaviors among a sample of HIV-positive smokers. In addition to characteristics of the individual, findings emphasize that members of an individual's social network may influence their smoking behaviors. Ultimately, characteristics traditionally associated with smoking cessation attempts are associated with attempts among HIV-positive smokers. These results indicate that strategies successfully employed in other populations may be of utility among people living with HIV and should be reinforced to fit the needs of smokers living with HIV (Encrenaz et al., 2010). Additionally, in light of the findings from the present study, smoking cessation interventions with a social component may prove to be effective, and merit further investigation.

5.5 References

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Table 5.1. Characteristics of current smokers living with HIV, stratified by prior quit attempts^a (NRT or medications), BEACON, 2006-2012 (n=269)

Characteristic	Total Sample (n=269)	Prior Quit Attempts ^a		p-value
		No	Yes	
		(n=109) n (%)	(n=160) n (%)	
Individual-Level				
Sex				
Male	163 (60.6)	70 (64.2)	93 (58.1)	0.315
Female	106 (39.4)	39 (35.8)	67 (41.9)	
Age				
28-44	66 (24.5)	34 (31.2)	32 (20.0)	0.113
45-49	75 (27.9)	24 (22.0)	51 (31.9)	
50-53	71 (26.4)	30 (27.5)	41 (25.6)	
54-65	57 (21.2)	21 (19.3)	36 (22.5)	
Age (mean (SE))	48.6 (0.37)	48.3 (0.61)	48.9 (0.46)	0.371
Race				
Black	244 (90.7)	104 (95.4)	140 (87.5)	0.028
Non-black	25 (9.3)	5 (4.6)	20 (12.5)	
Income				
<\$500	51 (19.0)	24 (22.0)	27 (16.9)	0.291
\$500+	218 (81.0)	85 (78.0)	133 (83.1)	
Marital status				
Not married	184 (68.4)	69 (63.3)	115 (71.9)	0.138
Married/committed relationship	25 (31.6)	40 (36.7)	45 (28.1)	
CESD^b Score				
<16	163 (60.6)	63 (57.8)	100 (62.5)	0.438
16+	106 (39.4)	46 (42.2)	60 (37.5)	
HIV Primary Care Visits^c				
0-2	114 (42.4)	49 (44.9)	65 (40.6)	0.561
3-4	66 (24.5)	28 (25.7)	38 (23.8)	
5-30	89 (33.1)	32 (29.4)	57 (35.6)	
12-Step Program ^c	149 (55.4)	64 (58.7)	85 (53.1)	0.365
Alcohol ^d	110 (40.9)	43 (39.4)	67 (41.9)	0.691
Any drug use ^{d,e}	138 (51.3)	58 (53.2)	80 (50.0)	0.605
Dyadic-Level				
Main partner smokes	117 (43.5)	49 (44.9)	68 (42.5)	0.690
Main supporter smokes	133 (49.4)	47 (43.1)	86 (53.7)	0.087
Main supporter interested in quitting	100 (37.2)	31 (28.4)	69 (41.1)	0.014
Main supporter made quit attempts in past ^a	65 (24.2)	18 (16.5)	47 (29.4)	0.016

<i>Family-Level</i>				
Smokers in family	230 (85.5)	93 (85.3)	137 (85.6)	0.945
Encouragement to smoke by family	24 (8.9)	10 (9.2)	14 (8.7)	0.905
Smoking causes health problems^f	261 (97.4)	106 (98.1)	155 (96.9)	0.522
Dislike smoking	240 (89.2)	97 (89.0)	143 (89.4)	0.921
Rules about smoking^g	234 (87.0)	95 (87.2)	139 (86.9)	0.946

^a Prior quit attempts using nicotine replacement therapy or pills/medications

^b CESD = Centers for Epidemiological Studies Depression scale

^c Within the past 6 months

^d Within the past 30 days

^e Not including alcohol

^f Belief held by family/friends

^g Rules about where people can and cannot smoke in the home

Table 5.2. Cigarette smoking characteristics of current smokers living with HIV, stratified by prior quit attempts (NRT or medications), BEACON, 2006-2012 (n=269)

	Total sample	No prior quit attempts	Prior quit attempts	p-value
	n (%)	n (%)	n (%)	
CPD^a				
<1	2 (0.7)	1 (0.9)	1 (0.6)	0.934
1-10	203 (75.8)	82 (75.9)	121 (75.6)	
11-20	60 (22.4)	24 (22.2)	36 (22.5)	
21-30	1 (0.4)	0 (0.0)	1 (0.6)	
31+	2 (0.7)	1 (0.9)	1 (0.6)	
Time to first cigarette				
<5 minutes	91 (34.0)	35 (32.4)	56 (35.0)	0.802
6-30 minutes	81 (30.2)	31 (28.7)	50 (31.2)	
31-60 minutes	25 (9.3)	12 (11.1)	13 (8.1)	
60+ minute	71 (26.5)	30 (27.8)	41 (25.6)	
Nicotine dependence^b				
Low	93 (34.7)	41 (38.0)	52 (32.5)	0.644
Medium	172 (64.2)	66 (61.1)	106 (66.2)	
High	3 (1.1)	1 (0.9)	2 (1.5)	

^a CPD = cigarettes per day

^b According to the Heaviness of Smoking Index

Table 5.3. Drug and alcohol use characteristics of current cigarette smokers living with HIV, BEACON, 2006-2012 (n=269)

Past 30 Day Drug and Alcohol Use	Total sample (n=269)	No prior quit attempts (n=109)	Prior quit attempts (n=160)	p-value
Cocaine/crack cocaine	89 (33.1)	40 (36.7)	49 (30.6)	0.299
Heroin	63 (23.4)	32 (29.4)	31 (19.4)	0.058
Stimulants^a	3 (1.1)	0 (0.0)	3 (1.9)	0.151
Opiates^b	39 (14.5)	16 (14.7)	23 (14.4)	0.945
Tranquilizers/barbiturates	16 (5.9)	2 (1.8)	14 (8.7)	0.019
Marijuana	63 (23.4)	33 (30.3)	30 (18.7)	0.028
Hallucinogens	1 (0.4)	0 (0.0)	1 (0.6)	0.408
Prescription drugs	10 (3.7)	3 (2.7)	7 (4.4)	0.490
Other	3 (1.1)	1 (0.9)	2 (1.2)	0.799
Any drug use^c	138 (51.3)	58 (53.2)	80 (50.0)	0.605
Alcohol	110 (40.9)	43 (39.4)	67 (41.9)	0.691

^a Other than cocaine/crack cocaine

^b Other than heroin

^c Not including alcohol

Table 5.4. Unadjusted and adjusted logistic regression analyses for the association between covariates and prior attempts smoking cessation attempts using NRT or medications among current cigarette smokers living with HIV, BEACON, 2006-2012 (n=269)

Characteristic	OR^a (95% CI^b)	aOR^{c,d} (95% CI^b)
<i>Individual-Level</i>		
Sex		
Male	1.0	1.0
Female	1.33 (0.97-1.81)	1.26 (0.71-2.24)
Age		
28-44	1.0	1.0
45-49	2.26 (1.14-4.48)	3.44 (1.60-7.39)
50-53	1.45 (0.74-2.85)	1.96 (0.91-4.20)
54-65	1.82 (0.88-3.75)	2.74 (1.22-6.17)
Race		
Black	1.0	1.0
Non-black	2.97 (1.08-8.18)	3.61 (1.23-10.62)
Income		
<\$500	1.0	1.0
\$500+	1.39 (0.75-2.59)	1.22 (0.92-1.60)
Marital status		
Not married	1.0	1.0
Married/committed relationship	1.67 (0.40-1.13)	0.61 (0.35-1.08)
Nicotine dependence^e		
Low	1.0	1.0
Medium-High	1.27 (0.76-2.12)	1.34 (0.79-2.37)
<i>Dyadic-Level</i>		
Main supporter made past quit attempts		
No	1.0	1.0
Yes	2.10 (1.14-3.87)	2.40 (1.24-4.63)

^a OR = odds ratio

^b CI = confidence interval

^c aOR = adjusted odds ratio

^d Multivariate model adjusted for sex, age, race, income, marital status, nicotine dependence, and Supporter quit attempts

^e Nicotine dependence according to the Heaviness of Smoking Index

6. CHAPTER 6 - DISCUSSION

This final chapter presents overviews of all four aims, including key findings from each study. Next, the limitations and strengths of the dissertation are presented, along with the public health and policy significance of the key findings. Finally, future directions are offered for research in the field.

6.1 Study Overviews and Summary of Key Findings

6.1.1 Aim 1: A Review Of The Literature Concerning HIV And Cigarette Smoking: Morbidity and Mortality, Associations With Individual- and Social-Level Characteristics, and Smoking Cessation Efforts

Chapter 2 presented a review of the literature concerning the intersecting fields of HIV and cigarette smoking. In this review, a summary of morbidity, mortality, quality of life, and adverse treatment and medication adherence outcomes associated with cigarette smoking was presented. Additionally, prior research concerning the individual- and social-level characteristics associated with cigarette smoking behaviors among people living with HIV was explored. Next, literature pertaining to issues concerning smoking cessation was reviewed, including research related to interest in quitting among smokers living with HIV and previously-identified barriers to smoking cessation. Currently accepted evidence-based smoking cessation treatments were discussed, followed by a summary of findings from cessation interventions conducted among smokers living with HIV. Twelve cessation trials were summarized, with somewhat mixed results. Last, gaps in the literature and directions for future research were identified.

6.1.2 Aim 2: The Association of Individual-Level and Social-Level Characteristics with Current Cigarette Smoking Status Among a Sample of People Living with HIV

Chapter 3 presented a study dedicated to exploring and identifying the individual- and social-level characteristics associated with current cigarette smoking status among a sample of persons living with HIV. In this sample, the majority of participants were current cigarette smokers. Participation in a 12-step program within the past 6 months, as well as past 30-day drug use, was positively associated with current cigarette smoking. Additionally, main Supporter smoking status was significantly associated with Index participant smoking status. To be more precise, having a main Supporter who is a smoker increased the likelihood that the Index participant would also be a smoker. A novel component of this study includes the inclusion of social environmental characteristics as potential correlates of current smoking status.

6.1.3 Aim 3: Quitting and Cutting Down on Smoking: Interest Among Cigarette Smokers Living with HIV

In Chapter 4, findings from a study aimed at exploring the individual- and social-level characteristics associated with interest in cutting down on or quitting smoking were presented. In this sample of current smokers, the vast majority were interested in either cutting down on smoking or quitting smoking altogether. Most exhibited a medium level of nicotine dependence, and had made a quit attempt in the past using pills/medications or nicotine replacement therapy. Participants expressed interest in a wide variety of smoking cessation modalities; particularly high endorsement was given for modalities that included a social component. Smokers who had made quit attempts in the past using

pharmacologic therapies were more likely than those who had not to be currently interested in quitting smoking. Additionally, individuals who received encouragement to smoke from their family members were less likely to be interested in cutting down on smoking or quitting smoking than were those who did not receive encouragement to smoke. Components of this study are innovative when considering that social environmental characteristics, in addition to individual-level characteristics, were included in the analysis as potential correlates of interest in cutting down on or quitting smoking. This study also examined a smoking behavior about which little is known in this population.

6.1.4 Aim 4: Prior Smoking Cessation Attempts Using Nicotine Replacement Or Medication Therapies: Associations With Individual And Social Characteristics Among Smokers Living with HIV

Chapter 5 presented findings from a study concerned with the exploration and identification of characteristics, both individual- and social-level, associated with prior smoking cessation attempts using NRT or medications. In this sample of current smokers, the majority had made prior quit attempts using pharmacologic smoking cessation aids. Smokers exhibited a medium level of nicotine dependence. Two individual-level characteristics, older age and non-Black race, were positively associated with having made prior quit attempts with NRT or medications. Additionally, having a main Supporter who had previously used NRT or medications for smoking cessation increased the likelihood that Index participants had used such smoking aids in the past. Much like Aim 2, this analysis contributes to the literature by including social-level

characteristics in the models as potential correlates of past cessation attempts, as well as by examining a smoking behavior that has yet to be examined among HIV-positive smokers.

6.2 Limitations

Findings from the present dissertation work should be interpreted in the context of several limitations, which merit acknowledgement and discussion. First, data utilized for these analyses were cross-sectional and observational in nature. As a result, no statements can be made regarding the causal relationship between variables.

Additionally, data were collected via self-report, creating potential concerns regarding recall and social desirability biases. However, social desirability bias was not anticipated to be of great concern since the primary concern of this work was to examine cigarette smoking behaviors and: 1) all participants are adults and cigarette smoking is legal, and 2) cigarette smoking is highly normative among people who are HIV-positive and use illegal drugs. Regardless, in an attempt to diminish concerns surrounding social desirability bias, information was collected using audio computer-assisted self interviewing (ACASI), which has been shown to increase the likelihood of honest responding to questions regarding sensitive information (Macalino et al., 2002).

Additionally, the survey from the parent study utilized in this work did not contain sociometric social network data (i.e., a survey in which the entire community are interviewed, and all respondents are asked about their contacts within the community) (Wasserman & Faust, 1994). Had this sort of data been available, it may have been possible to obtain additional information, such as: the density of cigarette smoking in an

individual's network, the types of relationship roles played by smokers in the network relative to Index participants, and the specific support provided by smokers to the Index. This type of information may have the potential to further elucidate the relationship between social environmental characteristics and cigarette smoking behaviors among HIV-positive persons. Furthermore, given the unique nature of the study sample (i.e., all HIV-positive, engaged in HIV primary care at the time of enrollment), findings may not generalize beyond similar types of samples. For instance,

Though the survey utilized for this work (i.e., the survey from the 6-month follow-up visit) contained the most information regarding cigarette smoking of the surveys administered at the three time points, additional information not contained in the surveys could be of interest. For instance, each of the main variables (i.e., current smoking, interest in cutting down/quitting, past cessation attempts) was measured using single items. This is problematic for the current smoking variable, in particular, which was measured in a less than ideal way in the parent study used for the present dissertation work. Typically, current smoking status is assessed using multiple questions (Troscclair & Dube, 2010): 1) has the participant smoked 100 or more cigarettes in their lifetime?; and 2) has the participant smoked at least one cigarette within the past 30 days?. The survey also did not collect information on the prevalence of cigarette smoking in the Index's larger social network (i.e., outside of the Index's family, main partner, or main Supporter). Additionally, the prevalence of cigarette smoking among family members was assessed using a single (yes/no) question, rendering it difficult to distinguish which family members were the smokers, or to determine their relationship to as well as type and quality of relationship with the Index. Additionally, the study contained a wide range

of information regarding main Supporter individuals, which was advantageous, but corresponding information regarding main partners was not available.

6.3 Strengths

Notwithstanding the aforementioned limitations, the present dissertation work possesses strengths that should be discussed as well. To begin, the first paper of this dissertation provided a comprehensive summary of the literature pertaining to the intersection of HIV and cigarette smoking. Additionally, results from these studies make a contribution to the extant literature concerning the epidemiology of cigarette smoking behaviors among people living with HIV, a group that is disproportionately affected by smoking and smoking-related morbidity and mortality. In addition to reporting the basic prevalence of various smoking behaviors, the present work explores and reports on characteristics associated with these behaviors, as well. The majority of existing research concerning cigarette smoking among people living with HIV has focused on exploring characteristics associated with current cigarette smoking status. Though knowledge on this topic is undoubtedly of interest and important, in addition to focusing on current smoking status, the present dissertation work extends the literature by focusing on smoking behaviors about which not much is known in this population: interest in cutting down on or quitting smoking and past use of NRT or medications for smoking cessation. Furthermore, the present work explores social-level characteristics associated with smoking behaviors, in addition to associations with individual-level characteristics explored in prior studies. An additional strength includes this work's focus on a typically hard-to-reach population among which smoking is a significant public health concern.

Furthermore, though numerous other studies of people with HIV do exist, this is one of the few that have survey items concerning social-level characteristics such as the ones examined within the present dissertation work, and allows for examination of associations between social-level characteristics and smoking behaviors among people living with HIV.

6.4 Public Health Significance and Implications

Cigarette smoking is a public health issue for the general population of the United States, where it continues to be the leading preventable cause of death (CDC, 2011a). Smoking is an even greater concern among certain subgroups of the population, who exhibit an inflated prevalence of smoking compared to the general population. Among people living with HIV, for instance, the prevalence of smoking is approximately two to three times higher than what is observed in the general population of the United States: 40-70% versus 19% (Collins et al., 2001; Gritz et al., 2004; Mamary et al., 2002; Burkhalter et al., 2005; Crothers et al., 2005; Lifson et al., 2010; CDC, 2011b). Findings from this work corroborate these high estimates: In Chapter 3, it was reported that 75% of the sample were current cigarette smokers. Moreover, smoking among people with HIV is associated with elevated risks of a variety of health conditions (Lewden et al., 2005; Lifson et al., 2010; Kirk et al., 2007), and smokers living with HIV now lose more life years to cigarette smoking than to the HIV virus (Helleberg et al., 2013). These prior research findings, coupled with corroborating findings from the present dissertation, make a strong case for the implementation of smoking cessation treatment integrated within the context of HIV primary care. Since people living with HIV who are engaged

in HIV primary care are likely making doctor visits on a regular basis, having both services in the same location may increase the likelihood of promotion, uptake, and maintenance of smoking cessation therapies.

Additionally, findings from this dissertation work have implications for the development of targeted smoking cessation interventions that contain a social component, alone or in conjunction with standard, traditional smoking cessation therapies (e.g., counseling, non-nicotine replacement therapy, nicotine replacement therapy, etc.). Each of the Aims containing statistical analyses described within the dissertation has statistically significant findings regarding the association of social-level characteristics with a variety of cigarette smoking behaviors. Findings such as these are similar to those observed in the general population (Christakis & Fowler, 2008; Alexander et al., 2001; Unger & Chen, 1999; Mermelstein et al., 1986), indicating the importance of social factors in determining smoking behaviors. Moreover, findings from Chapter 4 indicate that individuals in this sample of smokers living with HIV are interested in smoking cessation modalities that involve a social component.

Along with implications for the integration of smoking cessation treatment with HIV care and the development of cessation therapies with social components, findings from this work have policy implications as well. For instance, the development of effective smoking cessation therapies utilizing a social component may be able to impact the recommended and approved effective treatments for smoking cessation among smokers with HIV as detailed in the document *Treating Tobacco Use and Dependence: Clinical Practice Guidelines* (Fiore et al., 2008). Additionally, findings may have implications for improving educational curricula received by physicians regarding

tobacco treatment and counseling. As summarized in Chapter 2, a significant proportion of HIV care providers reported a lack of confidence in their ability to provide cessation resources and advice (Horvath et al., 2012; Shuter et al., 2012), and that one source of this decreased confidence may be deficient training in tobacco treatment and counseling methods (Shuter et al., 2012b). Additional mandated training in these methodologies have the potential to increase providers' confidence in giving cessation advice, consequently increase the likelihood that cessation advice and resources will be provided effectively, and have the potential to make an impact on the disproportionately high prevalence of cigarette smoking among people living with HIV.

6.5 Directions for Future Research

In the future, research examining the intersection of HIV and cigarette smoking should continue to be pursued, with an emphasis on the continued exploration of how social environmental characteristics influence smoking behaviors. To give one example, in the future, collecting additional information on main partners of people living with HIV, and comparing characteristics of the main partners and main Supporters may prove to be of utility. For instance, as found in Chapter 3 of this dissertation, main Supporter smoking status was associated with Index smoking status, while main partner smoking status was not. Future research could investigate what differentiates these individuals, and attempt to identify characteristics that make Supporters optimally influential in the lives of the Index participants. In the future, researchers should also consider an in-depth examination of how the prevalence of cigarette smoking among family and friends influences smoking behaviors. In the present dissertation work, the prevalence of

smoking among family was assessed via a single question. Future work may benefit from specifically distinguishing which family members are smokers, as well as exploring characteristics of the relationship between smokers in the family and Indexes. For instance, it is possible that the quality and type of relationship between family members may have an impact on how influential the relationship is in terms of transmitting smoking behaviors and attitudes. Additionally, factors like the age of influence and living situation may be influential (e.g., younger persons living at home with parents/grandparents/guardians may be susceptible to the influence of persons living in the home than would individuals who no longer live with their families or live alone). In future work, main outcome variables (i.e., current smoking status, interest in cutting down/quitting, past quit attempts, etc.) should be measured using multiple items to fully capture more dimensions of what the outcomes entail. Furthermore, future research should consider examining other forms of tobacco use among people living with HIV, in addition to cigarette smoking. Some of the health effects associated with cigarette smoking, outlined in Chapter 2 of this dissertation, are attributable to nicotine (Arcavi & Benowitz, 2004; Huttunen et al., 2011), which is present in other tobacco products.

As mentioned in Chapter 1 of this dissertation work, only the Intrapersonal and Interpersonal levels of the Ecological Model of Health Promotion are represented within the present analyses. Future work should consider examining variables that are representative of the remaining levels of the Ecological Model: Institutional (McLeroy et al., 1988), Community, and Public Policy. Though Public Policy characteristics are likely to apply to all individuals in a given population (e.g., the prices and taxes applied to cigarette sales in a given state/country apply to everyone), there may be variation in

certain Community and Institutional characteristics. These types of characteristics, such as the availability of tobacco outlets in a defined neighborhood or community (i.e., Community factors) or the rules regarding smoking in the workplace, bars, restaurants, and so on (i.e., Institutional factors), may prove to be influential of cigarette smoking behaviors, and may help to further identify points for interventions to reduce the prevalence of smoking among people living with HIV. Additionally, in terms of Social Cognitive Theory (Bandura, 1986), one key aspect of the model not represented in the present dissertation work due to constraints of the data is self-efficacy. Self-efficacy is the belief in one's own ability to complete tasks and reach goals, and has an effect on numerous aspects of human behavior. It is possible that self-efficacy would be influential of cigarette smoking behaviors among people living with HIV, particularly quitting behaviors (Gwaltney et al., 2009).

Additionally, the findings of this work have implications for the development of cessation interventions with a social component. As a result, future research could consist of the development of such intervention programs, either as stand-alone treatments or in conjunction with traditional smoking cessation therapies, and the subsequent evaluation of their effectiveness in terms of aiding in smoking cessation. In fact, in the *Clinical Practice Guidelines*, Fiore and colleagues (2008) identified several areas of research regarding HIV-positive smokers that require additional research, including evaluation of: the effectiveness of motivational interviewing and educational approaches to increase motivation to quit; effectiveness of medications and counseling/behavioral interventions for cessation and; effectiveness of community and social support networks in aiding motivation to quit and improving treatment outcomes.

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- Trosclair, A. & Dube, S.R. (2010). Smoking among adults reporting lifetime depression, anxiety, anxiety with depression, and major depressive episode, United States, 2005-2006. *Addictive Behaviors, 35*, 438-443.
- Unger, J.B. & Chen, X. (1999). The role of social networks and media receptivity in predicting age of smoking initiation: a proportional hazard model of risk and protective factors. *Addictive Behaviors, 24*(3), 371-381.
- Wasserman, S. & Faust, K. (1994). *Social networks analysis: Methods and applications*. Cambridge, UK: Cambridge University Press.

7. Curriculum Vitae

Lauren Renee Pacek (née Ropelewski)

Education

- 10/2013 – Present **Johns Hopkins University School of Medicine**, Baltimore, MD
Post-Doctoral Fellow, Department of Psychiatry
Advisor: Ryan Vandrey
- 08/2009 – 09/2013 **Johns Hopkins University Bloomberg School of Public Health**,
Baltimore, MD
Ph.D. Candidate, Department of Mental Health
Advisor: Rosa M. Crum
- 08/2005 - 04 /2009 **University of Pittsburgh**, Pittsburgh, PA, Concentration GPA:
3.96/4.0
B.S. in Psychology with Honors, *magna cum laude*
Honors Thesis Topic: "Behavioral Response Variation Across
Smoking Statuses"
Advisor: Eric C. Donny

Fellowships, Grants, and Awards

Graduate-level

- 10/2013 – Present Post-Doctoral Research Fellow – **National Institute on Drug Abuse, Human Behavioral Pharmacology of Substance Use Institutional Training Grant** (NIDA T32 DA007209), Johns Hopkins University School of Medicine
Role: Post-Doctoral Trainee
- 08/2012 – 09/2013 National Institute on Drug Abuse (F31 DA033873): Health Behavior Among Persons with HIV/AIDS: The Influence of Social Factors (08/2012 - present)
Role: Principal Investigator
- 08/2009 - 08/2012 Doctoral Research Fellow - **National Institute on Drug Abuse, Pre-Doctoral Drug Dependence Epidemiology Training Program Institutional Training Grant** (NIDA T32 DA007292), Johns Hopkins University Bloomberg School of Public Health
Role: Pre-Doctoral Trainee
- 06/2013 NIDA Director's Travel Award – College on Problems of Drug Dependence

Undergraduate-level

04/2009 Magna Cum Laude, University of Pittsburgh
04/2009 Departmental Honors, Department of Psychology
07/2008 Dr. John Knox Hall, Jr. Scholarship, University of Pittsburgh
2005-2009 Dean's List, University of Pittsburgh

Research Experience

08/2009 - 08/2012 Doctoral research fellow, **Drug Dependence Epidemiology Training Program**, trained in research of epidemiology, biostatistics, and public health issues associated with drug dependence. Data analysis, manuscript reviews, writing of research papers.

05/2008 - 09/2008 Undergraduate research assistant, **Alcohol & Smoking Research Laboratory, University of Pittsburgh, Department of Psychology**, (PI: Michael Sayette). Assist in data entry, assist in facial coding using Dacher Keltner's "Addendums to the Facial Action Coding System (FACS)".

08/2007 - 04/2009 Undergraduate research assistant, **Nicotine & Tobacco Research Laboratory, University of Pittsburgh, Department of Psychology**, (PI: Eric C. Donny). Act as primary research coordinator for experiment investigating variation in behavioral response inhibition and automated behaviors across smoking statuses and abstinence states, design programs in E-Prime for use in study, collect and analyze data, assist in subject recruitment and running human subjects for additional research studies.

Teaching Experience

08/2012 - 10/2012 Teaching Assistant, **Epidemiology of Drug Dependence** (Professor: C. Debra Furr-Holden), grading of assignments, fielding of student questions, facilitation of review sessions, maintenance of course website, development of quiz materials.

03/2012 - 05/2012 Teaching Assistant, **Brain and Behavior** (Professor: Michelle Carlson), grading of assignments, fielding of student questions, maintenance of course website.

01/2009 - 04/2009 Teaching Assistant, **Introduction to Biopsychology** (Professor: Eric C. Donny), fielding of student questions, facilitating students'

understanding during office hours, preparation and delivery of a lecture on the topic of Neuroanatomy.

08/2008 - 12/2008 Teaching Assistant, **Introduction to Clinical Psychology** (Professor: Anna L. Marsland), fielding of student questions, preparation and delivery of a lecture on the topic of Neuropsychological Testing.

Memberships in Professional and Scientific Societies

09/2011 - Present Society for Research on Nicotine and Tobacco, Student Member
09/2009 - Present College on Problems of Drug Dependence, Student Member
Spring 2007 - 2009 Psi Chi National Honor Society in Psychology
Spring 2006 - 2009 Phi Eta Sigma National Freshman Scholastic Honor Society

Editorial Activities – *Ad Hoc* Editorial Review

BMC Public Health
AIDS Care
The American Journal on Addictions
Journal of Substance Use
AIDS and Behavior

Manuscripts

Ropelewski, L.R., Mancha, B., Hulbert, A., Rudolph, A., & Martins, S.S. (2011). Correlates of Risky Injection Practices among Past-Year Injection Drug Users among the US General Population. *Drug and Alcohol Dependence, 116*, 64-71.

Ropelewski, L.R., Mancha, B., Hulbert, A., Rudolph, A., & Martins, S.S. (2011). Erratum to Correlates of Risky Injection Practices among Past-Year Injection Drug Users among the US General Population. *Drug and Alcohol Dependence, 119(3)*, 239.

Ropelewski, L.R., Hulbert, A., & Latimer, W.W. (2011). Factors related to Past HIV Testing among South African Non-Injection Drug Users. *AIDS Care, 23(11)*, 1519-1526.

Pacek, L.R., Malcolm, R.J., & Martins, S.S. (2012). Race/ethnicity differences between alcohol, marijuana, and co-occurring alcohol and marijuana use disorders and their association with public health and social problems using a national sample. *The American Journal on Addictions, 21*, 435-444.

Harrell, P.T., Trenez, R.C., Scherer, M., **Pacek, L.R.**, & Latimer, W.W. (2012). Cigarette smoking, illicit drug use, and routes of administration among heroin and cocaine users. *Addictive Behaviors*, *37*(5), 678-681.

Trenez, R.C., **Pacek, L.R.**, Scherer, M., Harrell, P.T., Zur, J., & Latimer, W.W. (2012). Prevalence of human immunodeficiency virus (HIV), risk behavior, and recent substance use in a sample of urban drug users: findings by race and sex. *World Journal of AIDS*, *2*, 183-193.

Storr, C.L., **Pacek, L.R.**, Martins, S.S. (2012). Substance use disorders and adolescent psychopathology. *Public Health Reviews*, *34*, Epub ahead of print.

Pacek, L.R., Martins, S.S., & Crum, R.M. (2013). The bidirectional relationship between alcohol, marijuana, co-occurring alcohol and marijuana use disorders with major depressive disorder: results from a national sample. *Journal of Affective Disorders*, *148*(2-3), 188-195.

La Flair, L.N., Reboussin, B., Storr, C., Letourneau, E., Green, K., Mojtabai, R., **Pacek, L.R.**, Alvanzo, A., Cullen, B., and Crum, R.M. (2013). Childhood Abuse and Neglect and Transitions in Stages of Alcohol Involvement among Women: A Latent Transition Analysis Approach. *Drug and Alcohol Dependence*, Epub ahead of print.

Pacek, L.R., Storr, C., Mojtabai, R., Green K.M., La Flair, L.N., Alvanzo, A.H.A., Cullen, B.A., & Crum, R.M. (In press). Comorbid Alcohol Dependence and Anxiety Disorders: A National Survey. *Journal of Dual Diagnosis*.

Cullen, B.A., La Flair, L.N., Storr, C., Green K.M., Mojtabai, R., **Pacek, L.R.**, Alvanzo, A.H.A., & Crum, R.M. (In press). The association of co-morbid generalized anxiety disorder and alcohol use disorder symptoms with health-related quality of life: Results from the National Epidemiological Survey on Alcohol and Related Conditions. *Journal of Addiction Medicine*.

Pacek, L.R., Harrell, P.T., & Martins, S.S. (Revise and resubmit). Cigarette smoking and drug use among a nationally representative sample of HIV-positive individuals. *The American Journal on Addictions*.

Dyer, T.P., Regan, R., **Pacek, L.R.**, & Khan, M.R. (Under review). Disproportionate social vulnerability and HIV risk among men who have sex with men and women (MSMW) in the United States. *Archives of Sexual Behavior*.

Pacek, L.R., Latkin, C., Crum, R.M., Stuart, E.A., & Knowlton, A.R. (Revise and resubmit). Current cigarette smoking among HIV-positive current and former drug users: associations with individual and social characteristics. *AIDS and Behavior*

Pacek, L.R., Latkin, C., Crum, R.M., & Knowlton, A.R. (In preparation). Prior smoking cessation attempts among HIV-positive smokers.

Pacek, L.R., Latkin, C., Crum, R.M., & Knowlton, A.R. (In preparation). Interest in smoking reduction and smoking cessation among HIV-positive cigarette smokers.

Pacek, L.R., Harrell, P.T., & Latkin, C. (In preparation). Cigarette smoking among urban substance users: differences between light and heavy smokers. *Nicotine and Tobacco Research*.

Pacek, L.R., Mauro, P.M., & Martins, S.S. (In preparation). Secular trends in perceived risk of use and use of cigarettes, alcohol, and marijuana: Results from a national sample.

Abstracts

Ropelewski, L., Hulbert, A., Rudolph, A.E., Kiertiburanakul, S., Zur, J., Moleko, A., & Latimer, W.W. Prevalence and risk factors of human immunodeficiency virus and hepatitis virus infections among black non-injection drug users in South Africa. Poster presented at the meeting of the College on Problems of Drug Dependence, Scottsdale, AZ, June, 2010.

Zur, J., Hulbert, A., **Ropelewski, L.,** & Latimer, W.W. Characteristics of HIV and HBV mono and co-infections among black South African drug users. Poster presented at the meeting of the College on Problems of Drug Dependence, Scottsdale, AZ, June, 2010.

Hulbert, A., Zur, J., **Ropelewski, L.,** Mancha, B., Trenz, R., Moleko, A., & Latimer, W.W. Gender differences, incarceration, and HIV in South Africa. Poster presented at the meeting of the College on Problems of Drug Dependence, Scottsdale, AZ, June, 2010.

Pacek, L.R., Harrell, P.T., & Martins, S.S. Cigarette smoking, drug use, and psychological problems among a nationally representative sample of HIV-positive individuals. The Society for Research on Nicotine and Tobacco 18th annual meeting, Houston, TX, March, 2012.

Pacek, L.R., Martins, S.S., & Crum, R.M. Bidirectional association between alcohol, marijuana, and co-occurring alcohol and marijuana use disorders with major depression. The College on Problems of Drug Dependence, Palm Springs, CA, June, 2012.

Pacek, L.R., Latkin, C., & Knowlton, A.R. Prior smoking cessation attempts among HIV-positive smokers. The Society for Research on Nicotine and Tobacco 19th annual meeting, Boston, MA, March 2013.

Pacek, L.R., Latkin, C., & Knowlton, A.R. Cigarette smoking among a sample of urban, current and former substance using, persons living with HIV/AIDS. (Accepted). The College on Problems of Drug Dependence, San Diego, CA, June 2013.

Pacek, L.R., Latkin, C., & Knowlton, A.R. Interest in smoking reduction and smoking cessation among HIV-positive cigarette smokers. (Accepted). The American Public Health Association, Boston, November 2013.

Dyer, T.P., Regan, R., **Pacek, L.R.**, & Khan, M.R. Sex and race/ethnicity differences for initiation of alcohol-related service use among persons with alcohol dependence (Submitted). The American Public Health Association, Boston, November 2013.

Dyer, T.P., Regan, R., **Pacek, L.R.**, & Khan, M.R. Disproportionate social vulnerability and HIV risk among men who have sex with men and women (MSMW) in the United States. (Submitted). The American Public Health Association, Boston, MA November 2013.

La Flair, L.N., Reboussin, B., Storr, C., Letourneau, E., Green, K., Mojtabai, R., **Pacek, L.R.**, Alvanzo, A., Cullen, B., and Crum, R.M. (accepted) "Childhood Victimization and Transitions in Stages of Alcohol Involvement among Women," College on Problems of Drug Dependence Annual Meeting, June 15-20, 2013. San Diego, CA.

Knowlton, A.R., Robinson, A.C., Mitchell, M.M., Nguyen, T., **Pacek, L.** "Medication assistance from family or friends is protective of effects of current substance use on virologic control: Implications for intervention", 8th International Conference on HIV Treatment & Prevention Adherence, Miami, FL.

Knowlton, A.R., Robinson, A.C., Mitchell, M.M., Nguyen, T., **Pacek, L.** "Informal caregiver reports of care recipients' ART adherence: Implications for dyadic intervention", 8th International Conference on HIV Treatment & Prevention Adherence, Miami, FL.

Oral Presentations

Zur, J., Hulbert, A., **Ropelewski, L.**, & Latimer, WW. Characteristics of HIV and HBV mono and co-infections among black South African drug users. Presented at the meeting of the College on Problems of Drug Dependence, Scottsdale, AZ, June, 2010.

La Flair, L.N., Reboussin, B., Green, K., Storr, C., Alvanzo, A., **Pacek, L.R.**, Mojtabai, R., Goggins, B., and Crum, R.M. Transitions through Stages of Problem Drinking among Women with Mood and Anxiety Disorders: A Latent Transition Analysis. Presented at the meeting of the Society for Epidemiologic Research Annual Meeting, Minneapolis, MN, June, 2012.