

Original Investigation

Characteristics of current and recent former smokers associated with the use of new potential reduced-exposure tobacco products

Mark Parascandola, Erik Augustson, & Allison Rose

Abstract

Objectives: To identify sociodemographic characteristics associated with having tried a potentially reduced-exposure tobacco product (PREP) and to compare the smoking and quitting behaviors and attitudes of smokers who have tried a PREP product with non-PREP users.

Methods: Analysis is based on a sample of 43,419 current and recent former smokers from the 2003 Tobacco Use Supplement to the Current Population Survey.

Results: Overall, PREP use is low (2.5%). Current daily and someday only smokers have higher rates of use (2.9% and 2.4%, respectively) compared with former smokers (1.5%). PREP use is higher in southern states and among younger smokers, non-Hispanic Whites, and those with some college education. Smokers who have tried a PREP product are more likely to smoke light or ultra-light cigarettes, report more symptoms of nicotine dependence, smoke more cigarettes per day, report a higher number of quit attempts, and seek quitting assistance from pharmacotherapy and behavioral therapies compared with non-PREP users.

Discussion: These findings support the concern that current smokers who are highly dependent yet motivated to quit smoking may seek PREPs as an alternative strategy to smoking cessation.

Introduction

A range of new tobacco products are being marketed to smokers as alternatives to conventional cigarettes with messages, explicit or implied, suggesting that they offer reduced exposure or risk compared with other products. These new potential reduced-exposure tobacco products (PREPs) include both

modified cigarettes and smokeless tobacco products (Pederson & Nelson, 2007). Currently, evidence is insufficient to determine whether these products result in meaningful reductions in risk or exposure compared with conventional tobacco products (Stratton, Shetty, Wallace, & Bondurant, 2001). Moreover, the marketing of PREPs poses substantial challenges for tobacco control efforts as tobacco control advocates and public health experts have raised concerns that use of these products may serve as an alternative to cessation for smokers or as a gateway to tobacco use initiation among nonusers (Joseph, Hennrikus, Thoele, Krueger, & Hatsukami, 2004; Martin, Warner, & Lantz, 2004; Warner & Martin, 2003).

Indeed, past experience with low-tar, light, and ultra-light cigarettes demonstrates how smokers may switch to a new brand with an expectation of health benefit, possibly instead of quitting (Kozlowski et al., 1998). Industry document research by Cataldo and Malone (2008) reveals that the tobacco companies developed low-tar and light cigarettes as a strategic marketing response to the health concerns of older smokers and targeted product sales to counter cessation efforts among this population. While smokers continue to believe that low-tar cigarettes are less harmful (Borland et al., 2004; Cummings, Hyland, Bansal, & Giovino, 2004; Shiffman, Pillitteri, Burton, Rohay, & Gitchell, 2001), epidemiological studies have failed to show any substantial benefit for smokers who switched from full flavor to low-tar brands (National Cancer Institute, 2001). Similarly, since the 1950s, the tobacco industry has been exploiting the medicinal properties of menthol to capture a population of smokers who perceive menthol cigarettes as healthier alternatives to regular cigarettes (Pollay & Dewhirst, 2002). Menthol levels in cigarettes have been manipulated and marketed by the industry to attract and maintain smokers who might otherwise be deterred by the harsh and irritating effects associated with regular cigarettes, including youth, beginning or occasional smokers, and smokers who may be concerned about the health effects of regular cigarettes (Kreslake, Wayne, & Connolly, 2008).

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Characteristics of current and recent former smokers

The experience of low-tar, light, and menthol cigarettes highlights the need for continual monitoring and surveillance of industry marketing efforts for new products, especially products, such as PREPs, that may be marketed or perceived as healthier alternatives to regular cigarettes.

Because PREPs are relatively new and may be available in only limited test markets (Hickman et al., 2004; Slater, Giovino, & Chaloupka, 2008), few published data are currently available about prevalence of use of these products. Previous studies have shown that smokers express strong interest in trying PREPs and/or perceive them to have lower health risks, even when advertising messages do not make explicit health claims (Caraballo, Pederson, & Gupta, 2006; Hund et al., 2006; O'Connor, Hyland, Giovino, Fong, & Cummings, 2005; Shiffman, Pillitteri, Burton, & Di Marino, 2004; Shiffman et al., 2001). To date, two surveys have provided national data on prevalence of PREP use, but these studies are limited in size and scope and did not allow for in-depth analysis of correlates of PREP use (Hund et al.; Parascandola, Augustson, O'Connell, & Marcus, 2009).

To address this research gap, a question was added about PREP use to the Tobacco Use Supplement (TUS) to the Current Population Survey (CPS), a large-scale nationally representative survey of U.S. adults. Using data from this survey, we sought to address three major aims: first, to provide national estimates of the prevalence of use of PREP products; second, to identify correlates of use in order to understand who is most likely to use PREPs (i.e., demographics and tobacco use behaviors); third, to understand the health beliefs and behaviors of PREP users, contrasted with nonusers, that may help understand why they use PREPs.

Methods

Sample population

Data for this analysis were drawn from the 2003 TUS to the CPS. The CPS is a national, monthly, household, interviewer-administered complex survey, which is administered in all 50 states. Conducted by the U.S. Census Bureau, the CPS primarily serves as the source of official government statistics on employment for the noninstitutionalized civilian population, aged 15 years and older in the United States (U.S. Census Bureau, 2002). Every 3 years since 1992, the TUS has been sponsored by the National Cancer Institute to measure a variety of smoking-related topics. The design of this survey allows for stable estimates of state and U.S. national population smoking rates. Given the importance of the parent survey and that it is run by the U.S. Census Bureau, both the CPS and the TUS data collection and data cleaning go through extensive quality checks, and the survey items themselves are vetted through a multistep validity process (U.S. Census Bureau, 2006).

The 2003 TUS-CPS includes responses from ~250,000 individuals, of whom 60% report never smoking, 18% report current smoking, and 22% ($n = 39,699$) report former smoking. Proxy responses are permitted in the CPS; however, the TUS specifically attempts to avoid proxy responses, and only self-report interviews were used for this analysis. The final household response rate for the survey was greater than 90%, and the

self-report-only response rate for the TUS was greater than 65% (U.S. Census Bureau, 2006).

All individuals included in this study were at least 18 years of age. Only current and former smokers who had quit within the past 5 years were asked questions on the TUS-CPS regarding PREPs, so data from only these individuals were used in this analysis. In addition, individuals who did not answer questions related to PREP use were dropped from the sample. Data were missing from less than 5% of those eligible to answer the PREP questions. Former smokers were defined as those individuals who reported that they had smoked at least 100 cigarettes in their life, were not currently smoking, and had quit within the past 5 years. The timeframe of abstinence was selected because only former smokers who had quit within the past 5 years were asked the question related to PREP use on the TUS-CPS. Current smokers were defined as having smoked 100 cigarettes in their lifetime and currently smoking. Current smokers were divided into daily and someday smokers. The final sample consisted of 10,088 former smokers and 33,331 current smokers, of whom 27,273 were daily smokers and 6,058 were someday smokers.

Table 1 describes the demographic characteristics of all 43,419 current and former smokers included in the study sample. As shown in the table, the majority report being current daily smokers (62%) compared with being current someday smokers (15%) or former smokers (23%). The sample also included a higher percentage of males compared with females (53% vs. 47%), and most participants reported ages within the 26–44 and 45–64 years of age categories (42% and 33%, respectively). The majority of participants were non-Hispanic Whites (78%), reported having a high school diploma (38%) or at least some level of college education (45%), and worked in white-collar (51%) or service (31%) professions. Geographically, participants were most likely to reside in the Midwest (26%) and South (37%) compared with the Northeast (18%) or West (19%).

Dependent variables (PREP use)

PREP use was assessed on the TUS-CPS with a question that inquired about the use of a series of products that were available in 2003: Eclipse, Accord, Ariva, Exalt, Revel, Omni, and Advance. Survey participants were asked the following: "Now, I'm going to ask about your use of new tobacco products that are sometimes claimed to have fewer harmful chemicals. Have you ever tried a product called —?" PREP use was defined as a dichotomous (yes/no) variable based on reported use of any product named in the survey.

Independent variables

Demographic variables routinely collected as part of the CPS were included in the analyses: gender, age, race/ethnicity, education level, employment status, occupation code, enrollment in school, geographic region, rural versus metropolitan living location, and income. Occupational categories were based on the 2002 Census Bureau industry and occupational classification systems, derived from the 2002 North American Industry Classification System and the 2000 Standard Occupational Classification system (Bowler, Ilg, Miller, Robison, & Polivka, 2003). Occupation, defined as usual job or latest full-time job lasting 2 or more weeks, was grouped into four categories: white-collar

Table 1. Sample characteristics of Tobacco Use Supplement to the Current Population Survey: Current and former smokers

Variables	Current and former smokers, N = 43,419 (%)
Smoking status	
Current, everyday	27,273 (62.1)
Current, someday	6,058 (14.8)
Former	10,088 (23.1)
Gender	
Male	20,866 (53.4)
Female	22,553 (46.6)
Age	
<25	5,826 (17.5)
26–44	18,379 (41.9)
45–64	15,211 (32.9)
65+	4,003 (7.7)
Race/ethnicity	
Non-Hispanic White	34,947 (77.5)
Non-Hispanic Black	3,363 (10.3)
Hispanic/Latino	2,772 (8.9)
Asian/Pacific Islander	771 (2.4)
American Indian	674 (0.9)
Education	
<12 years	6,447 (15.7)
GED	669 (1.8)
High school graduate	16,927 (38.0)
Some college +	19,376 (44.6)
Occupation	
White-collar	16,489 (51.0)
Blue-collar	5,796 (17.6)
Service	9,206 (30.5)
Other	271 (0.9)
Geographic location	
Midwest	12,055 (25.6)
South	12,828 (36.9)
West	9,852 (19.3)
Northeast	8,684 (18.2)

Note. GED = General Equivalency Diploma.

(management, business, and financial operations; professional and related occupations; sales and related occupations; and office and administrative support), blue-collar (construction and extraction; installation, maintenance, and repair; production; and transportation and material moving occupations), service (health care support, protective services, building and grounds maintenance, and personal care occupations), and other. The “other” category included those in the armed forces and those working in farming, forestry, and fishing.

The following variables from the TUS-CPS related to *smoking behavior* were also included: smoking status, cigarettes per day (CPD), cigarette type, time to first cigarette, ever having switched to a light cigarette, use of menthol cigarettes, use of other tobacco products, history of quit attempts, use of cessation pharmacotherapy at last quit attempt, use of behavioral treatment at last quit attempt, intentions to quit, and perceived likelihood of future quit success. Nicotine dependence was assessed on the 2003 TUS-CPS with items from the Shiffman

Nicotine Dependence Syndrome Scale and an item asking about time to first cigarette in the morning. Items from this test were summed to create a score ranging from 0 (*lowest*) to 4 (*highest*) levels of nicotine dependence. In addition, three questions from the TUS-CPS assessing beliefs about light cigarettes (“give less tar,” “are safer to smoke,” and “feel smoother and easier on the chest”) were included in the analysis. *Environmental variables* used in the analysis were restrictions on smoking behavior in work settings and/or home, health care provider contact, and advice to quit smoking by a health care provider.

Statistics

Analyses were performed using SAS-callable SUDAAN, release 8.0 (Research Triangle Institute, 2001), which corrects *SEs* to account for the complex sampling design of the CPS survey (U.S. Census Bureau, 2002). National population estimates and corrected standard errors were calculated based on the CPS sample weight for self-report interviews and the appropriate CPS replicate weights (U.S. Census Bureau). Using classic contingency table analysis, we compared PREP users with PREP nonusers for the sample as a whole (current and former smokers) and among daily smokers. Reported *p* values are based on chi-square tests using corrected standard errors derived from SUDAAN PROC CROSSTAB. Logistic regression was performed comparing all current and former smokers PREP users with PREP nonusers. Variables were selected for the model based on the bivariate analysis and included smoking status (daily, someday, and former), age, race/ethnicity, education level, occupation code, geographic region, CPD, cigarette type, ever having switched to a light cigarette, use of other tobacco products, health care provider contact in past 12 months, and participant opinion regarding smoking restrictions in bars. Some variables that were significant in the bivariate analysis were excluded from the multivariate analysis because they were not asked of all respondents, either because only current smokers were eligible for these questions or because of skip patterns within the survey. Variables not included in the analysis included nicotine dependence, history of quit attempts, use of cessation pharmacotherapy, use of behavioral treatment, and beliefs about light cigarettes. Odds ratios (*ORs*) and 95% *CI*s were calculated using the SUDAAN procedure PROC RLOGIST.

Results

PREP use by smoking status and demographic characteristics

Table 2 (under %PREP use) shows the prevalence of PREP use by smoking status and demographic characteristics of all current and former smokers. A total of 1,005 or 2.5% of current and former smokers reported having tried at least one of the seven PREP products referenced in the survey. Prevalence of PREP use varied significantly across three categories of smoking status (*p* = .000); prevalence was highest among current daily smokers (2.9%), lower among current nondaily smokers (2.4%), and lowest among former smokers (1.5%). Among those who had tried a PREP product, 75% reported having tried Eclipse; use was substantially lower for other brands, including Accord (14%), Ariva (17%), Exalt (10%), Revel (10%), Omni (20%), and Advance (20%; data not shown).

Table 2. PREP use by demographic characteristics and demographic profile of PREP versus non-PREP users (among all 43,419 current and former smokers)

Variables ^a	% PREP use	PREP vs. non-PREP users		p Value
	Total N = 1,005 (2.5%)	PREP users, N = 1,005 (%)	Non-PREP users, N = 42,414 (%)	
Gender				
Male	2.51	481 (53.4)	20,385 (53.4)	1.0000
Female	2.51	524 (46.6)	22,029 (46.6)	
Age				
<25	3.65	202 (25.4)	5,624 (17.3)	.0000
26–44	2.44	425 (40.7)	17,954 (42.0)	
45–64	2.24	321 (29.3)	14,890 (33.0)	
65+	1.51	57 (4.6)	3,946 (7.8)	
Race/ethnicity				
Non-Hispanic White	2.67	830 (82.5)	34,117 (77.4)	.0332
Non-Hispanic Black	1.81	67 (7.5)	3,296 (10.4)	
Hispanic/Latino	1.95	55 (6.9)	2,717 (9.0)	
Asian/Pacific Islander	1.97	14 (1.9)	757 (2.4)	
American Indian	3.50	16 (1.2)	658 (0.8)	
Education				
<12 years	2.35	145 (14.7)	6,302 (15.7)	.0151
GED	2.70	19 (1.9)	650 (1.8)	
High school graduate	2.19	353 (33.0)	16,574 (38.1)	
Some college +	2.84	488 (50.4)	18,888 (44.5)	
Occupation				
White-collar	2.76	404 (53.6)	16,085 (50.9)	.0020
Blue-collar	2.88	156 (19.4)	5,640 (17.6)	
Service	2.29	195 (26.7)	9,011 (30.6)	
Other	0.80	4 (0.3)	267 (0.9)	
Geographic location				
Midwest	2.48	293 (25.2)	11,762 (25.6)	.000
South	3.22	369 (47.2)	12,459 (36.6)	
West	1.96	174 (15.1)	9,678 (19.4)	
Northeast	1.73	169 (12.5)	8,515 (18.4)	

Note. GED = General Equivalency Diploma; PREP = potential reduced-exposure tobacco product.

^aOther variables considered in the bivariate analyses included income, employment status, school enrollment, and living in a metropolitan location; however, there were no statistically significant findings at the .05 level for these variables.

Rates of PREP use did not vary by gender; however, PREP use did vary significantly by age, race/ethnicity, education, occupation, and geographic location. Specifically, rates of PREP use declined as respondents' age increased, with those less than 26 years of age most likely to have tried a PREP product (3.65%) compared with older adults ($p = .000$). Also, non-Hispanic Whites and American Indians/Alaska Natives were significantly more likely to have tried a PREP product (2.67% and 3.50%, respectively) compared with non-Hispanic Blacks (1.81%), Hispanics/Latinos (1.95%), and Asians/Pacific Islanders (1.97%; $p = .03$). Rates of PREP use were highest among those with a General Equivalency Diploma (2.70%) and at least some college-level education (2.84%) compared with those with less than a high school diploma (2.35%) or a high school diploma only (2.19%; $p = .015$); white-collar and blue-collar workers reported significantly higher rates of PREP use (2.76% and 2.88%, respectively) compared with those working in a service profession (2.29%; $p = .002$). Finally, respondents living in the South were most likely to have tried a PREP product (3.22%) compared with those living in other parts of the country, where PREP use ranged from 1.73% in the North-

east to 2.48% in the Midwest ($p = .000$). There were no statistically significant differences in rates of PREP use by income, employment status, school enrollment, and living in a metropolitan versus nonmetropolitan location.

Tobacco-related behaviors, beliefs, and intentions to quit among PREP users versus non-PREP users

Supplementary Table 1 compares the tobacco-related behaviors and beliefs of current and former smokers who had tried a PREP product (also referred to as PREP users) with those who had not tried a PREP product (referred to as non-PREP users).

Smoking behaviors and beliefs. As shown in Supplementary Table 1 (under PREP vs. non-PREP users), smoking consumption behaviors varied significantly among PREP and non-PREP users. Specifically, PREP users had lower rates of very light smoking, i.e. ≤ 5 CPD, compared with non-PREP users (14.3% vs. 19.0%) and higher rates of heavy smoking, i.e. ≥ 20 CPD, compared with non-PREP users (51.6% vs. 45.8%; $p = .000$).

PREP users were also more likely than non-PREP users to be daily smokers (72.1% vs. 61.8%; $p = .000$) and to use other tobacco products (e.g., cigars; 43.0% vs. 28.8%; $p = .000$).

Cigarette type also varied significantly between PREP and non-PREP users ($p = .000$). Specifically, PREP users were more likely than non-PREP users to smoke light or mild cigarettes (46.0% vs. 41.7%). PREP users were also more likely than non-PREP users to smoke ultra-light cigarettes (15.6% and 12.1%). Furthermore, PREP users were significantly more likely to report switching to a light cigarette for at least 6 months (48.6%) compared with non-PREP users (33.7%; $p = .000$). PREP users are more likely to report that light cigarettes feel smoother and easier on the chest than regular cigarettes (70.3% compared with 63.5%; $p = .001$). However, PREP users were not more likely to believe that light cigarettes give less tar or are safer to smoke than regular cigarettes.

PREP users report higher levels of nicotine dependence compared with non-PREP users. Approximately 54% of PREP users scored above the median score of nicotine dependence compared with only 46.5% of non-PREP users ($p = .000$). PREP and non-PREP users did not differ significantly in use of menthol cigarettes or time to first cigarette.

Quitting and other health behaviors and intentions. As shown in Supplementary Table 1 (under PREP vs. non-PREP users), PREP users were significantly more likely to report ever having made a quit attempt of at least 1 day compared with non-PREP users (75.5% compared with 69.7%; $p = .004$). PREP users were also more likely than non-PREP users to report using pharmacotherapy (37.2% vs. 25.8%; $p = .000$) and behavioral treatments (32.8% vs. 24.2%; $p = .002$) during their last quit attempt in the past year compared with non-PREP users. There were no statistically significant differences between PREP and non-PREP users with respect to quitting intentions and likelihood of success among those who intended to quit. Also, although PREP users were more likely than non-PREP users to report seeing a health care provider in the past year (75.3% vs. 71.7%; $p = .030$), rates of provider advice to quit were similar between PREP and non-PREP users who had seen a medical professional in the past year.

Worksite and home smoke-free policies and attitudes toward public smoke-free policies. As shown in Supplementary Table 1 (under PREP vs. non-PREP users), PREP and non-PREP users reported similar rates of worksite smoking policies (~85% for both groups) and home smoking policies, with slightly more than 40% of both groups reporting that no one was allowed to smoke anywhere inside the home. However, attitudes toward public smoke-free policies varied significantly by PREP use status. Specifically, 37.6% of PREP users believed that smoking should be allowed in all public places compared with 31% of non-PREP users, and only 7.6% of PREP users believed that smoking should not be allowed at all in public places compared with 12.1% of non-PREP users ($p = .000$).

Multivariate results

As shown in Table 3, results from the logistic regression analysis confirm many of the bivariate findings. Age remained a significant predictor of PREP use. Compared with those aged 65 years or older, respondents aged 25 years or younger are more than

Table 3. Multivariate results: Odds of being a PREP versus non-PREP user

	OR	95% CI
Smoking status		
Current, daily	1.38	0.87–2.18
Current, nondaily	1.59	0.89–2.84
Former	1.00	
Age		
<25	5.31	2.00–14.09
26–44	2.87	1.14–7.21
45–64	2.47	0.92–6.59
65+	1.00	
Race/ethnicity		
Non-Hispanic White	1.03	0.76–1.41
Other	1.00	
Education		
<12 years	1.26	1.01–1.56
12+ years	1.00	
Occupation		
White-collar	1.27	1.00–1.61
Blue-collar	1.24	0.89–1.73
Service	1.00	
Geographic location		
Midwest	1.64	1.21–2.22
South	2.22	1.65–2.99
West	1.43	1.03–1.98
Northeast	1.00	
CPD		
<5	1.00	
6–10	1.31	0.88–1.94
11–19	1.63	1.02–2.60
20+	1.90	1.24–2.91
Cigarette type		
Light/mild	1.13	0.91–1.39
Ultra-light	1.22	0.89–1.68
Regular/full flavor	1.00	
Ever switch to light cigarette for 6 months		
Yes	1.43	1.16–1.76
No	1.00	
Other tobacco use (ever)		
Yes	1.73	1.44–2.08
No	1.00	
Public smoking policy attitude		
Allowed all areas	1.54	1.01–2.34
Allowed some areas	1.26	0.82–1.95
Not allowed at all	1.00	
HCP visit: past year		
Yes	1.19	0.99–1.43
No	1.00	

Note. CPD = cigarettes per day; HCP = health care provider; OR = odds ratio; PREP = potential reduced-exposure tobacco product.

five times as likely to have tried a PREP product ($OR = 5.31$; $CI = 2.00–14.09$), and those aged 26–44 years are nearly three times as likely to have tried a PREP product ($OR = 2.87$; $CI = 1.14–7.21$). Living in a geographic location outside the Northeast also remained a significant predictor of PREP use, with those living in the South reporting more than twice the odds of having tried a

PREP product compared with those in the Northeast ($OR = 2.22$; $CI = 1.65-2.99$). Having a post high school education also predicted PREP use compared with those with lower educational levels ($OR = 1.26$; $CI = 1.01-1.56$). Occupation and race/ethnicity are no longer significant predictors of PREP use.

Logistic regressions results also indicated that higher cigarette consumption was associated with PREP use. Specifically, those who report smoking 20 or more CPD were nearly twice as likely to have tried a PREP product compared with those who smoked 5 or fewer CPD ($OR = 1.90$; $CI = 1.24-2.91$). Respondents who had switched to a light cigarette for at least 6 months were also more likely to have tried a PREP product compared with those who had never switched to a light cigarette ($OR = 1.43$; $CI = 1.16-1.76$).

Discussion

According to our results, the overall prevalence of PREP use among U.S. adult current and former smokers is relatively low (2.5%). However, we found that there were substantial differences in PREP use across demographic groups and by smoking status. In particular, PREP use was higher among heavier smokers and those who were younger, non-Hispanic White, and more educated.

PREP users differed from non-PREP users in some important health beliefs and behaviors. Interestingly, while PREP users were more likely to smoke light cigarettes, PREP use was not associated with a belief that light cigarettes are safer or give less tar. At the same time, PREP use was associated with a belief that light cigarettes feel smoother and easier on the chest. While these results do not necessarily reflect respondents' beliefs about the specific PREP brands named in the survey, they do suggest that PREP users may not have an explicit expectation of health benefit from using a PREP-type product. Instead, those who try PREPs may be motivated more by sensory factors, such as "smoothness," than by specific health beliefs. PREP users may also be more interested in trying new products in general; we found that PREP users were more likely to use other non-cigarette tobacco products than were non-PREP users. Additionally, we found in another survey that interest in PREPs was associated with non-health-related factors, including favorable attitudes toward technology and a willingness to experiment with new products and trends (Parascandola, Hurd, & Augustson, 2008). Nevertheless, several previous studies have found that advertising messages for PREP-type products can influence smokers' beliefs regarding potential harm (Hamilton et al., 2004; O'Connor et al., 2007; O'Hegarty, Richter, & Pederson, 2007; Shiffman et al., 2007; Strasser, Tang, Tuller, & Cappella, 2008). Thus, further study is warranted here to better understand consumers' expectations and health beliefs about PREP products under different conditions.

We also found that PREP users had higher addiction scores and were more likely to have made a quit attempt and used pharmacologic or behavioral treatments. However, they were not necessarily more successful at quitting, as most PREP users were current smokers. A cluster of findings from this study—the relationship of PREP use with increased tobacco use (frequency and amount), greater use of light cigarettes, and increased levels of addiction—warrants concern about the po-

tential impact of PREPs on quitting. Smokers who are highly dependent and seeking help with their addiction may be more vulnerable to the new PREP products on the market. While these smokers are in the greatest need of assistance in quitting, they may instead see these novel products as an alternative to cessation. We also found that PREP users were more likely to oppose smoking restrictions; PREP users may feel a greater impact from smoking restrictions because they show higher levels of addiction and may have more difficulty quitting despite having made more quit attempts.

Our findings are consistent with previous findings that use of PREPs is limited (Biener & Bogen, 2007; Parascandola et al., 2008, 2009). However, previous studies have suggested that smokers' interest in trying PREPs is high, particularly among "health conscious" smokers (Hund et al., 2006; Shiffman et al., 2004; Steinik, 2004). Thus, the low reported use may reflect the current limited availability and marketing of these products. Nevertheless, the introduction of new products into the market is a dynamic process and this situation may change. In 1997, both Philip Morris and R. J. Reynolds introduced new smokeless tobacco products using the familiar brand names Marlboro and Camel (Feder, 2007).

There are some limitations to this study that are important to acknowledge. Our findings suggest that Eclipse was by far the most widely used PREP compared with other brands included in the survey. However, estimates of brand awareness should be interpreted cautiously, as some brands (such as Eclipse) have names that are similar to those of other, more widely available consumer products (Parascandola et al., 2008). Additionally, because this is a cross-sectional study, which asked whether respondents had tried a PREP, we were not able to assess patterns of use over time or distinguish between trial and ongoing use. The survey recorded PREP use in 2003 and does not necessarily reflect current PREP use or use of brands introduced after 2003. Because so few respondents had tried a smokeless-type PREP product in 2003, we were not able to draw distinctions between users of different categories of PREP products (e.g., smoked vs. smokeless).

This survey provides important baseline national prevalence information about PREP use in the United States. However, it is important to continue to monitor ongoing PREP use as the market and consumer behavior evolves. Larger surveys like this one should also be complemented by smaller, rapid-response surveys in emerging test markets to respond more quickly to the introduction of new products. Additionally, given the findings here suggesting that PREP use is related to particular health beliefs and behaviors, more in-depth research is needed to further explore the cognitive and behavioral processes associated with use of different types of tobacco products.

Supplementary material

Supplementary Table 1 can be found at *Nicotine and Tobacco Research* online (<http://www.ntr.oxfordjournals.org/>).

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Declaration of Interests

None declared.

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