



Changes in use of cigarettes and non-cigarette alternative products among college students



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HIGHLIGHTS

- E-cigarette use increased to 25% among cigarette smokers and 3% for non-smokers.
- Cigarette smokers were 8.5 times more likely than non-smokers to use e-cigarettes.
- Hookah use increased among non-cigarette smokers, but declined among smokers.

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ABSTRACT

Introduction: The present study examined change in use of various smoked and smokeless non-cigarette alternative products in a sample of college students, stratified by current, or past 30-day, cigarette smoking status.

Methods: Participants were 698 students from seven four-year colleges in Texas. Participants completed two waves of online surveys regarding tobacco use, knowledge, and attitudes, with 14 months between each wave.

Results: The most prevalent products used by the entire sample at Wave 1 were cigarettes, followed by hookah, cigars/cigarillos/little cigars, and electronic cigarettes (e-cigarettes). At Wave 2, prevalence of e-cigarette use surpassed use of cigars/cigarillos/little cigars. Snus and chew/snuff/dip were relatively uncommon at both waves. Examination of change in use indicated that e-cigarette use increased across time among both current cigarette smokers and non-cigarette smokers. Prevalence of current e-cigarette use doubled across the 14-month period to 25% among current smokers and tripled to 3% among non-cigarette smokers. Hookah use also increased across time, but only among non-cigarette smokers, whereas it decreased among current cigarette smokers. Use of all other non-cigarette alternatives remained unchanged across time. Logistic regression analysis was used to examine the socio-demographic predictors of Wave 2 e-cigarette use, the only product that increased in use among both current cigarette smokers and non-cigarette smokers. Results indicated that Wave 1 current cigarette use and Wave 1 current e-cigarette use, but not gender, age, or race/ethnicity, were significantly associated with Wave 2 e-cigarette use.

Conclusions: Findings underscore the need to track changes in the use of non-cigarette alternatives and call for additional research examining the factors contributing to change in use.

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1. Introduction

While cigarette use in the United States (U.S.) declined between 2005 and 2012 (Agaku, King, and Dube, 2014), use of non-cigarette alternative products, such as little cigars, snus, and electronic cigarettes (e-cigarettes) became increasingly prevalent (Connolly and Alpert, 2008; King, Alam, Promoff, Arrazola, and Dube, 2013). In 2010, an estimated 13.6% of adults tried one of the following: snus, hookah,

dissolvable tobacco, or an e-cigarette (McMillen, Maduka, and Winickoff, 2012). By 2013, lifetime use of e-cigarettes alone was 9.4% among the general adult population (King, Patel, Nguyen, and Dube, 2015). Young adults have the highest rates of use of non-cigarette alternatives, with one study indicating that young adults were nine times more likely than older adults to have tried snus (Biener, McCausland, Curry, and Cullen, 2011). Yet, there is limited research on young adult's use of non-cigarette alternatives. The purpose of the present study was to examine trends in use of non-cigarette alternative products by young adult college students across approximately 14 months.

Non-cigarette alternatives are either smoked (e.g., hookah and cigars) or smokeless (e.g., snus and e-cigarettes). Cigarette smokers are more likely than non-cigarette smokers to use both smoked and

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smokeless non-cigarette alternatives (Biener and Bogen, 2009; McMillen et al., 2012). Using data from a national study of college students, Jarrett, Blossnich, Tworek, and Horn (2012) found that 28.5% of current cigarette smokers were current hookah users in comparison with 5.9% of non-cigarette smokers. Regarding smokeless products, Popova and Ling (2013) showed that 38% of current and former cigarette smokers tried loose or moist snuff, snus, dissolvable tobacco, or e-cigarettes, and 13.6% used one of these in the past 30 days. Popova and Ling also reported that among the products examined, e-cigarettes were the most commonly used non-cigarette alternatives, and the product that current and former cigarette smokers were most receptive to trying in the future.

Use of non-cigarette alternatives is concerning for several reasons. First, smoked non-cigarette alternatives, like hookah, contribute to serious health problems, such as heart disease and lung cancer (Cobb, Ward, Maziak, Shihadeh, and Eissenberg, 2010). Smokeless alternatives are believed to be safer than traditional cigarettes. However, most smokeless products are not regulated by the U.S. Food and Drug Administration (FDA); thus, their safety has yet to be determined. Second, non-cigarette alternatives are being used as smoking cessation aids (Etter, 2010), even though there is no empirical evidence that they help cigarette smokers permanently quit. Use of these products may therefore sustain addiction. Finally, because smokeless products are marketed for use in places where smoking is not allowed (Mejia and Ling, 2010), these products may be used concurrently with cigarettes, especially when and where smoking is not allowed. Concurrent use of two or more products may result in additive or even multiplicative negative health effects (Wetter et al., 2002) and lead to escalated use and addiction among intermittent cigarette smokers (White, Bray, Fleming, and Catalano, 2009), or prolong addiction and fewer quit attempts among addicted smokers (Parascandola, Augustson, and Rose, 2009). Consequently, use of non-cigarette alternatives has considerable public health risks.

Relatively little is known about trends in use of non-cigarette alternative products across time (King et al., 2013, 2015; McMillen, Gottlieb, Whitmore Schaefer, Winickoff, and Klein, in press). One exception is a study conducted by King et al. (2015), which examined e-cigarette use in representative samples of U.S. adults in 2010 and 2013. The researchers found that prevalence of ever use of e-cigarettes more than doubled across the three-year period from 3.3% in 2010 to 8.5% in 2013. Further findings indicated that current (i.e., past 30-day) cigarette smokers had the highest rate of current e-cigarette use and were more likely than their peers to have ever used this product. These results highlight the need to monitor trends in use of non-cigarette alternatives across time, particularly among cigarette smokers. However, King et al.'s study was limited to examination of only one type of non-cigarette alternative, e-cigarettes, and implications from their data are limited by potential cohort effects because different samples were assessed in 2010 and 2013. Rather, to assess changes in use of non-cigarette alternatives, it is necessary to examine prevalence in the same sample across time.

The present study extends existing research by examining change in use of smoked and smokeless non-cigarette alternatives (i.e., cigars/cigarillos/little cigars, hookah, chew/snuff/dip, snus, and e-cigarettes) by 18 to 35 year old college students over an approximately 14-month period of time. The sample was drawn from four-year colleges because they are over-represented by young adults who tend to have the highest rates of use of non-cigarette alternatives. Given that cigarette smokers are more likely than their peers to use these products (Biener and Bogen, 2009; McMillen et al., 2012; Sutfin, McCoy, Morrell, Hoepfner, and Wolfson, 2013), we examined change in use separately for current cigarette smokers and non-cigarette smokers. Finally, for non-cigarette alternative products that showed a significant increase in use across time, we assessed the role of Wave 1 current smoking status and various socio-demographic predictors in increased use across time.

2. Material and methods

2.1. Participants

Participants were a convenience sample of 698 students from seven urban four-year colleges within the University of Texas System. Students participated in the study at two waves, with approximately 14 months between each wave. Wave 1 occurred in spring 2012 and Wave 2 in spring 2013. Students were initially 18–35 years old (*mean age* = 22.98; *standard deviation* = 4.21), and 10.7% were freshmen, 18.5% were sophomores, 25.9% were juniors, 29.4% were seniors, and 15.5% were graduate students. Over half (56%) of the 698 students were female; 42.5% were non-Hispanic white, 43.3% were Hispanic/Latino, 2.6% were African-American/Black, 6.9% were Asian, and 4.8% reported another race/ethnicity.

2.2. Procedure

The University of Texas at Austin Institutional Review Board gave approval for the two waves of data collection. Students were recruited to participate in the study via their university provided email addresses, which were obtained through open records requests from each of the universities, made possible due to the Public Information Act. In fall 2011, undergraduate enrollment at the seven universities ranged from 3094 to 38,437, summing to a total of 120,280 students. Almost 86,000 (85,659) student emails were provided through the open records request. After removal of 871 bounce-backs and 604 unsubscribed students, the adjusted sampling frame was 84,184 students.

In early spring 2012, students received an email introducing the study and indicating that an electronic survey invitation would be distributed two to three days later. The invitation provided a brief survey description and the hyperlink to the survey. Students who did not participate in the survey were sent two reminders. Upon completion of the survey, students were asked if they would be willing to participate in the second wave of the study. Of the 84,184 students who received an e-mail invitation, 8904 agreed to participate. However, 63 students were under the age of 18 and 1092 did not report their age, and were subsequently removed from the sample. Thus, a total of 7749 students, 18 years of age and older participated in Wave 1 and of these, 3444 indicated they would be willing to participate in a future wave. Approximately 14 months after Wave 1, the 3444 students were sent another round of four emails, inviting and reminding them to participate in Wave 2 of the study. After removal of 104 emails that were undeliverable, 3340 students were invited to participate in Wave 2. Of the 3340 students who participated in Wave 1 and who were willing to participate in Wave 2, a total of 765 completed the online survey at Wave 2. Given our focus on young adults, only data from the 698 students who were 18–35 years old at Wave 1 were retained for this study. Note, however, that sample sizes for individual analyses varied due to missing data, which ranged from zero cases for student's age and race/ethnicity to 20 cases for Wave 2 current snus use.

2.3. Measures

2.3.1. Current tobacco and e-cigarette use

Current use of cigarettes, cigars/cigarillos/little cigars, hookah, chewing tobacco/snuff/ dip, snus and e-cigarettes was assessed with the same question at both study waves. The question, "During the past 30 days, on how many days did you use ____?" (Starr et al., 2005), had seven response options, including '0 days', '1 to 2 days', '3 to 5 days', '6 to 9 days', '10–19 days', '20–29 days' and 'all 30 days.' Responses for each product were recoded into a dichotomous variable (0 = 0 days and 1 = 1 to 2 days or more in the past 30 days).

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