



What are young adults smoking in their hookahs? A latent class analysis of substances smoked



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HIGHLIGHTS

- We explore substances that college students smoke in hookahs.
- 44% of students had smoked tobacco from a hookah in their lifetime.
- Most (90%) hookah users smoked flavored tobacco, 45% smoked marijuana, 37% smoked herbal (non-tobacco) shisha, and 18% smoked hashish in a hookah.
- Latent class analysis revealed two distinct classes of hookah users, based on the substances they smoked in hookahs, with differing demographic and behavioral profiles.

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ABSTRACT

Rationale: Hookah smoking continues to be a popular form of tobacco use, especially among college students. Although hookahs are commonly used to smoke tobacco, anecdotal evidence suggests other substances, including herbal shisha, marijuana and hashish may be used. However, little is known about the variety of substances smoked in hookahs, or correlates associated with different substances smoked.

Methods: In fall 2010, 3447 students from 8 colleges in N.C. completed an online survey.

Results: 44% of students reported ever smoking tobacco from a hookah. Of those ever users, 90% reported smoking flavored tobacco in a hookah, 45% marijuana, 37% herbal (non-tobacco) shisha, and 18% hashish. Latent class analysis revealed two distinct classes. The most prevalent class (77%) primarily smoked flavored tobacco, with minimal use of herbal shisha and marijuana and virtually no use of hashish. The second class (23%) primarily smoked marijuana, hashish and flavored tobacco with moderate use of herbal shisha. Logistic regression analysis adjusting for clustering within schools revealed that males, illicit drug users, daily, nondaily and former cigarette smokers and those whose mothers had higher levels of education were significantly more likely to be in the second class compared to the first.

Conclusions: Rates of lifetime use of hookah were high in our sample of college students. While the majority of hookah users smoked tobacco in hookahs, they also smoked other substances, notably marijuana and herbal shisha. Prevention efforts should recognize that students are using hookahs to smoke a variety of substances.

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1. Introduction

Declines in cigarette smoking among adolescents and young adults may be offset, at least in part, by the spread of hookah tobacco in the U.S. Current cigarette smoking among young adults dropped from 24% in 2005 to 20% in 2010 (Centers for Disease Control and Prevention, 2011), and for adolescents it dropped from 36% in 1997 to 20% in 2009 (Centers for Disease Control and Prevention, 2010). However, hookah smoking may be increasing, especially among adolescents and young adults. For example, data from *Monitoring the Future* show that

annual prevalence of hookah use among 12th graders increased from 17% in 2010 to 19% in 2011 (Johnston, O'Malley, Bachman, & Schulenberg, 2012). Data from the New Jersey Youth Tobacco Survey show an increase in both lifetime and current hookah use from 2008 (18% and 10%, respectively) to 2010 (21% and 11%, respectively) in a large sample of high school students (Bover Manderski, Hrywna, & Delnevo, 2012).

The existing evidence suggests that hookah smoking-associated health risks are at least comparable with, and perhaps greater than, those of cigarette smoking. A systematic review concluded that hookah use was significantly associated with lung cancer, respiratory illness, low birth-weight and periodontal disease (Akl et al., 2010). An analysis of mainstream waterpipe smoke (i.e., inhaled by the user) found large

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amounts of carcinogens, hydrocarbons, and heavy metals (Shihadeh, 2003). Additionally, the charcoal used to roast the tobacco results in high levels of carbon monoxide (Jawad, McEwen, McNeill, & Shahab, 2013).

Waterpipes are commonly used to smoke flavored tobacco (Maziak, Ward, Afifi Soweid, & Eissenberg, 2004). Known as *shisha* in the U.S., hookah tobacco contains shredded tobacco mixed with honey or molasses and dried fruit and flavorings (Primack, Aronson, & Agarwal, 2006). In addition to tobacco shisha, non-tobacco or herbal shisha, which is made from herbs and molasses, is also available. Herbal shisha is often labeled as having fewer toxicants, such as “0% tar”, which may increase perceptions that it is a safer product, leading in turn to increased use. Additionally, studies have shown associations between marijuana and hookah smoking (Dugas, Tremblay, Low, Cournoyer, & O’Loughlin, 2010; Sutfin et al., 2011), but few have assessed the use of a hookah waterpipe to smoke marijuana.

Brockman and colleagues (Brockman, Pumper, Christakis, & Moreno, 2012) conducted an online survey of 216 college students recruited via Facebook to assess hookah smoking practices, and to measure references to hookah smoking on Facebook profile pages. Results revealed that 27.8% reported lifetime hookah use. Of those who used a hookah, 78% reported mostly smoking tobacco, 22% smoked marijuana, 12% smoked only hashish, and 10% smoked both marijuana and hashish. These findings suggest that hookahs are used to smoke substances other than tobacco. However, the study was limited to participants from only two colleges and those that had a publically available Facebook page. Therefore, generalizability is limited.

The goals of this study were to: (1) describe the variety of substances that young adults smoke from hookahs; (2) determine whether subtypes or classes of hookah users exist based on the types of substances smoked and (3) describe the correlates associated with these classes. Research on tobacco use among college students has shown associations with several contextual and behavioral factors. For example, affiliation with Greek organizations is associated with tobacco use among college students, particularly social smoking (Morrell, Cohen, Bacchi, & West, 2005; Sutfin, Reboussin, McCoy, & Wolfson, 2009; Sutfin et al., 2012). Residence location is also associated with cigarette smoking. Students who report smoking only a few puffs in the past month are more likely to live on-campus than heavy, moderate or social smokers (Sutfin et al., 2009). Finally, a large body of research has documented the association of tobacco use and other substance use, including alcohol and illicit drugs (Morrell et al., 2005; Ridner, 2005; Sutfin et al., 2012). In this paper, we aim to describe classes of hookah users based on demographic and behavioral correlates. To our knowledge, this is the first study to explore classes of users based on substances smoked.

2. Methods

2.1. Sample

In fall 2010, a stratified random sample of undergraduate students attending eight universities in North Carolina was invited to complete a web-based survey as part of a randomized group trial of an intervention to reduce high-risk drinking behaviors and their consequences, the Study to Prevent Alcohol-Related Consequences (SPARC) (Wolfson et al., 2012). Participating schools included public and private universities (seven public and one private), ranging from 5000 to over 40,000 students. Students from each campus were selected randomly within class year strata from undergraduate enrollment lists provided by each school. Our target sample at each university was 450 respondents, equally divided by class year, for a total of approximately 3600 students. The number of students selected to participate was based both on power considerations for the overall SPARC trial, and the expectation from previous studies and previous waves of the survey that approximately 30–35% of the students would complete the survey within the allotted time period (Reed, Wang, Shillington, Clapp, & Lange, 2007).

Shortly after the target number from the eight schools was met, the website was closed.

2.2. Procedures

All randomly selected students were sent an email inviting them to participate in a web-based survey. The message included a link to a secured website where the survey could be completed. Students were sent up to four emails over approximately four weeks. All who completed the survey were provided \$15.00 in PayPal dollars. From the list of completions, one student at each school was randomly selected to receive \$100. The study protocol was approved by the Wake Forest School of Medicine (WFSM) Institutional Review Board (IRB). Participating schools' institutional review boards individually approved the study protocol or deferred to the WFSM IRB.

2.3. Measures

The web-based College Drinking Survey, from which data in the present report were taken, focused on alcohol use and measured demographics, alcohol consumption behaviors, and consequences of alcohol use. The survey also assessed other health-risk behaviors, including use of tobacco, marijuana, and other drugs.

2.3.1. Hookah smoking

In the section of the survey focused on tobacco use, students were asked several questions about waterpipe use, adapted from Maziak and colleagues, (Maziak, Eissenberg, & Ward, 2005) and Ward and colleagues (Ward et al., 2007), including: *Have you ever smoked tobacco from a waterpipe (also known as hookah, shisha, narghile) even one or two puffs (yes/no)*. Follow-up questions then assessed whether the participant had used a hookah to smoke any of the following substances: flavored tobacco, non-tobacco or herbal shisha, marijuana and hashish. These items were not mutually exclusive.

2.3.2. Demographic characteristics

Demographics included year in school (freshmen vs. other), gender, race/ethnicity, residence location (on vs. off-campus) and mother's and father's educational level (some college education or less vs. college degree or higher). Participants were asked about membership in Greek letter organizations (fraternities or sororities), as a member or a pledge, because membership in Greek letter organizations is associated with tobacco use among college students, particularly social smoking (Morrell et al., 2005; Sutfin et al., 2012, 2009).

2.3.3. Cigarette smoking

Using standard items from Youth Risk Behavior Surveillance System, age of smoking initiation (used to gauge if students had ever smoked a whole cigarette) and the number of days smoked in the past month were assessed. Responses to age of initiation were: I have never smoked a whole cigarette, age 8 or younger, each individual age between 9 and 21, and 22 or older. Responses to the number of days smoked were: 0 days, 1–2 days, 3–5 days, 6–9 days, 10–19 days, 20–29 days, and all 30 days. Using these two items, four categories were created to represent cigarette smoking behavior: never smoker (never smoked a whole cigarette), former or experimenter (smoked a whole cigarette in lifetime, but not in the past 30 days), current nondaily (smoked on between 1 and 29 of the past 30 days), and current daily (smoked on all of the past 30 days).

2.3.4. Alcohol and drug use

Students were asked about past month binge drinking, defined as having 4 or more drinks in a row for females and 5 or more drinks in a row for males (yes/no) and lifetime illegal drug use, including any form of cocaine, methamphetamines, hallucinogens, flunitrazepam (Rohypnol), 3-4-methylenedioxyamphetamine (Ecstasy), or prescription drugs

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