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Non-cigarette tobacco and poly-tobacco use among persons living with HIV drawn from a nationally representative sample*

Lauren R. Pacek^{a,**}, Maggie M. Sweitzer^a, and F. Joseph McClernon^a

^aPsychiatry and Behavioral Sciences, Duke University Medical Center, Durham, NC

Abstract

Introduction—Smoking is more prevalent among persons living with HIV (PLWH) than the general population. Little is known about the prevalence of non-cigarette tobacco and poly-tobacco use (PTU; using multiple tobacco products) among this population, which, in the general population is associated with poor health and cessation outcomes. We aimed to characterize the prevalence of cigarette and non-cigarette tobacco use, PTU, and correlates of tobacco use status among a nationally-representative sample of PLWH.

Methods—Data came from 472 HIV-positive adults from the 2005-2013 National Survey on Drug Use and Health (NSDUH).

Results—The prevalence of PTU overall was 8.7% (95% CI=5.6-13.2), and 16.6% (95% CI=10.2-25.7) among past-year tobacco users. In multinomial logistic regression analyses, participants with a high school education or greater (aRRR=2.03, 95% CI=1.03-4.00) were more likely to be non-tobacco users than single product users. Past year drug users (aRRR=0.35, 95% CI=0.19-0.66) and past month binge drinkers (aRRR=0.24, 95% CI=0.12-0.50) were less likely to be non-tobacco users than single product users. Compared to 18-25 year olds, individuals age 26-34 (aRRR=0.13, 95% CI=0.03-0.65) and 35+ (aRRR=0.24, 95% CI=0.09-0.63), and with lifetime anxiety disorder(s) (aRRR=0.18, 95% CI=0.06-0.57) were less likely to be PTUs as compared to single product users. Individuals who reported liking to test themselves by doing risky things were more likely to be PTUs than single product users (aRRR=2.95, 95% CI=1.27-6.84).

Conclusions—PTU was slightly higher than in the general population, and should be taken into account when developing cessation interventions tailored to tobacco users living with HIV.

Keywords

HIV; comorbidity; poly-tobacco use; vulnerable populations; smoking; tobacco

**Corresponding author: 2608 Erwin Road, Suite 3038, Durham, NC 27705; telephone: 919-684-5437; fax: 919-681-1600; lauren.pacek@duke.edu.

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1. Introduction

The prevalence of smoking among persons living with HIV (PLWH) is disproportionately high compared to the United States (U.S.) general population (40-75% versus 18%) (Centers for Disease Control and Prevention [CDC], 2015; Mdodo et al., 2015; Pacek et al., 2014a, 2014b). Smokers with HIV experience increased risk for smoking-related morbidities (Freiberg et al., 2010; Helleberg et al., 2014; Madeddu et al., 2013) and mortality (Helleberg et al., 2013; 2014; Pines et al., 2011) compared with nonsmoking PLWH or HIV-negative smokers. Significant morbidity and mortality is also associated with use of non-cigarette tobacco products in the general population (CDC, 2014, 2015). Estimates of non-cigarette tobacco product use among PLWH are scarce, and vary based on study (Matthews et al., 2013; Shuter et al., 2012; Tesoriero et al., 2010) and product examined (i.e., cigar use: 15-41.9% (Matthews et al., 2013; Shuter et al., 2012). With the exception of Tamí-Maury et al. (2013), poly-tobacco use (PTU; use of multiple tobacco products) and its correlates remain largely unexplored in PLWH.

This is significant given the health consequences associated with non-cigarette tobacco products, including increased risk for cancers (CDC, 2014, 2015), cardiovascular disease (Katsiki et al., 2013), respiratory disease (Schivo et al., 2014), immune dysfunction, reproductive issues (Willis et al., 2012), and poor dental/oral health (Kallischnigg and Weitkunat, 2008). PTU has the potential to additively increase the risk for nicotine exposure (Bombard et al., 2007) and tobacco-attributable death and disease relative to the use of individual tobacco products (Wetter et al., 2002). PTU may also create challenges for smoking cessation (Bombard et al., 2007; Wetter et al., 2002). These associations with PTU in the general population underscore the need for research concerning non-cigarette and PTU among HIV-positive smokers, who face significant tobacco-related health consequences.

Tamí-Maury and colleagues (2013) described the prevalence (21.6%) and correlates of PTU in a sample of HIV-positive treatment-seeking *cigarette smokers*. However, some single product and PTUs are not cigarette smokers; this portion of the population was not captured in that study. Treatment-seeking smokers may differ from other smokers in key ways, including their tobacco use profile. To address this gap, we characterized the prevalence of cigarette and non-cigarette tobacco use, single and PTU, and correlates of tobacco use status in a sample of PLWH in a nationally representative survey in the U.S.

2. Methods

2.1 Data source

Data came from the 2005-2013 National Survey on Drug Use and Health (NSDUH). The NSDUH, sponsored by the Substance Abuse and Mental Health Services Administration, is an annual cross-sectional survey providing prevalence estimates of extra-medical use of drugs in U.S. community-based individuals age 12. NSDUH employs a 50-state design with an independent multistage area probability sample for each state and the District of Columbia.

Informed consent was obtained prior to interviews. Participants received a description of the study, statement regarding confidentiality, assurance that participation was voluntary, and U.S. \$30 for participation. Surveys were administered by computer-assisted personal interviewing (CAPI) and audio computer-assisted self-interviewing (ACASI; Center for Behavioral Health Statistics and Quality; 2013). Secondary data analyses in the present study were based on de-identified publicly available data exempt from Institutional Review Board review.

Sampling weights were computed to control for unit-level and individual-level non-response, and were adjusted to ensure consistency with population estimates obtained from the U.S. Census Bureau. To use data from multiple survey years, a new weight was created by dividing the original weight by the number of data sets combined. Additional information regarding the NSDUH is reported elsewhere (Center for Behavioral Health Statistics and Quality; 2013).

2.2 Measures

2.2.1 Tobacco use—Based on self-reported past-year use of cigarettes, cigars, chew, and snuff, participants' tobacco use status was classified as: 1) past-year non-tobacco users (no tobacco use); 2) past-year single product users (use of one tobacco product); and 3) past-year poly-tobacco users (use of >one tobacco product). Chew and snuff were combined as “smokeless tobacco” due to low frequency of use. A variable for the number of tobacco products used (2; >2), and descriptions of the combinations of products used by PTUs were created.

2.2.2 Sociodemographics—Sociodemographic variables included: sex (18-25; 26-34; 35+), race/ethnicity (Caucasian; non-Caucasian), education (<than high school/GED; high school/GED), marital status (not married; married), total family income (\$19,999; \$20,000-\$39,999; \$40,000+), and survey year.

2.2.3 Substance use—Participants reported binge drinking, and past-year alcohol and extra-medical use of: cannabis, cocaine, crack cocaine, heroin, hallucinogens, LSD, PCP, Ecstasy, inhalants, analgesics, Oxycontin, tranquilizers, and stimulants.

2.2.4 Mental health—Lifetime major depressive episode (MDE) was defined as experiencing 5 of 9 criteria, where at least one criterion is depressed mood or loss of interest or pleasure in daily activities. Participants self-reported whether they had a lifetime anxiety disorder.

2.2.5 Risk variables—Participants were asked about the frequency with which they “get a real kick out of doing things that are a little bit dangerous” and “like to test yourself by doing something a little risky” Dichotomous response variables were created (never/seldom; sometimes/always).

2.3 Statistical analysis

Data were weighted to reflect the complex design of the NSDUH and were analyzed with STATA SE version 12.0 software; Taylor series estimation methods (i.e., “svy” commands) were used to obtain proper standard error estimates (StataCorp, 2011). Participants were stratified by tobacco use status; chi-square (χ^2) tests determined differences between groups. Multinomial logistic regression analyses identified characteristics associated with tobacco use status. Given that differences between HIV-positive tobacco users—a group that generally encompasses both single product users and PTUs—compared to HIV-positive non-users have been reported previously (Gritz et al., 2004; Pacek et al., 2014a, 2014b), single tobacco product users served as the reference group for the present analyses, allowing for comparisons between single product users and PTUs, as well as single product users and non-tobacco users. Variables in the adjusted model were selected based on the literature (e.g., Fix et al., 2014; Tamí-Maury, et al., 2013) and statistical significance ($p < 0.05$) in χ^2 analyses, and included: sex, age, race, education, survey year, past-year drug use, binge drinking, lifetime MDE and anxiety, getting a kick out of dangerous things, and testing oneself by doing risky things.

3. Results

3.1 Study population

An initial sample size of 504,828 was obtained from the 2005-2013 NSDUH. Of these, 541 (0.2%) reported a lifetime HIV diagnosis. Sixty-nine individuals <age 18 were excluded due to concerns regarding interpretability of associations between this age group and covariates (e.g., marital status and education). The resulting sample of 472 was used to calculate the overall prevalence of PTU and explore correlates of tobacco use status. A subset ($n=276$) of the sample was used to describe the prevalence of tobacco products used among past-year tobacco users.

3.2 Sample characteristics

The majority was male (81.0%) and age 35+ (78.1%) (Supplementary Table 1¹). A greater proportion of PTUs were age 18-25 (16.2%; Wald $\chi^2=3.13$, $p=0.029$) than single product or non-tobacco users (5.7% and 3.2%, respectively). Half were Caucasian (52.7%), and most had high school education (80.8%) and were unmarried (86.0%). Non-tobacco users were more likely to have high school education (87.5%) than single product or PTUs (74.1% and 77.4%, respectively; Wald $\chi^2=5.15$, $p=0.008$). Respondents' total family income was as follows: \$0-\$19,999 (39.1%), \$20,000-\$39,999 (22.3%), and \$40,000+ (38.6%). Tobacco use status was distributed equally across survey year ($p=0.141$).

Three-quarters of the sample (75.6%) reported alcohol use. Past-year drug use (Wald $\chi^2=16.77$, $p<0.001$) and past-month binge drinking (Wald $\chi^2=13.75$, $p<0.001$) were reported more frequently among single product users and PTUs as compared to non-tobacco users. Approximately 15% reported having a lifetime anxiety disorder, and 10.5% met criteria for a lifetime MDE. PTUs were more likely to test themselves by doing risky things

¹Supplementary material can be found by accessing the online version of this paper at <http://dx.doi.org> and by entering doi:...

(Wald $\chi^2=5.34$, $p=0.007$), while 23.5% of the sample reported getting a kick from doing dangerous things.

3.3 Tobacco use

3.3.1 Tobacco use among all PLWH—Among the total sample of PLWH ($n=472$), 52.4% (95% CI=45.9-58.7) reported any past-year tobacco use; 43.7% (95% CI=36.1-51.7) of the total sample were single product users, while 8.7% (95% CI=5.6-13.2) reported PTU.

3.3.2 Tobacco use among PLWH reporting past-year tobacco use—Among past-year tobacco-users ($n=276$), 16.6% reported PTU (Table 1). Among single product users, most used cigarettes (95.0%), followed by cigars (3.7%), and smokeless tobacco (1.3%). Among PTUs, 89.7% used two products, while 10.3% used >2 products in the past year. Cigarettes were the most commonly used product among PTUs (100.0%), though 98.1% also used cigars, and 12.3% used smokeless tobacco. The most common combination of products was cigarettes and cigars (87.7%).

3.4 Multinomial logistic regression

In adjusted analyses (Table 2), participants with high school education were more likely than those without to be non-tobacco product users than single product users (aRRR=2.03, 95% CI=1.03-4.00). Additionally, participants who reported past-year drug use (aRRR=0.35, 95% CI=0.19-0.66) or past month binge drinking (aRRR=0.24, 95% CI=0.12-0.50) were less likely to be non-tobacco product users as compared to single product users.

Compared to individuals age 18-25, individuals age 26-34 (aRRR=0.13, 95% CI=0.03-0.65), age 35+ (aRRR=0.24, 95% CI=0.09-0.63), and who reported a lifetime anxiety disorder (aRRR=0.18, 95% CI=0.06-0.57) were significantly less likely to be PTUs as compared to single product users. Persons who liked to test themselves by taking risks were more likely to be PTUs than single product users (aRRR=2.95, 95% CI=1.27-6.84).

4. Discussion

Among PLWH, smoking is more prevalent than in the general population, resulting in increased risk for smoking-related morbidity and mortality. The changing tobacco landscape—stemming from increased diversity of products, changing regulations, and fluctuating tobacco product prices (Rath et al., 2012)—raises the question of whether PLWH are using other tobacco products instead of or in addition to cigarettes.

Nine percent of the total sample and 16.6% of past-year tobacco users reported past-year PTU. These estimates are slightly higher than the 7% that is reported among the general population in the NSDUH (Fix et al., 2014), and are lower than but roughly comparable to findings from Tamí-Maury and colleagues, who reported 21.6% PTU among HIV-positive past-year cigarette smokers (2013). Given the increased health risks and difficulty in cessation associated with PTU among HIV-positive smokers (Tamí-Maury et al., 2013), higher rates of PTU in PLWH are potentially troubling. This is particularly true when considering that HIV-positive smokers appear to be disadvantaged in terms of smoking-related morbidity (Helleberg et al., 2013; 2014; 2015) and factors that complicate cessation

[i.e., psychiatric and substance use comorbidity (Helleberg et al., 2015)], as compared to the general population.

Exclusive use of cigars or smokeless tobacco was infrequent. However, most PTUs reported co-use of cigarettes and cigars. This is roughly consistent with Matthews and colleagues (2013), who found that 42% of HIV-positive cigarette smokers also used cigars. Cigars are a less expensive alternative or adjunct to cigarettes, which can be purchased individually or in small quantities at relatively low prices (Cullen et al., 2011; Public Health Law Center, 2012). The next most prevalent combination of products was cigarettes, cigars, and smokeless tobacco, with 10% of PTUs reporting past-year use of these products. In addition to lower cost, PTU may be driven by social and cultural preferences regarding tobacco products or as a means to circumvent smoking bans, in the case of smokeless tobacco use (Agaku et al., 2014). Additionally, using numerous tobacco products with different routes of administration may serve a marker for increased nicotine dependence. However, though additional research is needed, use of products with varying routes of administration may alternately represent a harm reduction-related effort, involving at least partial transition from combustible to non-combustible products.

Consistent with prior research, non-tobacco users were more likely to be more educated than single product users (Gritz et al., 2004). Additionally, non-tobacco users were less likely than single product users to report past-year drug use (Gritz et al., 2004; Pacek et al., 2014b) or binge drinking (Pacek et al., 2014a). As compared to participants age 18-25, participants age 26-34 and 35+ were less likely to be PTUs than single product users. This is roughly consistent with prior research regarding older age and smoking behaviors in PWLH (Pacek et al., 2014a, 2014c). Individuals who test themselves by doing risky things were more likely to be PTUs—consistent with prior work examining correlates of PTU in the general population (Fix et al., 2014; Lando et al., 1999) and knowledge about positive associations between impulsivity and sensation seeking with tobacco use (Bickel et al., 1999; Spillane et al., 2010). Conversely, individuals with a lifetime anxiety disorder were less likely to be PTUs. This finding needs to be better explored in future research, though some research indicates that higher trait anxiety is associated with less risky decision-making (Hartley and Phelps, 2012; i.e., not engaging in PTU).

This study has a number of limitations. First, the NSDUH is a cross-sectional survey. Second, all answers are obtained via self-report. To mitigate social desirability bias, the NSDUH utilizes ACASI, which increases the likelihood of honest responding of sensitive information (Macalino et al., 2002). Nicotine dependence in the NSDUH is cigarette-based, which limits the opportunity to test how nicotine dependence factors into PTU. Further, it is possible that participants may have endorsed cigar use when their true intention was to endorse “blunt” use (i.e., cigars filled with cannabis), as questions about cigar use did not explicitly exclude blunts. Additionally, the NSDUH does not capture information on certain types of tobacco products (e.g., e-cigarettes, waterpipe tobacco, snus). Therefore, some subgroups of tobacco users are missed by the NSDUH, resulting in potential underestimation of the prevalence of nicotine/tobacco use and PTU. Additionally, the present work did not explore frequency of tobacco product use.

The present study also has a number of strengths. Our inclusion criteria allowed for a more comprehensive sample of tobacco users. We provided a detailed description of the types of products used by the sample overall, as well as separately for single product users and PTUs. Within PTUs, we characterized the products used by describing the combinations of products used within the past year. Additionally, the present study allowed for comparisons between non-users as well as PTUs with single product users. Moreover, this is the first study to utilize a nationally representative sample to examine PTU in PLWH.

This study corroborates findings that the prevalence of PTU is substantial in PLWH, and is higher than in the general population. PTU appears to hamper the success of brief cessation interventions (Tamf-Maury et al., 2013). Based on these findings, PTU and its correlates should be taken into account when developing and refining tailored smoking cessation interventions for PLWH. Future work should include detailed examination of patterns of tobacco product use to inform the development of cessation interventions, as well as to assess motives for PTU.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Highlights

- The prevalence of polytobacco use was higher in HIV+ persons than in the general population.
- Age, anxiety disorder, and risk taking were associated with polytobacco use.
- HIV-positive polytobacco users most commonly used cigarettes and cigars.

Table 1
Tobacco use characteristics of past-year tobacco users living with HIV, NSDUH^a
2005-2013 (n=276)

Type of Tobacco Product Use	n (wt% ^b)
<i>Past year tobacco use – total sample (n=276)</i>	
Product used	
Cigarettes	260 (95.8%)
Cigars	69 (19.3%)
Smokeless tobacco ^c	16 (3.1%)
Single versus poly-tobacco use	
Single product use	215 (83.4%)
Poly-tobacco use	61 (16.6%)
<i>Past year single product use (n=215)</i>	
Product used	
Cigarettes only	199 (95.0%)
Cigars only	11 (3.7%)
Smokeless tobacco only	5 (1.3%)
<i>Past year poly-tobacco use (n=61)</i>	
Number of products used	
2 products	53 (89.7%)
More than 2 products	8 (10.3%)
Products used	
Cigarettes	61 (100.0%)
Cigars	58 (98.1%)
Smokeless tobacco	11 (12.3%)
Combination of products used	
Cigarettes + cigars	50 (87.7%)
Cigarettes + smokeless	3 (1.9%)
Cigars + smokeless	0 (0%)
Cigarettes + cigars + smokeless	8 (10.3%)

^aNSDUH = National Survey on Drug Use and Health

^bwt% = weighted percentage

^csmokeless tobacco includes chew and snuff

Table 2
Adjusted multinomial logistic regression analyses for characteristics associated with non-
tobacco use and PTU^a, as compared to single tobacco product use among adults living
with HIV (n=472), NSDUH^b, 2005-2013

		Non-tobacco use vs. <u>Single product use</u> aRRR ^{c,d} (95% CI ^e)	PTU vs. <u>Single product use</u> RRR ^d (95% CI)
Sex			
	Male	1.0	1.0
	Female	1.22 (0.61-2.46)	0.57 (0.16-2.12)
Age			
	18-25	1.0	1.0
	26-34	1.39 (0.56-3.46)	0.13 (0.03-0.65)
	35+	1.30 (0.62-2.71)	0.24 (0.09-0.63)
Race			
	Caucasian	1.0	1.0
	Non-Caucasian	0.72 (0.33-1.55)	0.49 (0.23-1.04)
Education			
	<High school	1.0	1.0
	High school	2.03 (1.03-4.00)	0.90 (0.34-2.37)
Survey year		1.02 (0.85-1.22)	0.92 (0.73-1.14)
Drug use		0.35 (0.19-0.66)	1.80 (0.72-4.49)
Binge drinking		0.24 (0.12-0.50)	1.09 (0.45-2.61)
Anxiety		0.63 (0.26-1.55)	0.18 (0.06-0.57)
MDE		1.25 (0.38-4.12)	1.90 (0.37-9.86)
Get a kick from dangerous things		1.76 (0.71-4.33)	1.18 (0.51-2.57)
Test self by doing risky things		0.95 (0.40-2.25)	2.95 (1.27-6.84)

Note: Bolded text indicates statistically significant findings

^aPTU = polytobacco use

^bNSDUH = National Survey on Drug Use and Health

^caRRR = adjusted relative risk ratio

^dModel adjusted for sex, age, race, education, survey year, drug use, binge drinking, anxiety, MDE, getting a kick out of dangerous things, and testing oneself by doing risky things

^eCI = confidence interval