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Use of and Reasons for Using Multiple Other Tobacco Products in Daily and Nondaily Smokers: Associations with Cigarette Consumption and Nicotine Dependence

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Abstract

Background—Use of other tobacco products (OTPs) among smokers is increasing. Little is known about types of OTP used and the reasons for use, and how OTP use and reasons for use correlate with smoking patterns and nicotine dependence in daily and nondaily smokers. This paper addresses these gaps in the literature.

Methods—656 daily smokers and 203 nondaily smokers provided information on their use of different OTPs (hookah, e-cigarettes, chew/snuff, snus, cigars, dissolvables), and reasons for using OTPs (e.g., “to cut down on smoking”), as well as their cigarette consumption and nicotine dependence. Logistic regression models assessed the association of smoking status with OTP use (ever and current) and reasons for use. Within each smoking group, separate logistic regression models examined the associations of OTP use and reasons for use with cigarette consumption and nicotine dependence.

Results—Compared to daily smokers, nondaily smokers were more likely to use hookah and cigars, less likely to use dissolvables, and less likely to endorse using OTPs to reduce their smoking. Among non-daily smokers, nicotine dependence was associated with a higher likelihood of current OTP use (OR=1.04 [95% CI 1.01–1.07]; $p < .05$), whereas cigarette consumption was not.

Conclusions—Results suggest OTP use in nondaily smokers does not correlate with less frequent smoking, but may correlate with higher nicotine dependence. Use of combustible OTPs among nondaily smokers may offset any potential benefits achieved through less frequent cigarette

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consumption. Providers should explicitly address OTP use when discussing cigarette cessation and reduction.

Keywords

Other tobacco products; Nondaily smokers; Smoking patterns; Nicotine dependence

1. INTRODUCTION

While cigarette smoking remains the most common form of tobacco use among adults, with nearly 17% of the U.S. population endorsing current smoking, smoking prevalence is steadily declining (Centers for Disease Control and Prevention, 2015). In contrast, the use of other tobacco products, including smokeless tobacco, electronic cigarettes, cigars, and hookah (shisha), is on the rise (Agaku and Alpert, 2015), and there is evidence that rates of multiple product use are increasing, particularly among smokers. Under the 2009 Family Tobacco Control Act, the FDA must consider the effects of OTP use on population health in deciding how to regulate tobacco products (Ashley and Backinger, 2012). As such, examining OTP use among current smokers is essential in order to better appreciate the potential net effects of OTP use on public health and to inform regulatory decisions on OTPs in an evolving tobacco market.

On one hand, the use of multiple other tobacco products (OTPs) among current smokers may represent a significant public health problem, by allowing current smokers to supplement their nicotine intake from cigarettes, which could increase total nicotine consumption, promote higher dependence, and reduce the likelihood of tobacco cessation. Alternatively, supplementing nicotine intake via potentially “reduced harm” tobacco products (e.g., snus, e-cigarettes) among current smokers may allow these individuals to decrease their consumption of combustible cigarettes (e.g., Gilljam and Galanti, 2003; Adriaens et al., 2011), and could thus reduce the massive public health burden attributed to combustible tobacco. Population-level studies have reported that *nondaily smokers*, who consume fewer cigarettes and tend to be less dependent than daily smokers on average (Shiffman et al., 2012b, 2012b), may use some OTPs at higher rates (Adkison et al., 2013; Schauer et al., 2015a) compared to daily smokers. In addition, a study on a sample of U.S. college students found that nondaily smokers were more likely to use OTPs compared to daily smokers (Enofe et al., 2014). In contrast, other studies suggest that heavier daily cigarette consumption (higher cigarettes per day) and nicotine dependence are associated with *higher* likelihood of any noncombustible tobacco use (Richardson et al., 2014). Still other studies have reported no difference in rates of multiple tobacco product use across daily and nondaily smokers (Shiffman et al., 2012; Lee et al., 2014).

One explanation for these mixed findings is that the types of and reasons for OTP use may vary across the spectrum of smokers. Daily and nondaily smokers are commonly distinguished in the literature, in part because intermittent (or less than daily) smoking behavior runs counter to “traditional” (e.g., withdrawal-avoidance) models of established, daily smoking (Shiffman, 2009), and motives for smoking may differ across these groups (Shiffman et al., 2012a). While nondaily and daily smokers can be viewed as representing

both ends of the smoking continuum, nondaily smokers show some degree of overlap with daily smokers with respect to dependence and are a heterogeneous group (Shiffman et al., 2012b). Furthermore, nondaily smokers differ from daily smokers on a number of sociodemographic characteristics (e.g., nondaily smokers are likely to be younger, better educated, have higher income, and to be ethnic minorities; Ackerson and Viswanath, 2009; Cooper et al., 2010; Shiffman et al., 2012c; Trinidad et al., 2009; Wortley et al., 2003; Zhu et al., 2003), some of which are also correlated with OTP use (e.g., younger individuals are more likely to use OTPs; Fix et al., 2014; Lee et al., 2014; Schauer et al., 2015a). This highlights the utility of adjusting for such demographic differences when examining relationships between OTP use and nondaily smoking status.

Understanding the ways in which OTP use differs both across and *within* daily and nondaily smokers has important implications for understanding how OTP use relates to cigarette smoking patterns and nicotine dependence. For example, OTP use among nondaily smokers may allow some individuals (e.g., more frequent and/or dependent smokers) to achieve higher levels of nicotine intake (Tomar et al., 2010), despite regularly abstaining from cigarettes, which could maintain higher dependence (Tomar et al., 2010; Wetter et al., 2002). In addition, understanding the *reasons* that nondaily and daily smokers use OTPs may provide important information about why and how different smokers use these products (Richardson et al., 2014). For example, compared to nondaily smokers, daily smokers may be more inclined to use OTPs to cope with periods in which smoking is not allowed, whereas nondaily smokers may be more likely to use OTPs for other reasons (e.g., just to try them). Examining OTP use and reasons for use within nondaily smokers may also yield important insights into some of the seemingly anomalous characteristics of this growing segment of the smoking population (up to 38% of current smokers; U.S. Department of Health and Human Services, 2014), such as how they are able to maintain stable, low rates of smoking, yet still have difficulty quitting (Tindle and Shiffman, 2011) and show signs of dependence (Shiffman et al., 2012b). However, no studies have examined the relationships between OTP use, cigarette consumption, and nicotine dependence across and within daily and nondaily smokers.

The current study addresses these gaps in the literature by examining the ways in which cigarette consumption and nicotine dependence among current daily and nondaily smokers are associated with 1) likelihood of OTP use, 2) number of different types of tobacco products used, and 3) reasons for OTP use. We hypothesized that daily smokers and nondaily smokers would demonstrate similar rates of overall OTP use. Within each smoker type, we hypothesized that heavier cigarette consumers and more dependent smokers would be more likely to report using any OTPs and more different types of OTPs. In terms of reasons for OTP use, we expected that heavier cigarette consumers and more dependent smokers would be more likely to report using OTPs when smoking is not allowed and to cut down on their smoking.

2. MATERIAL AND METHODS

2.1 Sample

The current study uses combined data from two previous studies conducted through the RAND Patient Reported Outcomes Measurement Information System (PROMIS®) Smoking Initiative. For comprehensive descriptions of these samples and study methods, see Stucky and colleagues (Stucky et al., 2015). Briefly, all participants were current adult smokers (at least 18 years old), who had smoked for at least a year, had smoked in the past 30 days, and had no plans to quit within next 30 days. The first sample consisted of a subset of smokers (N=491; Nondaily: n=70; Daily: n=421) enrolled in the PROMIS Smoking Initiative calibration sample (see Edelen et al., 2014), who were initially recruited through Harris Interactive's online panel, and completed a follow-up online survey about their smoking behavior between May, 2013 and August, 2013. The second sample consisted of smokers (N = 368; Nondaily: n=133; Daily: n=235) who were recruited via community advertisements (e.g., flyers, campus newspapers) at various community venues in several large U.S. cities, who completed a similar survey either online or via paper and pencil between July, 2013 and April, 2014. The two samples differed with respect to age ($p < 0.01$), race ($p < 0.01$), education ($p < 0.01$), and cigarettes smoked per day ($p < 0.01$); differences between the two samples are described in detail elsewhere (Edelen et al., 2016). All study procedures were approved by the institution's internal review board.

2.2 Measures

2.2.1 Smoker Status and Cigarette Consumption—Nondaily and daily smoker status was assessed based upon self-reported number of smoking days in the past month: 1) nondaily smokers reported smoking on less than 28 days in the past 30 days and 2) daily smokers endorsed smoking on 28–30 days in the past 30 days (Edelen et al., 2016, 2012). Among nondaily smokers, level of cigarette consumption was defined using smoking days per month, categorized as follows: 1–5 days, 6–9 days, 10–19 days, and 20–27 days. Cigarette consumption among daily smokers was defined using cigarettes per day, and level of consumption was defined as follows: 1) smoking between 1 and 10 cigarettes every day (*light*); 2) smoking between 11 and 20 cigarettes per day (*moderate*); and 3) smoking over 20 cigarettes per day (*heavy*) (Edelen et al., 2012).

2.2.2 Nicotine Dependence—Nicotine dependence was assessed using the short form version of the PROMIS Nicotine Dependence item bank. The short form consists of 8 items (e.g., “When I haven’t been able to smoke for a few hours, the craving gets intolerable”; “I find myself reaching for cigarettes without thinking about it”; “I drop everything to go out and buy cigarettes”). The short form Nicotine Dependence measure is unidimensional, highly reliable (reliability = 0.97), and performs similarly across gender, age, and race/ethnicity groups (Shadel et al., 2014).

2.2.3 Other Tobacco Product (OTP) Use

2.2.3.1 Ever and Current Use: Participants reported whether or not they had used OTPs in the past (ever use) and whether they had used OTPs in the past month (current use; Agaku et al., 2014). We created dichotomous indicators for *ever use* and *current use* of each of the

following products: hookah, e-cigarettes, snus, dissolvables, cigars, and snuff/chew. We also created dichotomous summary variables to indicate *any OTP use* (considering use of any of the six products described above; yes/no), ever and currently, and the *number of different types of OTPs used*, ever and currently.

2.2.3.2 Reasons for Use: For each type of OTP, individuals who endorsed ever use were asked if they had used that product for any of the following reasons: 1) “cigarette smoking was not allowed in the place where you were” 2) “you were trying to cut down on smoking cigarettes”; 3) “you just wanted to try it”; or 4) “some other reason” (Richardson et al., 2014). Within each OTP type, we created a dichotomous variable to indicate whether or not participants reported any of the aforementioned reasons for using that product. We also created dichotomous summary variables to indicate whether or not participants reported each of the aforementioned reasons for use of *any OTP* (yes/no).

2.2.4 Demographic Variables—Individuals also reported on a number of demographic variables, including age, sex, race/ethnicity (White [non-Hispanic], Hispanic, Black [non-Hispanic], Asian, or other), and education (high school degree or less, some college, college degree or higher).

2.3 Data Analysis

We first examined bivariate associations between smoker status (nondaily vs. daily) and participant characteristics using unadjusted chi-square (dichotomous variables) and t-tests (continuous variables). We then used multiple logistic regression to examine the associations of smoker status with OTP use (ever and current) and reasons for use. These analyses were conducted within product type and overall (i.e., any OTP use), first examining unadjusted associations and subsequently controlling for demographic factors (age, sex, race, education) that were expected to correlate with nondaily smoker status and/or OTP use (e.g., Shiffman et al., 2012b; Lee et al., 2014). In addition, Poisson regression was used to examine the association between smoker status and number of different types of OTPs used (ever and currently). Within groups (nondaily, daily), we then examined the associations of OTP use and reasons for use with level of cigarette consumption and nicotine dependence score. Logistic regression assessed the association between independent variables (smoking days per month [nondaily], cigarettes per day [daily], nicotine dependence [both]) and likelihood of using *any OTP* (ever and current use). Poisson regression assessed the relationship between predictors and the number of different OTPs used (ever and current use). Logistic regression also assessed the relationship between level of consumption and nicotine dependence and the likelihood of endorsing each reason for using any OTP. Since data were combined from two separate samples, all analyses included an indicator for source sample. All analyses were conducted using SAS version 9.4 (SAS Institute, Cary, NC).

3. RESULTS

3.1 Sample

Table 1 shows participant characteristics. The combined sample consisted of 30.95% (n=203) nondaily smokers and 69.05% (n=656) daily smokers. Daily and nondaily smokers

differed on demographic characteristics. Nondaily smokers were younger ($p < .0001$), and more likely to be Hispanic ($p < .0001$), men ($p < .05$), and college-educated ($p < .05$). Nondaily smokers were also significantly less dependent than daily smokers ($p < .0001$).

In bivariate chi-square and t-tests, sample of origin was significantly associated with nondaily vs. daily smoker status ($\chi^2_{(1)}=55.82, p < .0001$), age ($t(df=730)=-7.59, p < .0001$), race ($\chi^2_{(3)}=254.03, p < .0001$), and education ($\chi^2_{(2)}=27.49, p < .0001$), but was not associated with sex ($p = .43$). Sample of origin was correlated with ever-use of hookah ($\chi^2_{(1)}=16.02, p < .0001$), but was not correlated with ever-use of *any* OTPs ($p = .68$), nor with ever-use of any other specific types of OTPs (e-cigarettes, snus, dissolvables, chew, or cigars; all p 's $> .26$). Sample of origin was correlated with current use of *any* OTPs ($\chi^2_{(1)}=12.22, p < .001$), and with current use of hookah ($\chi^2_{(1)}=17.75, p < .0001$), dissolvables ($\chi^2_{(1)}=4.41, p = .04$), and cigar use ($\chi^2_{(1)}=28.21, p < .0001$); sample of origin was not associated with current use of any other specific types of OTPs (e-cigarettes, snus, chew; all p 's $> .18$).

3.2 Differences in OTP Use and Reasons for Use across Nondaily and Daily Smokers

Table 2 shows type of OTP use (ever and current use) by smoker status (nondaily, daily). In unadjusted analyses, nondaily smokers were significantly more likely to endorse ever use of any OTP, ever use of hookah, and ever use of cigars; there was a trend ($p=.05$) such that nondaily smokers were less likely to endorse ever use of dissolvables. In multivariable analyses that controlled for demographic variables, the difference between nondaily and daily smokers on ever use of any OPT was no longer significant, and the difference on ever use of dissolvables reached statistical significance ($p < .05$); nondaily smokers were still significantly more likely to endorse ever-use of hookah and cigars. As shown in Figure 1, bivariate analyses indicated that nondaily smokers reported use of more different types of OTPs (ever: $B=0.19$, 95% CI 0.07–0.32; $p < .01$; current: $B=0.29$, 95% CI 0.03–0.55; $p < .05$). However, differences in number of different types of OTPs were no longer significant after controlling for demographic variables (ever: $B=0.02$, 95% CI –0.11–0.17; $p = .74$; current: $B=0.14$, 95% CI –0.13–0.41; $p = .32$).

Table 3 shows reasons for OTP use by smoker status. In unadjusted analyses, nondaily smokers were less likely to endorse using any OTP to cut down on their smoking compared to daily smokers. Nondaily smokers were also more likely to use any OTP for “some other reason” compared to daily smokers. These differences remained after controlling for demographic factors. In addition, the multivariable analyses indicated that nondaily smokers were marginally less likely than daily smokers ($p < .06$) to endorse using e-cigarettes to cut down on smoking, but significantly more likely to endorse using e-cigarettes for other reasons.

3.3 Correlates of OTP Use and Reasons for Use within Nondaily and Daily Smokers

3.3.1 Nondaily Smokers—Table 4 shows the associations of smoking patterns and nicotine dependence with OTP use and reasons for use. For nondaily smokers, number of smoking days per month was not associated with likelihood of ever or current OTP use, nor was it associated with number of OTPs ever or currently used. However, number of smoking

days per month was significantly associated with reasons for using OTPs, such that individuals who smoked on more days per month were more likely to endorse using OTPs to cut down. Smoking days per month was unrelated to other reasons for OTP use.

Nicotine dependence was marginally positively associated with likelihood of ever OTP use ($p=0.05$) and significantly associated with higher likelihood of current OTP use. Dependence was not associated with number of OTPs ever used, but was significantly associated with a greater number of OTPs currently used. In addition, nondaily smokers with greater dependence were significantly more likely to report that they used OTPs to try to cut down on smoking. Dependence was unrelated to other reasons for OTP use.

3.3.2 Daily Smokers—Among daily smokers, smoking more cigarettes per day was associated with likelihood of ever using OTPs (e.g., comparing levels of consumption, heavy daily smokers were 1.25 times as likely as light daily smokers to endorse ever using OTPs; $OR=1.25$ [95% CI 1.01–1.54], $p < .05$), but was unrelated to likelihood of current OTP use and number of OTPs used ever or currently. Number of cigarettes per day was not associated with any specific reasons for using OTPs (see Table 4).

Nicotine dependence was not associated with likelihood of ever or current OTP use or number of OTPs ever used, nor was it associated with number of OTPs used ever or currently. Greater dependence was significantly associated with greater likelihood of using OTPs when smoking was not allowed and using OTPs to cut down on smoking; dependence was unrelated to other reasons for OTP use (see Table 4).

4. DISCUSSION

To the best of our knowledge, this is the first study to conduct a detailed analysis of multiple tobacco product use and reasons for use in relation to cigarette consumption and nicotine dependence in both daily and nondaily smokers. Daily and nondaily smokers in this sample differed with respect to multiple demographic characteristics (e.g., nondaily smokers were more likely to be Hispanic, younger, and college-educated compared to daily smokers), which is consistent with findings from previous studies (Ackerson and Viswanath, 2009; Cooper et al., 2010; Shiffman et al., 2012c; Trinidad et al., 2009; Wortley et al., 2003; Zhu et al., 2003). Adjusting for demographic characteristics, nondaily smokers were *more likely* than daily smokers to endorse ever using other combustible products (hookah and cigars) and less likely to endorse using dissolvable products. In addition, nondaily smokers were significantly *less likely* than daily smokers to endorse using OTPs to reduce their smoking. Nicotine dependence (but not smoking frequency) was associated with greater likelihood of current OTP use and currently using more types of OTPs among nondaily smokers. Among daily smokers, heavier cigarette consumption (but not dependence) was associated with greater likelihood of ever using OTPs. In both daily and nondaily smokers, higher dependence was associated with using OTPs to try to cut down on cigarette smoking. These findings suggest that, among nondaily smokers, OTP use correlates with higher dependence but does not correlate with less frequent smoking. This may have important implications for understanding the potential role of OTP use in maintaining tobacco dependence among nondaily smokers who use these products (e.g., individuals who use OTPs in an attempt to

cut down or quit smoking may be unsuccessful in achieving those aims; combined use of cigarettes and OTPs may increase total nicotine intake, which could support higher levels of nicotine dependence despite lower-frequency smoking).

Nondaily and daily smokers differed with respect to the types of OTPs that they reported using. After controlling for demographic factors, nondaily smokers as a group were *more likely* than daily smokers to endorse using combustible products (hookah, cigars), used noncombustible products (i.e., e-cigarettes, snus) at similar rates, and were *less* likely than daily smokers to endorse using dissolvable products. Our findings build upon those of Lee et al. (2014), which showed that combustible products (*rather than* non-combustible OTPs) are used by a majority of dual cigarette and OTP users, and suggest that rates of combustible OTP use among *nondaily* smokers may be particularly high (e.g., 33% and 55% of nondaily smokers endorsed ever-use of hookah and cigars, respectively, compared to 16% and 40% of daily smokers). These findings suggest that the higher rates of OTP use observed among nondaily smokers may offset any potential benefits achieved through their lower rates of cigarette consumption, relative to daily smokers. Additional education on the harms associated with *any* combustible product use may be helpful in curbing combustible OTP use, which is consistent with recent national campaign efforts that explicitly target hookah and cigarillo use (truth® campaign; Truth Initiative).

Within groups, dependence was associated with using OTPs “to cut down on smoking” among both nondaily and daily smokers. This evidence suggests that more dependent smokers – regardless of daily vs. nondaily smoker status- may be more likely to use OTPs as a substitute for cigarettes in an effort to reduce smoking. Among nondaily smokers, higher frequency of cigarette consumption was also correlated with using OTPs to cut down on smoking. Thus, although frequency of consumption was not associated with likelihood of OTP use among nondaily smokers overall, these findings suggest that nondaily smokers who use OTPs in order to limit their cigarette consumption tend to be more dependent, heavier smokers.

One possible explanation for this is that nondaily smokers who report using OTPs to cut down, particularly individuals who are more dependent and who smoke more frequently, may be more likely to be former daily smokers, who have reduced their smoking and currently use OTPs to keep their cigarette consumption at a nondaily level. History of daily smoking among current nondaily smokers is quite common- approximately half of nondaily smokers report being former daily smokers (Edwards et al., 2010; Nguyen and Zhu, 2009; Shiffman et al., 2012c). Unfortunately, data on history of daily smoking was not available for this study. However, several factors support the possibility that history of daily smoking among current nondaily smokers could correlate with higher rates of OTP use. Among nondaily smokers, former daily smokers tend to smoke more days per month (Shiffman et al., 2012c) and tend to be more dependent (Shiffman et al., 2012b); individuals with these characteristics were more likely to endorse current OTP use and using OTPs to help cut down on their smoking in the current study. This has important implications for understanding the potential role of OTPs in smoking reduction and cessation, particularly among nondaily smokers. Most nondaily smokers attempt and fail to quit each year, and these individuals are less likely to use behavioral and pharmacological cessation aids during

quit attempts than daily smokers (Tindle and Shiffman, 2011). Switching to OTPs is a prevalent cigarette reduction/cessation approach among smokers, but is not empirically supported nor recommended for cessation (Schauer et al., 2015b). One study using national survey data reported that nearly half (48%) of dual cigarette and smokeless tobacco users who made a quit attempt reported “trying to quit smoking by switching to smokeless tobacco” (Messer et al., 2015). Among “light smokers” (<12 smoking days per month) examined in this same study, dual users and exclusive cigarette smokers showed no difference in likelihood of making cessation attempts (Messer et al., 2015), suggesting that multiple tobacco product use may be unrelated to quitting initiation among lower-rate smokers. In addition, across all levels of cigarette consumption, dual users were no more likely to *successfully quit* smoking compared to exclusive cigarette smokers, and tended to relapse more quickly during quit attempts (i.e., cessation attempts are shorter; Messer et al., 2015). Other studies also suggest that OTP use is not associated with successful quit attempts (Popova and Ling, 2013; Schauer et al., 2015a). Rather, OTP use may make quitting *harder*, perhaps by maintaining nicotine dependence during cessation or reduction attempts. Assessing OTP use among nondaily smokers who are interested in quitting may be important for guiding cessation treatment. Moreover, efforts to engage smokers who are interested in cutting down or quitting smoking in the use of empirically based treatments (e.g., nicotine replacement therapy) may be helpful in reducing the use of OTPs -which are not associated with smoking cessation - and improving smoking cessation outcomes among all smokers.

The current study was subject to several limitations. Although we identified a number of significant correlations (e.g., between nicotine dependence and likelihood of OTP use among nondaily smokers), the effects were relatively modest, which may suggest a role for other factors in explaining OTP use in daily and nondaily smokers. For example, we were unable to examine OTP use in relation to smoking history or history of quit attempts among nondaily or daily smokers. We also did not have biochemical measures of nicotine intake to validate self-reported data on tobacco consumption. In addition, we did not have information on heaviness of cigarette consumption on smoking days for nondaily smokers, nor did we have data on the frequency of OTP use among daily or nondaily smokers. Thus, the extent to which heaviness of smoking correlates with *amount* of OTP consumption is unknown, which limits our ability to draw inferences about how individuals may use OTPs as a substitute for cigarettes and how use of these products may correspond to total nicotine exposure. Future studies should examine both frequency and quantity of OTP consumption in relation to cigarette consumption, and should incorporate biomarkers of nicotine exposure, in order to better understand how OTP use among smokers may affect overall nicotine intake and public health. In addition, these data were collected in 2013 and 2014, and the availability and use of other tobacco products (particularly e-cigarettes) have only become more prevalent in recent years. More studies are needed to replicate and expand upon these findings in the context of an evolving tobacco market and tobacco control climate. Finally, we did not have information on “other” reasons why nondaily smokers may be using OTPs. More research is needed in order to better understand the specific reasons for OTP use among nondaily smokers.

Findings from this study suggest that nondaily smokers are more likely than daily smokers to use combustible OTPs like hookah and cigars, but are not more likely to use noncombustible, potentially lower-risk products (e.g., snus, dissolvables, e-cigarettes). Among nondaily smokers, current OTP use did not correlate with less frequent smoking. This suggests that smokers who use OTPs may experience greater exposure to nicotine and other toxins associated with combustible tobacco product use, compared to nondaily smokers with similar patterns of cigarette consumption who do not use OTPs. In addition, greater nicotine dependence was associated with likelihood of current OTP use in nondaily smokers, suggesting that OTP use may help to maintain or promote nicotine dependence among nondaily smokers, despite low rates of smoking. Nondaily and daily smokers may also use OTPs for different reasons; specifically, our findings suggest that nondaily smokers are *less likely* than daily smokers to endorse using OTPs to reduce their smoking. However, among nondaily smokers, heavier and more dependent smokers were more likely to endorse using OTPs to cut down on their smoking. Providers should explicitly address OTP use with smokers, especially among individuals who are interested in cutting down or quitting. More work is needed to understand the frequency of and reasons for OTP use among nondaily smokers, and its potential role in maintaining smoking behavior.

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Highlights

- Nondaily (vs. daily) smokers were more likely to use other combustible products.
- Nondaily smokers were less likely to use other products to cut down on smoking.
- Higher dependence -but not smoking rate- predicted product use in nondaily smokers.
- Use of other tobacco products may promote dependence in nondaily smokers.

Figure 1. Number of different types of other tobacco products used by nondaily and daily smokers

This figure shows the percentages of nondaily and daily smokers that endorsed using various numbers of different types of other tobacco products. The top panel shows the number of different types of other tobacco products individuals reported trying ever. The bottom panel shows the number of different types of other tobacco products individuals endorsed using currently.

Table 1

Participant characteristics

	Nondaily (n=203)	Daily (n=656)	
Variable	Mean (SD) or Percent	Mean (SD) or Percent	Difference (p)
Age	43.85 (12.07)	48.61 (10.85)	<.0001
Race/Ethnicity			<.0001
White	44.55	61.59	
Hispanic	41.58	23.17	
Black	5.94	8.54	
Asian/Other	7.92	6.71	
Sex			0.019
Male	55.67	46.25	
Female	44.33	53.75	
Education			0.04
High School or less	22.50	27.44	
Some college	44.50	48.32	
College degree or higher	33.00	24.24	
Nicotine Dependence Score	40.92 (10.91)	50.41 (9.67)	<.0001
Smoking Days per Month			NA
1–2 days	5.42	0	
3–5 days	14.29	0	
6–9 days	13.30	0	
10–19 days	17.24	0	
20–27 days	49.75	0	
28+ days	0	100	

Note. Group differences assessed via bivariate chi-square tests (categorical variables) and t-tests (continuous variables).

Table 2

Differences in type of other tobacco product use across daily and nondaily smokers

Product	Ever Use (%)		Current Use (%)		Difference OR (95% CI) ^a		Difference, Controlling for Demographics OR (95% CI) ^{a, b}	
	ND	D	ND	D	Ever	Current	Ever	Current
Hookah	33.50	16.16	4.93	2.29	2.20^{***} (1.52–3.21)	1.14 (0.47–2.78)	1.58[*] (1.03–2.43)	0.71 (0.27–1.86)
Electronic Cigarette	36.95	37.96	17.24	12.20	0.93 (0.66–1.31)	1.50 (0.96–2.35)	0.75 (0.52–1.10)	1.28 (0.79–2.08)
Snus	10.34	9.6	2.96	1.68	1.10 (0.64–1.89)	1.53 (0.54–4.36)	0.97 (0.55–1.73)	1.35 (0.46–3.97)
Dissolvable Products	3.94	7.93	0.99	0.91	0.46 [†] (0.21–1.01)	0.81 (0.15–4.32)	0.41[*] (0.19–0.92)	0.49 (0.08–3.23)
Cigar	54.68	40.4	19.21	11.13	1.78^{***} (1.28–2.47)	1.51 (0.96–2.36)	1.53[*] (1.06–2.19)	1.37 (0.84–2.23)
Snuff/Chew	16.26	15.55	2.96	1.37	1.16 (0.75–1.81)	2.05 (0.69–6.09)	0.92 (0.57–1.48)	1.49 (0.47–4.72)
Any OTP Use	73.89	62.65	31.55	22.27	1.72^{**} (1.20–2.46)	1.39 (0.95–2.02)	1.35 (0.92–2.00)	1.20 (0.81–1.79)

Note.

[†] $p < .06$ ^{*} $p < .05$ ^{**} $p < .01$ ^{***} $p < .001$ ^a All models examine combined sample data, controlling for sample of origin.^b Models control for age, race, sex, and education.

ND=Nondaily smokers. D=Daily smokers.

Table 3

Differences in reasons for other tobacco product use by product type across nondaily and daily smokers

Product	Reasons for Using								Difference ^a OR (95%CI)					Difference, controlling for Demographics OR (95% CI) ^{a,b}			
	Cigarette smoking not allowed		Trying to cut down on smoking		Just wanted to try it		Other reason		Cigarette smoking not allowed	Trying to cut down on smoking	Just wanted to try it	Other reason	Cigarette smoking not allowed	Trying to cut down on smoking	Just wanted to try it	Other reason	
	ND	D	ND	D	ND	D	ND	D									
Hookah	8.82	4.72	10.29	2.83	58.82	71.70	25.00	21.70	1.24 (0.33–4.67)	--	0.72 (0.36–1.43)	1.18 (0.54–2.57)	1.14 (0.26–5.05)	--	0.46 (0.20–1.10)		2.10 (0.84–5.28)
Electronic Cigarette	17.33	20.08	30.67	48.59	61.33	51.00	17.33	7.23	1.00 (0.50–2.03)	0.58 (0.32–1.03)	1.42 (0.81–2.47)	1.80 (0.77–4.20)	0.83 (0.38–1.78)	0.55 [†] (0.30–1.02)	1.39 (0.77–2.53)		2.71 [*] (1.06–6.91)
Snus	0.00	25.40	0.00	12.70	66.67	55.56	9.52	15.87	--	--	1.84 (0.63–5.40)	0.61 (0.12–3.16)	--	--	1.76 (0.45–6.91)		0.53 (0.09–3.10)
Dissolvable	12.50	5.77	12.50	46.15	0.00	40.38	37.50	13.46	5.70 (0.28–117.24)	0.16 (0.02–1.49)	--	--	--	0.28 (0.02–3.24)	--	--	--
Cigar	0.90	1.13	10.81	15.09	54.05	56.98	41.44	32.45	0.56 (0.06–5.71)	0.51 (0.25–1.06)	1.08 (0.67–1.75)	1.46 (0.90–2.35)	1.65 (0.06–42.58)	0.54 (0.26–1.13)	0.97 (0.58–1.60)		1.60 (0.96–2.65)
Snuff/Chew	15.15	19.61	9.09	15.69	60.61	59.80	24.24	19.61	1.07 (0.34–3.38)	0.53 (0.13–2.09)	0.84 (0.36–1.99)	1.30 (0.48–3.53)	1.01 (0.28–3.61)	0.50 (0.12–2.07)	0.68 (0.27–1.70)		1.76 (0.59–5.28)
Any OTP	16.00	19.22	22.67	40.15	71.33	71.05	44.00	26.28	0.88 (0.52–1.48)	0.43 ^{***} (0.28–0.67)	1.05 (0.68–1.61)	2.05 ^{***} (1.36–3.07)	0.70 (0.40–1.23)	0.43 ^{***} (0.27–0.68)	0.86 (0.54–1.37)		2.46 ^{***} (1.56–3.86)

Note. ND = nondaily; D = daily.

[†] $p < .06$

^{*} $p < .05$

^{**} $p < .01$

^{***} $p < .001$

-- Model did not converge due to quasi-complete separation.

^a All models examine combined sample data, controlling for sample of origin.

^b Models control for age, race, sex, and education.

Effects of smoking patterns and dependence on any other tobacco product use and reasons for use

Table 4

	Nondaily Smokers		Daily Smokers	
	Smoking Days per Month	Dependence	Cigarettes per Day	Dependence
Likelihood of Any OTP Use	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Ever	1.09 (0.84–1.41)	1.03 (1.00–1.07) [†]	1.25 (1.01–1.54) [*]	1.01 (0.99–1.02)
Current	1.20 (0.91–1.57)	1.04 (1.01–1.07) [*]	1.10 (0.85–1.41)	1.01 (0.99–1.03)
Number of OTTs Used	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)	Estimate (95% CI)
Ever	0.08 (–0.02–0.18)	0.01 (–0.01–0.01)	0.06 (–0.03–0.15)	0.01 (–0.002–0.01)
Current	0.10 (–0.02–0.36)	0.01 (0.004–0.05) [*]	0.04 (–0.16–0.23)	0.01 (–0.003–0.03)
Reasons for Use	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
<i>Cigarette smoking was not allowed in the place where you were</i>	0.98 (0.68–1.41)	0.98 (0.94–1.03)	0.12 (0.80–1.56)	1.04 (1.01–1.07) ^{**}
<i>Trying to cut down on smoking cigarettes</i>	1.74 (1.16–2.62) ^{**}	1.09 (1.04–1.15) ^{***}	0.89 (0.68–1.16)	1.05 (1.02–1.07) ^{***}
<i>Just wanted to try it</i>	1.04 (0.77–1.39)	0.97 (0.94–1.01)	1.04 (0.78–1.39)	0.98 (0.96–1.00)
<i>Some other reason</i>	1.03 (0.79–1.35)	1.01 (0.98–1.04)	1.03 (0.76–1.39)	0.99 (0.97–1.01)

Note. OR=odds ratio. Smoking days per month categorized as 1–10 days, 11–20 days, 21–27 days. Cigarettes per day categorized as 1–10 cigarettes per day, 11–20 cigarettes per day, 21 or more cigarettes per day. Odds ratios and estimates are from separate within-group (i.e., nondaily smokers; daily smokers) models using the combined sample, controlling for participant sample of origin.

[†] p < .06

^{*} p < .05

^{**} p < .01

^{***} p < .001