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Factors associated with dual and polytobacco use among people in residential substance use disorder treatment

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Abstract

Background and Objectives: Little is known whether people in substance use disorder (SUD) treatment are at risk for multiple tobacco use. We examined factors associated with dual and polytobacco use among clients in SUD treatment.

Methods: A cross-sectional survey was conducted in 2019 among 562 clients (M_{age}=39, 74% male) in 20 residential SUD treatment programs in California, US. The outcome included single-, dual-(use of 2 products), and polytobacco use (use of ≥ 3 products). Independent variables were nicotine dependence, quitting-related factors, blunt/spliff use, and health-related factors. A multinomial model examined associations between the independent variables and the outcome, controlling for demographics and time in treatment.

Results: Overall, 32.6%, 18.9%, and 14.0% of the sample were single-, dual-, and polytobacco users, respectively. Factors associated with increased odds of polytobacco use included greater nicotine dependence (AOR = 1.60, 95% CI = 1.19, 2.16), ever using e-cigarettes for quitting (AOR = 4.56, CI = 2.23, 9.34), and past 30-day use of blunt/spliff (AOR = 2.96, CI = 1.48, 5.89). Factors associated with increased odds of dual use were ever using e-cigarettes for quitting (AOR = 3.19, CI = 1.79, 5.66) and reporting more mentally unhealthy days (AOR = 1.05, CI = 1.02, 1.07).

Conclusion and Scientific Significance: This study extends the literature on tobacco use among people in SUD treatment by revealing the high prevalence of dual and polytobacco use and unique characteristics of users. The findings have implications for interventions reducing all types of tobacco use in this understudied population.

Keywords

tobacco; smoking; multiple polytobacco use; polysubstance; substance use disorder

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Declaration of Interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this paper. This research has not been previously published, either in whole or in part, nor have the findings been posted online. The abstract was presented as a poster at the Society of Research on Nicotine and Tobacco. As the corresponding author, I confirm my full access to all aspects of this research and writing process, and I take final responsibility for this paper.

INTRODUCTION

Tobacco use remains high among people with substance use disorders (SUD).[1,2] Prevalence of cigarette smoking in this population is approximately 60-90%, which is 3-4 times higher than that in the general population.[1–3] Notably, prevalence of tobacco-related mortality among people in SUD treatment is nearly double that in the general population.[4] Cigarette smoking is also associated with poorer SUD treatment outcomes and smokers with SUD are more likely to die from tobacco-related causes than from other substance-related causes.[2] Thus, addressing tobacco use and promoting tobacco cessation among people in SUD treatment are needed.

In the past decade, use of non-cigarette tobacco products (e-cigarettes, cigars/cigarillos, smokeless tobacco, and hookah) has increased in the US.[5] The 2019 national data showed that 20.8% of US adults currently used any tobacco product, with cigarettes being the most common tobacco product among adults (14.0%), followed by e-cigarettes (4.5%), cigars/cigarillos (3.6%), smokeless tobacco (2.4%), and hookah (1.0%).[6] However, e-cigarette vaping (9.3%) surpasses cigarette smoking (8.0%) among young adults.[6] Notably, multiple tobacco use (use of two or more products) is increasingly popular (3.9 % among the general population and 18.6 % among current tobacco users),[6,7] with the most common pattern being dual use of cigarettes and e-cigarettes.[8] In response to these changes, research focusing on multiple tobacco use in the general population has increased.[9] Existing evidence shows that younger age, male sex, use of cannabis, and tobacco use initiation with a noncombustible product were associated with multiple tobacco use in the general population.[9] Furthermore, compared to single tobacco product users, multiple tobacco users have higher exposure to harmful constituents,[10] greater nicotine dependence,[8] and decreased intention to quit.[11] Given their high prevalence of cigarette smoking, people in SUD treatment may be at greater risk for multiple tobacco use and its health–related harms as compared to the general population. However, little is known about multiple tobacco use in this understudied population.[1]

To date, the preponderance of literature in this area has focused on use of traditional combustible cigarettes,[1] which may lead to under-estimates of tobacco use in this population and limit tobacco intervention strategies to a single product. To our knowledge, only two studies explored the use of alternative tobacco products in this population,[12,13] and only one of those examined multiple tobacco use.[12] Guydish et al. examined the weekly use of different tobacco products among clients from SUD treatment programs in the National Institute on Drug Abuse Clinical Trials Network during 2014-2015. This study found multiple tobacco use was prevalent (24.4%) but less than single product use (57.9%), and that multiple tobacco users (vs. single product users) smoked more cigarettes per day, were more likely to try to quit smoking, and had greater susceptibility to advertising for non-cigarette products.[12] Given the recent increasing use of non-cigarette tobacco products, more data are needed to understand the current status of tobacco use, particularly multiple tobacco use, among people in SUD treatment, ultimately inform policy and intervention efforts targeting this population.

To address these gaps, we examined multiple tobacco use among clients in residential SUD treatment programs in California. In addition, as available tobacco services in the treatment programs focus primarily on cigarette smoking cessation, comparing characteristics of dual-(use of two products) and polytobacco users (use of three or more products) versus single tobacco users can help tailor interventions to reduce all types of tobacco use in this high-risk group. Thus, we examined the associations between tobacco-related (e.g., nicotine dependence, using e-cigarette for quitting, quitting intention, co-use with cannabis in blunt/spliff) and health-related factors (e.g., physical and mental health) and tobacco use patterns. We hypothesized that dual and polytobacco users would have greater nicotine dependence, less quitting motivation, and lower health status compared to single tobacco users.

METHODS

Design and Participants

The current study is a secondary analysis of baseline data from three ongoing projects. These projects aimed to reduce tobacco use and promote wellness among clients at 20 residential SUD treatment programs in California, US.[14,15] One project aimed to support seven treatment programs in implementing tobacco-free policies. The second project aimed to improve tobacco interventions in four treatment programs. The third project aimed to understand existing tobacco policies and interest in implementing tobacco-free policies in nine treatment programs. The 20 programs were located in 11 of California's 58 counties. All were publicly funded and state-licensed to provide residential SUD services, although some programs treated clients with both SUD and mental health problems. Residential SUD programs are those where clients live while receiving SUD treatment. Medicaid pays for residential SUD program in California, reimbursing up to 90 days of residential treatment services.[16] Programs sometimes have additional contracts with local public health or criminal justice departments, or with state prisons for rehabilitation of inmates pre-or post-release. California law prohibits indoor smoking in public spaces, including residential treatment. Nearly all California SUD residential treatment programs have a policy concerning e-cigarette use, either restricting use to the same times and places as use of combustible cigarettes or, less often, banning e-cigarettes from use on program property.[16] However, most programs allowed tobacco use in designated outdoor areas, such as front or back porches, program parking lots, or other specified areas.[16]

Data collection was conducted by research staff during site visits in 2019. All adult clients enrolled in each program on site visit days were eligible to complete the survey. The same procedure and a core set of tobacco items were used for data collection across sites. Research staff reviewed study information with clients in small groups. Those interested to participate were given an iPad with a pre-populated research ID number, reviewed the study information sheet on the iPad, and clicked "Agree" to complete an online Qualtrics™ survey. Informed consent was obtained from all individual participants included in the study. The self-administered survey took approximately 30 minutes and participation was anonymous. Participants received a $20 gift card for study participation. Study procedures were approved by the institutional review board of the University of X. There were 682 clients enrolled in

the participating programs at the time of the site visits and 562 completed the survey, giving an 82% participation rate.

Measures

Outcome—Current use of tobacco products was self-reported. Current cigarette smokers were those who reported having smoked ≥100 cigarettes during their lifetime and currently smoked at the time of survey. Current users of each of the other tobacco products were those who had reported using [e-cigarette, cigar/cigarillo, and smokeless tobacco] during the past 30 days.[17] There were 5 participants selecting "Don't know" for current use of alternative tobacco products and their responses were coded as missing. Based on their reports on use of four tobacco products, participants were categorized into one of three categories: polytobacco users (currently using three or more tobacco products), dual tobacco users (currently using only two tobacco products), and single tobacco users (currently using only one product).

Other tobacco-related factors—Nicotine dependence was measured using the Heaviness of Smoking Index (HSI),[18] a 6-point scale based on two self-report items (i.e., number of cigarettes smoked per day and time to first cigarette after awakening). The HSI has demonstrated reliability and validity as a measure of nicotine dependence severity, with internal consistency (α) of 0.63,[19] and the correlation (r) with the Fagerstrom Test for Nicotine Dependence score of 0.94.[20]

Quitting experience was measured by two items. Having past-year quit attempts was assessed by the item "In the past year, did you quit smoking voluntarily for at least 24 hours?" Participants also reported whether they had ever used e-cigarettes to try to quit smoking.

Intention to quit smoking was assessed by the item "Are you seriously thinking of quitting smoking?" with response options including "Yes, in the next 30 days", "Yes, within the next six months but not in the next 30 days;" and "No".[21] Intention to quit smoking was defined as seriously thinking of quitting in the next 30 days (yes/no).

Past 30-day use of blunt (cannabis rolled in cigar wrappers) or spliff (a mix of tobacco and cannabis in a rolling paper) was assessed by the item "Have you mixed tobacco and marijuana and smoked them together (as part of the same blunt or spliff) in the past 30 days?"

Health-related factors—Perceived physical and mental health assessments were based on the Centers for Disease Control (CDC) and Prevention's Healthy Days Measures.[22] As defined by the CDC, the term "physically unhealthy days" was used to describe a number of days when physical health was not good, and was assessed by the item "Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?" Likewise, the term "mentally unhealthy days" was used to describe a number of days when mental health was not good, and was assessed by the item "Now thinking about your mental health, which includes

stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?"

Covariates—Demographic characteristics included age, gender, race/ethnicity, and educational attainment. Age was self-reported. Gender was self-reported as male, female, transgender, genderqueer, and other. Since there were 10 participants identifying as transgender and genderqueer, these individuals were combined into the "Other" group. Race/ethnicity was measured by combining two items: race (White, Black, Asian/Pacific Islander, American Indian/Alaskan Native, More than one race, and Other) and ethnicity (Hispanic or not). Due to small numbers of Non-Hispanic Asian/Pacific Islander (n=11) and American Indian/Alaskan Native participants (n=15), these subgroups were collapsed into "Other/Multi-race", resulting in only four groups in the analysis (i.e., "Non-Hispanic White", "Non-Hispanic Black", "Hispanic", and "Other/Multi-race"). Educational attainment was measured as less than a high school education, high school or GED equivalent, and greater than a high school education.

Participants were asked about reasons for entering treatment programs with answer options including treatment for SUD, for both SUD and a mental health condition, or for other reasons. Those with a SUD problem, or SUD and mental health problem, were asked about primary drug for treatment and/or mental health diagnosis, respectively. Persons reporting treatment for other reasons were most often referred by criminal justice sources. If they did not disclose a SUD or mental health reason for treatment, they were not asked for primary drug or mental health diagnoses. In addition, participants reported their time in treatment ("How many weeks have you been in your current treatment program?").

Statistical Analysis

Participant characteristics were summarized for the total sample and by tobacco use pattern (i.e., single users, dual users, and polytobacco users). Since the outcome was a three-category variable, we employed multinomial regression modeling with single tobacco use as the referent outcome and cluster–robust standard errors to account for clients nested within each treatment program.[23] A multivariate model included all independent variables (e.g., nicotine dependence severity, past 30-day use of blunt/spliff, quitting-related factors, physical and mental health) and controlled for demographic variables and time in treatment. The analysis used complete cases. Multicollinearity among the independent variables was examined by Variance Inflation Factor (VIF) and the results showed no presence of multicollinearity. All tests were two-tailed with a significance level of α less than 0.05. Statistical analyses were performed using STATA version 15 (Stata Corp, 2017).

RESULTS

Participant characteristics

The sample had a mean age of 38.9 years (SD = 11.6). The majority was male (74.0%) or Hispanic (39.3%), and 39.5% reported having more than high school education (see Table 1). The average time in treatment program was 11.6 weeks (SD = 13.1). The most common primary drug for SUD treatment reported was stimulants. Among clients who reported also

being in treatment for a mental health disorder, the most common disorder reported was post-traumatic stress disorder.

Tobacco use characteristics

Table 2 describes specific tobacco use patterns among the total tobacco users and among each tobacco use subgroup. Of the total sample (n=562), 32.6% reported single tobacco use, 18.9% reported dual tobacco use, and 14.0% reported polytobacco use. Most tobacco users were using cigarettes (92.4%). Among the alternative tobacco products, e-cigarettes were the most commonly used in the past 30 days (34.0%), followed by cigars/cigarillos (32.1 %), and smokeless tobacco (19.8%). Among tobacco users, the top three common patterns were exclusive cigarette use (44.8%), dual use of cigarettes and e-cigarettes (12.0%), and dual use of cigarettes and cigars/cigarillos (11.4%). Compared to single tobacco users, dual and poly users had greater mean of HSI scores and higher proportions of ever using e-cigarettes for quitting smoking and past 30-day use of blunt/spliff.

Factors associated with dual and polytobacco use

Results from the multivariate multinomial model are shown in Table 3. HSI scores [Adjusted Odds Ratio (AOR) = 1.60, 95%CI = 1.19, 2.16] and past 30-day use of blunt/spiff (AOR = 2.96, 9CI = 1.48, 5.89) were positively associated with polytobacco use as compared to single tobacco use. Of note, participants who reported ever using e-cigarettes for quitting smoking were more likely to be both dual tobacco users (AOR = 3.19, CI =1.79, 5.66) and polytobacco users (AOR = 4.56, CI = 2.23, 9.34). Likewise, those who reported greater mentally unhealthy days had increased odds of being dual tobacco users (AOR = 1.05, CI = 1.02, 1.07). Conversely, older participants (AOR = 0.97, CI = 0.95, 0.99), females (AOR = 0.11, CI = 0.03, 0.39), and other/multiracial participants (AOR = 0.42, CI = 0.25, 0.69) had decreased odds of polytobacco use. In addition, participants who had greater physically unhealthy days (AOR = 0.96, CI = 0.92, 0.99) and time in treatment program (AOR = 0.98, CI = 0.96, 0.99) were less likely to be dual tobacco users.

DISCUSSION

Using cross-sectional data from 562 clients in residential SUD treatment programs in California, we found that 65.5% of the sample were using any tobacco, with multiple tobacco use (32.9%) being equally prevalent as single tobacco use (32.6%). Our estimate of multiple tobacco use is much higher than that in the general population (18.6% among tobacco users)[6,24] and also higher than the previous estimate from a national sample of people in SUD treatment (29.6%).[12]. This study adds to current evidence identifying multiple tobacco use as an emerging public health issue among people in SUD treatment. Notably, our observation that proportion of dual users was higher than that of polytobacco users has not been reported in previous research in SUD populations. In addition, consistent with previous studies among SUD samples,[12,13] we found that e-cigarette was the most common alternative tobacco product used and dual use of cigarettes and e-cigarettes was the most common pattern of multiple tobacco use. However, our study is among the first bringing up the popularity of cigars/cigarillos and its dual use with cigarettes, calling for greater attention to this dual use pattern among people with SUD.

This study extends existing literature by indicating factors associated with dual and polytobacco use among people in SUD treatment. Current tobacco users who had ever used e-cigarettes for quitting smoking were more likely to be both dual and polytobacco users. Although the efficacy of e-cigarettes as cessation aids is unclear,[25] current evidence indicated that e-cigarette use was related to greater smoking[26] and the escalation of multiple tobacco use over time,[5] and thus, may not be an effective aid for long-term cessation.[27] Aligned with this evidence, our study suggested that current tobacco users in SUD treatment who are unsuccessful in quitting by using e-cigarettes may continue using multiple tobacco products.

In our study, past 30-day use of blunt/spliff was strongly associated with polytobacco use. Since use of cigars/cigarillos was prevalent in our sample, it is possible that participants were using cigars/cigarillos for blunt use. This finding may partly reflect our recruitment in California-a state having legalized recreational cannabis use since 2018 and considered the largest cannabis market in the US.[28] Co-use of tobacco and cannabis is even higher than tobacco use alone among California's young people.[29] In the general population, cannabis use is associated with persistent cigarette smoking, high nicotine dependence, and low cessation among cigarette smokers.[30] Likewise, a study among the SUD population found that ever users of blunt/spliff were less likely to plan to quit in the next 30 days.[15] Given the increasing legalization of cannabis use in the US, our finding and other emerging evidence points to a need to address co-use of tobacco and cannabis and its potential impacts on tobacco use and cessation among people in SUD treatment.

Consistent with previous research among the general population and the SUD treatment population,[8,12,31] we found that polytobacco users had greater nicotine dependence and dual users had fewer days of good mental health as compared to single tobacco users. Mental health is frequently comorbid with SUD, and mental health problems (e.g., depression) is also linked to multiple tobacco use.[32,33] This highlights a need to address the intersection of multiple tobacco use and mental health in SUD treatment programs. While prior studies in the SUD population found that multiple tobacco users were more likely to have past-year quit attempts,[12] we did not find differences in having quit attempts and intention to quit smoking between dual or polytobacco users and single tobacco users. More research is needed to better understand quitting intention, quit attempts, and cessation outcomes among dual and polytobacco users in SUD treatment.

Our study has implications for efforts to address tobacco use in the SUD population. As dual and polytobacco use is highly prevalent among clients in SUD treatment and may confer additive risk compared to cigarette smoking alone, SUD treatment programs need to screen and assess the use of alternative tobacco products to better provide cessation supports for quitting cigarette smoking as well as quitting other types of tobacco use. Dual and polytobacco users may comprise distinct groups, given that their use of multiple tobacco products is associated with greater nicotine dependence, co-use with cannabis in the form of blunt/spliff, and mental health problems, and thus, tailored interventions or multicomponent interventions may be needed to address multiple health risks simultaneously. Particularly, interventions targeting dual use of cigarettes with e-cigarettes or cigars/cigarillos should be provided since they may place people in SUD treatment at risk for increased negative

health effects and continued tobacco use rather than quitting.[34,35] Although in-door smoking is prohibited in residential SUD treatment programs in California, clients may still smoke cigarettes and use other tobacco products outdoor. Tobacco-free grounds policies, which ban use of tobacco products on treatment program grounds, should be adopted to reduce tobacco use among clients in SUD treatment.[16]

Study limitations include reliance on cross-sectional data, which precludes causal inference. Second, self-reported data in this study may have been susceptible to some degree of recall and social desirability bias. Third, the generalization of study findings is limited by the convenience sampling strategy, the inclusion of residential SUD programs only, and the fact that all programs were located in California. Finally, we could not explore reasons for dual and polytobacco use patterns as well as context of using alternative tobacco products due to the small sample size and original measures. Future research should investigate potential mechanisms underlying tobacco use patterns among people in SUD treatment, such as use of e-cigarette for substitution and incidental use of blunt/spliff for cannabis consumption, to find the best ways to treat tobacco use in this population.

In conclusion, this study revealed high prevalence of dual and polytobacco use among people in SUD treatment, and suggested that SUD treatment programs should address use of other tobacco products as well as cigarette smoking among their clients. In addition, interventions for dual and polytobacco users should address use of e-cigarettes, cigars/cigarillos, and blunt/spliff as well as mental health to improve cessation outcomes and reduce tobacco-related health disparities among this population.

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Table 1:

Characteristics of a total sample and stratified by tobacco use status

Characteristics	Total sample N=562 (100%)	Single tobacco users N=183 (100%)	Dual tobacco users N=106 (100%)	Polytobacco users N=79 (100%)
Age, Mean (SD)	38.9 (11.6)	39.5 (12.0)	36.0 (9.9)	34.1 (9.3)
Gender				
Male	416 (74.0)	121 (66.1)	80 (75.5)	71 (89.9)
Female	134 (23.8)	60 (32.8)	24 (22.6)	5 (6.3)
Other	12 (2.1)	2 (1.1)	2 (1.9)	3 (3.8)
Race/Ethnicity				
Non-Hispanic White	175 (31.1)	61 (33.3)	35 (33.0)	40 (50.6)
Non-Hispanic Black	110 (19.6)	39 (21.3)	16 (15.1)	7 (8.9)
Hispanic	221 (39.3)	66 (36.1)	41 (38.7)	26 (32.9)
Other/Multi-race	56 (10.0)	17 (9.3)	14 (13.2)	6 (7.6)
Education				
Less than High school	144 (25.6)	58 (31.7)	24 (22.6)	23 (29.1)
High school/GED	196 (34.9)	58 (31.7)	34 (32.1)	35 (44.3)
More than High school	222 (39.5)	67 (36.6)	48 (45.3)	21 (26.6)
Time in treatment (weeks), Mean (SD)	11.6 (13.1)	11.5 (11.9)	8.5 (9.1)	9.0 (13.9)
Health-related variables, Mean (SD)				
Physically unhealthy days	4.0 (7.9)	5.1 (9.3)	3.6 (6.6)	4.2 (7.8)
Mentally unhealthy days	5.8 (8.7)	5.9 (8.2)	7.5 (9.6)	5.7 (8.4)
Reasons for entering treatment program				
SUD	319 (56.8)	96 (52.5)	68 (64.1)	60 (75.9)
SUD and mental health	150 (26.7)	62 (33.9)	27 (25.5)	18 (22.8)
Other	88 (15.7)	24 (13.1)	11 (10.4)	1 (1.3)
Primary drug for treatment				
Alcohol	111 (19.8)	33 (18.0)	15 (14.2)	13 (16.5)
Stimulants	216 (38.4)	76 (41.5)	49 (46.2)	45 (57.0)
Opiates	88 (15.7)	33 (18.0)	26 (24.5)	16 (20.3)
Other	41 (7.3)	11 (6.0)	5 (4.7)	4 (5.1)
Mental health disorders				

Characteristics	Total sample N=562 (100%)	Single tobacco users N=183 (100%)	Dual tobacco users N=106 (100%)	Polytobacco users N=79 (100%)
Anxiety	24 (4.3)	9 (4.9)	3 (2.8)	3 (3.8)
Depression	39 (6.9)	16 (8.7)	9 (8.5)	4 (5.1)
Post-traumatic stress disorder	41 (7.3)	15 (8.2)	8 (7.6)	4 (5.1)
Bipolar disorder	19 (3.4)	7 (3.8)	3 (2.8)	6 (7.6)
Other	23 (4.1)	9 (4.9)	4 (3.8)	4 (5.1)

Table 2:

Tobacco use characteristics among current tobacco users and stratified by tobacco use patterns

Tobacco use pattern	Total tobacco users N=368 (100%)	Single tobacco users N=183 (100%)	Dual tobacco users N=106 (100%)	Polytobacco users N=79 (100%)
Current use				
Any cigarette	340 (92.4)	165 (90.2)	99 (93.4)	76 (96.2)
Any e-cigarette	125 (34.0)	5 (2.7)	49 (46.2)	71 (89.9)
Any cigar/cigarillo	118 (32.1)	8 (4.4)	47 (44.3)	63 (79.8)
Any smokeless tobacco	73 (19.8)	5 (2.7)	17 (16.0)	51 (64.6)
Single tobacco use patterns	183 (49.7)			
Cigarette only	165 (44.8)	165 (90.2)		
E-cigarette only	5 (1.4)	5 (2.7)		
Cigar/cigarillo only	8 (2.2)	8 (4.4)	NA	NA
Smokeless tobacco only	5 (1.4)	5 (2.7)		
Dual tobacco use patterns	106 (28.8)			
Cigarette + E-cigarette	44 (12.0)		44 (41.5)	
Cigarette + Cigar/Cigarillo	42 (11.4)		42 (39.6)	
Cigarette + Smokeless tobacco	13 (3.5)	NA	13 (12.3)	NA
E-cigarette + Cigar/cigarillo	3 (0.8)		3 (2.8)	
E-cigarette + Smokeless tobacco	2 (0.5)		2 (1.9)	
Cigar/cigarillo + Smokeless tobacco	2 (0.5)		2 (1.9)	
Polytobacco use patterns	79 (21.5)			
Cigarette + E-cigarette + Cigar/Cigarillo	28 (7.6)			28 (35.4)
Cigarette + E-cigarette + Smokeless tobacco	16 (4.3)			16 (20.3)
Cigarette + Cigar/Cigarillo + Smokeless tobacco	8 (2.2)	NA	NA	8 (10.1)
E-cigarette + Cigar/Cigarillo + Smokeless tobacco	3 (0.8)			3 (3.8)
All 4 products	24 (6.5)			24 (30.4)
Heaviness of Smoking Index, Mean (SD)	2.0 (1.4)	1.8 (1.4)	2.0 (1.2)	2.6 (1.3)
Quitting-related variables				
Having past-year quit attempts	216 (58.7)	105 (57.4)	64 (60.4)	47 (59.5)
Having plan to quit in next 30 days	111 (30.2)	56 (30.6)	32 (30.2)	23 (29.1)
Ever using e-cigarette for quitting smoking	162 (44.0)	53 (29.0)	58 (54.7)	51 (64.6)

Tobacco use pattern	Total tobacco users N=368 (100%)	Single tobacco users N=183 (100%)	Dual tobacco users N=106 (100%)	Polytobacco users N=79 (100%)
Past 30-day use of blunt/spliff	49 (13.3)	14 (7.7)	16 (15.1)	19 (24.1)

NA: Not Applicable

Table 3:

Factors associated with dual and polytobacco use among current tobacco users in substance use disorder treatment (N=368)

Factors	Dual tobacco use vs. Single tobacco use AOR (95%CI)	Polytobacco use vs. Single tobacco use AOR (95%CI)
Tobacco-related factors		
Heaviness of smoking index	1.17 (0.90, 1.51)	**1.60 (1.19, 2.16)** ***
Past 30-day use of blunt/spliff	1.79 (0.65, 4.94)	**2.96 (1.48, 5.89)** ***
Ever using e-cigarette for quitting smoking	**3.19 (1.79, 5.66)** ***	**4.56 (2.23, 9.34)** ***
Having past-year quit attempts	1.24 (0.70, 2.21)	1.56 (0.81, 3.00)
Having plan to quit in next 30 days	1.18 (0.64, 2.19)	1.36 (0.62, 2.99)
Health-related factors		
Physically unhealthy days	**0.96 (0.92, 0.99)** *	0.98 (0.93, 1.03)
Mentally unhealthy days	**1.05 (1.02, 1.07)** ***	1.03 (0.99, 1.08)
Covariates		
Age	1.00 (0.97, 1.02)	**0.97 (0.95, 0.99)** *
Gender (Ref=Male)		
Female	0.46 (0.19, 1.12)	**0.11 (0.03, 0.39)** ***
Other	0.71 (0.37, 1.35)	1.08 (0.18, 6.29)
Race/Ethnicity (Ref = NH White)		
NH Black	0.90 (0.47, 1.70)	0.46 (0.10, 2.11)
Hispanic	1.33 (0.56, 3.15)	0.63 (0.25, 1.61)
Other/Multi-racial	1.40 (0.67, 2.94)	**0.42 (0.25, 0.69)** ***
Education (Ref = Less than High school)		
High school or GED	1.58 (0.56, 4.45)	1.27 (0.47, 3.45)
More than High school	1.55 (0.57, 4.17)	0.65 (0.21, 2.01)
Time in treatment program	**0.98 (0.96, 0.99)** **	0.99 (0.97, 1.01)

Note:

*: p<0.05

**: p<0.01

***: p<0.001;

AOR: Adjusted Odds Ratio; 95%CI: 95% Confidence Interval.

The multinomial model included all the variables. The outcome included 3 categories (single-, dual-, and polytobacco use) with single tobacco use as a referent outcome.

Table 4:

Factors associated with single and polytobacco use among current tobacco users in SUD treatment (N=368)

Factors	Single use vs. Dual use AOR (95%CI)	Poly use vs. Dual use AOR (95%CI)
Tobacco-related factors		
Heaviness of smoking index	0.86 (0.66, 1.11)	**1.37 (1.14, 1.65)** ***
Past 30-day use of blunt/spliff	0.56 (0.20, 1.53)	1.65 (0.89, 3.06)
Ever using e-cigarette for quitting smoking	**0.31 (0.18, 0.56)** ***	1.43 (0.83, 2.46)
Having past-year quit attempts	0.80 (0.45, 1.43)	1.25 (0.62, 2.53)
Having plan to quit in next 30 days	0.85 (0.46, 1.57)	1.15 (0.47, 2.79)
Health-related factors		
Physically unhealthy days	**1.05 (1.01, 1.09)** *	1.02 (0.96, 1.09)
Mentally unhealthy days	**0.95 (0.93, 0.98)** ***	0.98 (0.94, 1.03)
Covariates		
Age	1.00 (0.98, 1.03)	0.98 (0.95, 1.00)
Gender (Ref=Male)		
Female	2.18 (0.89, 5.30)	**0.25 (0.09, 0.65)** ***
Other	1.41 (0.74, 2.68)	1.52 (0.24, 9.57)
Race/Ethnicity (Ref = NH White)		
NH Black	1.12 (0.59, 2.12)	0.52 (0.16, 1.69)
Hispanic	0.75 (0.32, 1.78)	0.47 (0.22, 1.01)
Other/Multi-race	0.71 (0.34, 1.50)	**0.30 (0.14, 0.62)** ***
Education (Ref = Less than High school)		
High school or GED	0.63 (0.22, 1.77)	0.80 (0.26, 2.42)
More than High school	0.65 (0.24, 1.74)	0.42 (0.16, 1.09)
Time in treatment program	**1.02 (1.01, 1.04)** *	1.01 (0.98, 1.04)

Note:

*: p<0.05

**: p<0.01

***: p<0.001;

AOR: Adjusted Odds Ratio; 95%CI: 95% Confidence Interval.

The multinomial model included all the variables. The outcome included 3 categories (single-, dual-, and polytobacco use) with dual tobacco use as a referent outcome.