Original Investigation

Present and Past Influences on Current Smoking Among HIV-Positive Male Veterans

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Received August 5, 2010; accepted February 28, 2011

Abstract

Introduction: Cigarette smoking has become an important influence of morbidity and mortality for HIV-positive individuals in the era of highly active antiretroviral therapy. Although smoking is common among military personnel and veterans, the lasting impact of military service on smoking at a later stage of life has not been examined. The current study investigated present and past influences on current smoking among HIV-positive male veterans.

Methods: Participants were 200 HIV-positive men served by the Veterans Affairs Medical Center. A survey was administered via audio-enhanced computer-assisted self-interview, and additional information was extracted from the computerized patient record system.

Results: Logistic regression was performed to test hypotheses concerning the participants' current situations as well as characteristics of their past military service. Having smokers in one's environment, being more depressed, and having used alcohol or drugs were associated with having smoked in the previous 30 days, whereas stronger endorsement of attitudes stating adverse effects of smoking was linked to lower likelihood of smoking. Neither having been in a military conflict nor the length of the military service was significantly related to current smoking.

Conclusions: Remote experiences in the military did not have a sustained effect on smoking behavior years later. Implications of this study for the development of smoking cessation programs targeting HIV-positive veterans include the importance of altering attitudes about tobacco, treating underlying depression, addressing social influence, decreasing substance use, and increasing awareness of the heightened vulnerability to a variety of negative consequences of smoking among infected individuals.

Introduction

Highly active antiretroviral therapy (HAART) has radically altered the prognosis for people infected with HIV/AIDS and

has transformed the infection from a universally fatal to a typically chronic disease (Mocroft et al., 2003; Palella et al., 1998). As a result, many HIV-infected individuals can now expect to die from conditions other than HIV, including cardiovascular, pulmonary, and non-AIDS-defining neoplastic disease (Aberg, 2009; Palella et al., 2006). Behaviors that increase the risk for such conditions, such as cigarette smoking, are therefore becoming important influences of morbidity and mortality in the HIV-seropositive population (Feldman et al., 2006).

The current study examined cigarette smoking among HIV-positive male veterans served by the Veterans Affairs Medical Center (VAMC) in Washington, DC. The prevalence of smoking among persons living with HIV is high, with reported rates as extreme as two thirds in contrast to approximately one fifth of the general population (Burkhalter, Springer, Chhabra, Ostroff, & Rapkin, 2005; Centers for Disease Control and Prevention, 2008; Collins et al., 2001; Savès et al., 2003). Veterans also represent a group in which smoking is common. One study reported that about a third of veterans are smokers (Collie, Clancy, Yeats, & Beckham, 2004), but estimates for Vietnam veterans have been higher (e.g., Lasser et al., 2000). Furthermore, service in the military is often a catalyst to the initiation of smoking (Nelson & Pederson, 2008).

For HIV-infected persons, cigarette smoking can have negative health consequences beyond those seen in the general population, and in a large sample of veterans, poor health outcomes were evident among HIV-positive smokers even with low tobacco exposure (Crothers et al., 2005). Some health problems are specifically related to HIV, including less effective response to HAART (Feldman et al., 2006), more likely progression to AIDS (Feldman et al., 2006; Nieman, Fleming, Coker, Harris, & Mitchell, 1993), and death (Crothers et al., 2009). Smoking can also increase vulnerability to other conditions that occur more frequently among HIV-positive individuals, such as spontaneous pneumothorax (Metersky, Colt, Olson, & Shanks, 1995), pneumonia (Arcavi & Benowitz, 2004; Miguez-Burbano et al., 2005), lung cancer (Patel et al., 2006), and oral diseases

doi: 10.1093/ntr/ntr050

Advance Access published on March 24, 2011

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(Arcavi & Benowitz, 2004). Similarly, smoking may exacerbate the risks associated with unhealthy changes in lipid profiles due to both HIV itself and HAART (Aberg, 2009). In addition, smoking has been linked to greater probability of other risk behaviors, such as heavy drinking, unprotected sex, and drug use (Ames et al., 2010; Cooper et al., 2008; Richter, Ahluwalia, Mosier, Nazir, & Ahluwalia, 2002), all of which can be especially harmful for HIV-positive individuals.

Smoking is widespread in the military population (Arvey & Malone, 2008). Several characteristics of military life may serve as incentives to tobacco use, including the lower cost of cigarettes in military facilities, sanctioned smoking work breaks, designated smoking areas, smoking as a social activity, and smoking as a means to relieve boredom or stress (Haddock et al., 2009; Nelson, Pederson, & Lewis, 2009). It has been noted that tobacco use has played a key role in military social culture for decades (Bray & Hourani, 2007; Nelson & Pederson, 2008).

Established psychological models have emphasized the importance of attitudes and social influence in determining smoking and other risk behaviors (e.g., Azjen, 1991). Evaluative attitudes, risk perception, and social influence have been associated with tobacco use and cessation in many studies (e.g., Avenevoli & Merikangas, 2003; Hosking et al., 2009; Kobus, 2003; McCaul et al., 2006; Tyas & Pederson, 1998). In one study, HIV-positive smokers reported that nearly half of the people in their social networks were smokers (Humfleet et al., 2009). Men who have sex with men (MSM), who represent a large proportion of the HIV-infected population, smoke more than heterosexual men, and smoking is inherent in some aspects of gay social life (Ryan, Wortley, Easton, Pederson, & Greenwood, 2001).

Depression and anxiety have been associated with greater likelihood of smoking, greater difficulty quitting, and greater tobacco dependence (e.g., Pence, Miller, Whetten, Eron, & Gaynes, 2006; Trosclair & Dube, 2010). Smoking can be a response to negative feelings and mood states (Feldner, Babson, & Zvolensky, 2007; Reynolds, Neidig, & Wewers, 2004), and depression has been linked to smoking in an HIV-positive sample (Webb, Venable, Carey, & Blair, 2009). Furthermore, psychological stresses associated with military training and deployment have been cited by soldiers as a motivation to smoke (Nelson et al., 2009; Stein et al., 2008). Military personnel are at increased risk of experiencing or witnessing traumatic events, both of which have been associated with greater likelihood of smoking (Hourani, Yuan, & Bray, 2003).

In this study, we investigated present and past influences on current smoking among a group of older HIV-positive veterans, the majority of whom were Black. We hypothesized that depressed mood, substance use, and a social environment containing other smokers would be associated with greater likelihood of having smoked in the previous thirty days. We also hypothesized that stronger endorsement of attitudes concerning adverse effects of smoking and a sexual orientation as heterosexual would be linked to lower likelihood of current smoking. Although greater prevalence of smoking among military personnel than among civilians has been repeatedly shown, the lasting impact of military service on smoking at a later stage of life has not been examined. We hypothesized a greater likelihood of smoking among veterans who had been in a military conflict because of the trauma experienced in such settings. We

also explored the effect of length of military service on smoking behavior. We anticipated conflicting influences in this case. A longer period of service would mean more extended socialization in tobacco use in military life; however, officers spend more time in service than enlisted men, and tobacco use is less common and even stigmatized in this group (Bray & Hourani, 2007; Nelson et al., 2009).

Methods

Participants and Procedures

Data were collected during the latter part of 2009. Participants were 200 HIV-positive male veterans who receive their care in the Infectious Diseases Silver Clinic of the VAMC. Inclusion criteria included being male, HIV-positive, and 18 years of age or older. Individuals who were mentally unfit to give truly informed consent or to answer questions were excluded, regardless of the source of the incapacity (e.g., organic cognitive deficits, altered mental state due to drugs). Posters about the study were displayed on the walls of the waiting room of the clinic, and participants were recruited during HIV clinic hours. The research assistant approached potential participants in the waiting room, gave a brief explanation of the study, and ascertained whether a person was eligible and interested. If so, she arranged a time for participation after the person's medical appointment.

A survey was administered via audio-enhanced computer-assisted self-interview (A-CASI) and took place in a private room. The research assistant reviewed the consent form—describing the computerized survey and extraction of data from the computerized patient record system (CPRS)—with the participant. After obtaining consent, she trained the participant in the use of A-CASI on laptop computer with touch screen technology, and the participant then completed an A-CASI training exercise. Individuals with low literacy skills were able to participate by using the A-CASI audio presentation of questions and response options. No participants reported discomfort or difficulty using A-CASI, and no one declined to participate because of it. The research assistant remained in an adjacent room and was available to answer any questions. It took approximately 30 min for participants to complete the survey. Participants received \$5 worth of coupons at the VAMC canteen as reimbursement for their time.

Measures

The survey covered three major areas: smoking, risk behavior, and psychosocial factors. The measures described here include those used in the analyses for this paper.

Smoking

Participants were asked if they had smoked part or all of a cigarette during the previous thirty days. We used this interval, rather than a shorter one, because smoking among Blacks is often light and sporadic (Substance Abuse and Mental Health Services Administration [SAMHSA], 2006). Those who responded that they had not smoked in the previous thirty days were asked about the length of time since they had smoked, and there was an option to indicate never having smoked. Other questions about smoking concerned the number of cigarettes smoked per day, the age of smoking initiation, and the type of cigarettes

smoked. In order to assess social influence concerning smoking, participants were asked if they were around people smoking cigarettes at home, at work, and in social situations. A mean of these three responses was used to indicate the level of presence of smokers in the person's environment. Cronbach's alpha was .71. We also administered the Fagerström Test for Nicotine Dependence (Heatherton, Kozlowski, Frecker, & Fagerström, 1991) to the smokers.

Mental Health

We assessed depression with seven items from the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977), a shortened version that excludes vegetative symptoms of depression, which can be confounded with physical symptoms associated with HIV (Zea, Reisen, Poppen, & Bianchi, 2009). The items refer to feelings such as being sad or having trouble concentrating. Response options ranged from *rarely or none of the time* (0) to *Most or all of the time* (3). Cronbach's alpha was .87 in this sample. We also administered a shortened version (nine items) of the Posttraumatic Stress Disorder (PTSD) checklist (Keen et al., 2008). Cronbach's alpha was .93. Scores on the PTSD and the CES-D were highly correlated ($r = .71$); therefore, we included only the CES-D in the multivariate analysis.

Attitudes About Adverse Effects of Smoking

We used seven items from the Adverse Effects of Smoking subscale of the Attitudes Towards Smoking scale (Etter, Humair, Bergman, & Perneger, 2000). We modified the wording to assess attitudes of both smokers and nonsmokers (e.g., "Smoking is extremely dangerous to one's health" rather than "to my health."). Topics covered in the scale include effects on breath, skin, energy, as well as the cost and dangers of smoking. We added two additional questions concerning smoking effects for HIV-positive people. They were "Smoking has worse health consequences for people who have HIV than for people who do not" and "Some medical problems experienced by HIV-positive people are the result of smoking." Response options ranged from 1 = *strongly disagree* to 5 = *strongly agree*. Cronbach's alpha in this study was .86.

Military Service

Two questions addressed military service history. Participants were asked: "Were you ever in an area involved in military conflict?" and "How long were you in military service?" Because the distribution of this variable was highly skewed, we applied a square-root transformation to the raw data and used the transformed variable in the logistic regression described below. Information from the CPRS provided details concerning the historical period of participants' military involvement.

Substance Use

Participants were asked separate questions about their use of alcohol and drugs in the previous three months. Questions concerning drugs (marijuana, amyl nitrates, crack-cocaine, cocaine, methamphetamines, MDMA [3,4-Methylenedioxy-methamphetamine], hallucinogens, barbiturates, and heroin) included street names. Three dichotomous variables were created to indicate any alcohol use, any drug use, and any substance use (either alcohol or drug) in the previous three months. In addition, the survey included one question asking whether the participant had ever used injection drugs.

Sexual Orientation

We asked participants their sexual orientation, with response options of straight or heterosexual, gay, bisexual, transgender, and other. We dichotomized this variable to *heterosexual* (1) versus *not* (0).

Demographic and HIV-Related Information

Demographic questions included education and income. Information on race and age was obtained from the CPRS as were data on HAART, viral load, CD4 count, and AIDS diagnosis.

Data Analysis

Logistic regression was performed to test the hypotheses, with all variables of interest entered simultaneously using SAS v. 9.1. We used a simultaneous approach because we wanted to see the unique contributions of the predictors while controlling for all other variables in the model. The dichotomous outcome variable reflected whether participants had smoked in the previous thirty days or not. Predictors included substance use, depression, attitudes concerning smoking, and being around smokers as well as having been in a military conflict and number of years of military service. Control variables were age, education, and sexual orientation.

Results

The vast majority of the sample (86%) was Black. The men's age ranged from 25 to 80 years of age, with a mean and a median of 54 years. About 80% served in the military during the period of the Vietnam War. With two exceptions, the remainder served in the intervening years between then and the present, some with experience in Korea, the Gulf, or Iraq. The mean number of years served was 5.8. Almost one fifth of the participants had no fixed address, and nearly two thirds made less than \$800 per month.

More than half of the sample reported having smoked cigarettes during the previous 30 days, and 82% reported having smoked at some time. Consistent with the literature on smoking among Blacks (SAMHSA, 2006), smoking levels were light, with about half the smokers reporting fewer than 10 cigarettes/day. Moreover, nicotine dependence was also generally low in this sample, with two thirds of the sample having scores of 4 or less on the Fagerström Test for Nicotine Dependence (Heatherton et al., 1991). More than four fifths purchased their cigarettes by the pack, but nearly 8% reported buying single cigarettes. In addition, 85% of the smokers used menthol cigarettes—a common choice among for Blacks (Gardiner, 2004). More than three quarters of the participants began smoking before age 20 years, and 92% did so by age 25 years.

Table 1 shows descriptive characteristics for men who smoked during the previous thirty days and for men who did not smoke. Smokers were less educated and more likely to have used recreational drugs in the previous three months. A significant difference was not found, however, between those participants who reported ever having used injection drugs compared with those who did not. In addition, 61% of heterosexuals were smokers in contrast to 39% of men who identified their sexual orientation as gay, bisexual, or other. All participants in this study were HIV-positive, with a mean

Table 1. Descriptive Characteristics of Men Who Smoked or Did Not in the Previous Thirty Days (N = 200)

	Smokers (N = 103)	Nonsmokers (N = 97)
	Means (SD)	
Age	54.84 (8.33)	53.53 (8.70)
Education (range = 0–7)*	4.15 (1.38)	4.63 (1.59)
Years since HIV diagnosis	14.09 (6.51)	15.28 (7.59)
CD4 count	443.58 (270.0)	505.91 (326.8)
Smoking worse for HIV+ people*	3.82 (0.88)	4.14 (1.03)
Some medical problems of people living with HIV due to smoking*	3.28 (0.96)	3.67 (1.05)
	%	
Black	90.29	81.44
AIDS diagnosis	34.95	26.80
Receiving antiretroviral treatment	86.41	82.47
Undetectable viral load	59.80	62.89
Had alcoholic drink in last three months	66.02	56.70
Used recreational drugs in last three months*	36.89	22.68
Substance use (alcohol or drugs) in last three months	71.84	61.86
Ever used injection drugs	30.10	19.59
Heterosexual*	61.17	46.39

Note. * $p < .05$.

of nearly 15 years since the diagnosis. The vast majority (85%) were receiving HAART as indicated in the CPRS. There were no significant differences between smokers and nonsmokers on several HIV-related indicators, including CD4 count, undetectable viral load in the most recent test, and ever having received an AIDS diagnosis. Smokers expressed significantly less agreement than nonsmokers with the idea that smoking has worse consequences for people who have HIV than for those who do not. In addition, smokers reported less agreement with the statement that some medical problems experienced by people with HIV were the result of smoking.

Logistic regression was performed predicting the dichotomous outcome of smoking in the previous thirty days. The overall model was significant ($\chi^2 = 36.0$, $p < .0001$). As can be seen in Table 2, being around smokers at home, work, and in social situations was very strongly associated with smoking. In addition, those participants who had used recreational drugs or alcohol were more likely to be smokers, as were those who were more depressed. In contrast, stronger endorsement of attitudes concerning the adverse effects of smoking was associated with lower likelihood of smoking. Neither the duration of time served in the military nor having been in a military conflict was significantly related with current smoking. Moreover, in this multivariate model, we did not find a significant association between sexual orientation and smoking. The control variables of age and education were also not significant. Race was not included as a control variable because of the small number of non-Black participants.

Table 2. Logistic Regression Predicting Smoking in the Previous Thirty Days (N = 198)

Variable	Parameter	Wald χ^2	Adjusted OR	95% CI
Intercept	0.33	0.03		
Age	0.02	0.54	1.06	0.97–1.06
Education	−0.01	0.00	0.99	0.79–1.25
Sexual orientation	0.32	0.69	1.37	0.65–2.90
Smokers in environment	1.96	18.53***	7.08	2.90–17.26
Substance use (alcohol or drugs)	0.81	4.69*	2.24	1.08–4.65
Depression	0.58	6.07*	1.79	1.13–2.84
Attitudes concerning adverse effects	−0.83	9.39**	0.43	0.26–0.74
Been in a military conflict	−0.58	2.46	0.56	0.27–1.16
Years in military service	0.14	0.48	1.15	0.77–1.72

Note. OR = odds ratio.

* $p < .05$; ** $p < .01$; *** $p < .0001$.

Discussion

Consistent with previous literature, we found that smokers tended to live, work, and socialize with other smokers to a greater extent than did nonsmokers. Although most literature on social influence and smoking focuses on adolescents, adults also are clearly affected by the behaviors and norms exhibited by others in their social networks. It should be noted, however, that smoking may also influence the composition of the social network. For example, smokers may seek other smokers as companions due to the perceived stigma associated with smoking (Stuber, Galea, & Link, 2009), or they may meet other smokers in places where smoking is allowed. The same bidirectional effects would also operate in the process of quitting smoking: Nonsmoking friends could influence a person to quit and becoming a nonsmoker could increase the likelihood that a person will socialize with nonsmokers.

Attitudes concerning the adverse effects of tobacco use were also related to smoking, with a lower likelihood of smoking among those who strongly endorsed the adverse effect of tobacco. Moreover, smokers showed less agreement with statements about negative consequences of smoking specifically for people living with HIV. Much psychological theory of risk posits that attitudes influence behavior, and there is empirical support for this position (e.g., McCaul et al., 2006). Thus, those who believe that smoking has adverse effects are less likely to begin smoking; however, becoming a smoker can also result in a modification of one's previous attitudes (de Leeuw, Engels, Vermulst, & Scholte, 2007).

As predicted, depression was associated with having smoked in the previous thirty days. Research has indicated not only a higher prevalence of smoking among those who are depressed but also greater dependence on tobacco and less success quitting than among those who are not depressed (Trosclair & Dube, 2010). Cessation programs often indirectly address depressed

mood through the use of bupropion as an aid in reducing nicotine dependence and cravings, but assessment of depression should be included as an integral part of intervention efforts.

Qualitative research with men living with HIV has identified cognitive processes that may support the use of tobacco among HIV-positive people. Focus group participants reported some perceived benefits from smoking for HIV-positive individuals, including increased sense of well-being (Reynolds et al., 2004). In assessing their tobacco use, the men described a type of cost-benefit analysis balancing the improved emotional state with the potential health threat from smoking, which they tended to view as long term and therefore irrelevant due to their lower life expectancy. This way of thinking could also apply to substance use. Moreover, it may be especially prevalent among those men with some underlying depression, who would not only have greater need for the emotional comfort provided by cigarettes, alcohol, or drugs but also be more prone to a pessimistic assessment of their own longevity.

Consistent with the research literature, this study found an association between the use of alcohol or drugs and smoking (Ames et al., 2010; Piasecki et al., 2008; Richter et al., 2002). This association has been consistently found and has been attributed to a variety of factors including personality traits such as impulsivity (Hershberger et al., 2004) and genetic factors influencing the neurobiology of addictive behaviors (e.g., Flatscher-Bader et al., 2010). It has been suggested that treatment is more effective when co-occurring dependencies are addressed together (Drobes, 2002).

Although previous research has indicated more smoking among MSM than among heterosexual men (Ryan et al., 2001), we found the opposite in a bivariate comparison but no association between sexual orientation and smoking after controlling for other factors. The MSM in this HIV-positive sample had a different socioeconomic profile from that of the heterosexual men: They were younger, better educated, had higher incomes, and were less likely to have used injection drugs. Moreover, the MSM were less depressed, less likely to be around other smokers, and more likely to perceive negative effects of smoking. Thus, the two groups differed in many ways that could explain the initial bivariate effect as well as the disappearance of significance when other variables were included in the model.

Neither of the hypotheses concerning military experiences and current smoking was supported in this study. We had expected that the trauma experienced in military conflict would serve as a trigger to smoking and subsequent tobacco addiction (Hourani et al., 2003), which could be sustained over many years. It may be that both the smokers and the nonsmokers in this sample—who were largely Black, of lower socioeconomic status, and in some cases, homeless—encountered traumatic events in other portions of their lives, which might have masked an association between the trauma of military conflict and smoking. We also explored the impact of duration of past military service on current smoking but found no effect. As we noted earlier, the relationship between time in the military and smoking may be complex, and conflicting influences could obscure underlying associations.

For many of the men in this study, military service occurred many years or even decades ago. Although we had expected that

current conditions and characteristics of the men's lives would be more strongly linked to having smoked in the previous thirty days, the greater prevalence of smoking not only among those in active duty but also among veterans was the impetus for exploring the lasting impact of military service on smoking. The findings of this study failed to support the view that remote experiences in the military have a sustained effect on smoking behavior years later.

A limitation of this study was the cross-sectional design. In addition to clarifying the causal directions concerning attitudes, social networks, and smoking, a longitudinal study could also provide a fuller examination of the hypotheses concerning the effects of military service on smoking. The impact of military service on smoking initiation, as well as continuance over time, would be assessed more adequately with a research design that began following military personnel from the time of their service. Another limitation was the measure of smoking in the participant's social environment, which included three yes-no questions about smokers at work, at home, and in social situations. The use of scaled responses reflecting the extent to which there were smokers in the environment would have created a more valid and sensitive indicator.

Implications of this study for the development of smoking cessation programs targeting HIV-positive veterans include the importance of focusing on the needs of this specific population, particularly altering attitudes about tobacco, treating underlying depression, and addressing social networks. It is crucial to address the social, emotional, and physical context in which smoking occurs, and effective promotion of smoking cessation may require a more global examination of the factors associated with tobacco use, including other substance use. Moreover, the medical context for smokers who have HIV should be made clear, so that people are truly aware of their increased risk for a variety of diseases and negative physical conditions (Nahvi & Cooperman, 2009).

Such efforts may be especially important in military settings. Although we did not find evidence of lasting effects on smoking for veterans with military experience in the remote past, current service personnel still operate within a social context that supports smoking in many ways. Policy changes have lessened some of the tobacco-friendly aspects of military life, but many remain, including reduced costs for cigarettes in canteens and looser guidelines concerning areas and times where smoking is allowed, as contrasted to civilian life (Arvey & Malone, 2008; Nelson & Pederson, 2008). Furthermore, as long as smoking continues to be a valued and shared social activity among enlisted personnel, sustained abstinence will be difficult. Cessation programs for current military personnel should incorporate efforts to change this aspect of military culture and introduce other avenues for socializing that do not include tobacco use.

The HIV-positive men in this study, of whom greater than 50% are current smokers, face multiple socioeconomic challenges, many of which are typically associated with decreased access to medical care. These men, however, receive treatment through the VAMC. A recent paper called for targeted smoking cessation interventions for especially vulnerable populations of smokers, including those who are HIV-positive (Borrelli, 2010).

The VA system, with its greatly reduced barriers to care, presents an opportunity to create such programs and to reduce smoking among veterans living with HIV.

Funding

The project described was supported by a Collaborative Faculty Award for Research from the George Washington University HIV/AIDS Institute.

Declaration of Interests

None declared.

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