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A longitudinal, naturalistic study of U.S. smokers' trial and adoption of snus

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HIGHLIGHTS

- Most US smokers with low quit intention tried snus when offered it for free
- After 3–4 months, most of these smokers stopped regular snus use
- Frequency and quantity of snus use among current users were consistently low
- Male gender and initial expectations about snus use predicted snus use outcomes

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ABSTRACT

To refine public health policy amidst a changing landscape of tobacco products in the United States, it is first necessary to describe fully the nature of smokers' alternative product use. Little research addresses smokers' snus use, and most studies are limited by small samples, cross-sectional designs, and crude outcome measurement. This study sample includes 626 adult US smokers who denied intention to quit in the next month and were randomized to receive free snus during a 6-week sampling period, after which no snus was provided. Participants were then followed for one year. Outcome data were collected via phone. Participants (mean age: 48.7 years) were predominately female, White non-Hispanic. Eighty-four percent reported trial of snus. Eleven percent reported purchase (i.e., adoption). Current use declined from 47.1% at the end of the sampling period to 6.5% at the end of follow-up. Frequency and quantity of snus use among current users was low. Among snus users, 79.3% said it functioned as an alternative to smoking and 58.4% said it provided a means of coping with smoking restrictions; options not mutually exclusive. In logistic regressions, men were more likely to report trial (odds ratio [OR] = 2.33, $p < 0.01$) and adoption (OR = 1.84, $p < 0.05$) than women. Baseline expectations about the nature of snus use also predicted snus outcomes (OR = 1.28–1.78, $p < 0.05$). Smokers showed willingness to try snus, but product interest waned over time. Snus as currently marketed is unlikely to play a prominent role in US tobacco control efforts.

1. Introduction

Conventional smokeless tobacco (chew tobacco and snuff) use has historically been low among United States (US) adults (Bhattacharyya, 2012; Fix et al., 2014; Mumford, Levy, Gitchell, & Blackman, 2006). Data from the 2000–2010 National Health Interview Surveys, for example, indicate only 1–2% of US adults are "regular" smokeless tobacco users (Bhattacharyya, 2012). Recently, however, the tobacco industry's investment in smokeless tobacco increased (Federal Trade Commission, 2011; Mejia & Ling, 2010; Richardson, Ganz, Stalgaitis, Abrams, & Vallone, 2014), likely in response to an expansion of smoke-free legislation and a shift in social norms that stigmatizes smoking (Bayer & Stuber, 2006). Options for smokeless tobacco products changed with the introduction of low nitrosamine smokeless tobacco (LNST) products such as snus, an oral, spitless, pouched, and flavored tobacco. Comparative carcinogenic profiles suggest snus is

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less harmful than conventional tobacco products (Hatsukami, Lemmonds, Zhang, et al., 2004; Stepanov, Jensen, Hatsukami, & Hecht, 2008), including cigarettes (Lee, 2011; Levy et al., 2006; O'Connor, 2012), but it still carries health risks. The introduction of snus to the US tobacco market has not yet changed the nationwide prevalence of smokeless tobacco use (Agaku et al., 2014; Bhattacharyya, 2012; Biener et al., 2016; Boyle, Saint Claire, Kinney, D'Silva, & Carusi, 2012; Choi & Forster, 2013; Fix et al., 2014; Lee, Hebert, Nonnemaker, & Kim, 2014; Maher, Bushore, Rohde, Dent, & Peterson, 2012; Soneji, Sargent, & Tanski, 2016; Zhu et al., 2013, 2009), but there may exist subgroups of the population who are more receptive to snus than others.

Tobacco industry internal documents, marketing strategies, and advertisements all pinpoint current smokers as the intended consumer of snus (Bahreinifar, Sheon, & Ling, 2013; Mejia & Ling, 2010; Rogers, Biener, & Clark, 2010; Timberlake, Pechmann, Tran, & Au, 2011). Smokers might have interest in snus due to the: 1) perception that snus is less harmful than cigarettes (Biener & Bogen, 2009; Choi, Fabian, Mottey, Corbett, & Forster, 2012; Lund, 2012), 2) desire to circumvent smoking restrictions and temporarily mitigate nicotine withdrawal (Bahreinifar et al., 2013; Biener et al., 2016; Wray, Jupka, Berman, Zellin, & Vijayakumar, 2012), and/or 3) intention to use snus as a means of smoking reduction or cessation (Biener et al., 2016; Choi et al., 2012; Lund, 2012). Thus, snus use could function as an alternative to smoking, a complement to smoking, or both. Indeed, one of the more reliable predictors of snus (and other LNST) use is smoking status: current and former smokers are more likely to report snus use than never smokers (Biener et al., 2016; Choi & Forster, 2013; Zhu et al., 2013).

Very few population-based studies of snus use among US adult smokers exist (Biener et al., 2016; Boyle et al., 2012; Lee et al., 2014; Rath, Villanti, Abrams, & Vallone, 2012). Prior work primarily aims to determine the pervasiveness of "dual use," and results indicate a 30-day point prevalence of snus use occurs in 3–10% of current smokers (Biener et al., 2016; Boyle et al., 2012). This literature offers insights into smokers' willingness to try snus, but is constrained by limited outcome measurement and the fact that most studies are cross-sectional. This report aims to advance the current literature via a detailed description of snus uptake during a longitudinal study with adult US smokers who denied intention to stop smoking in the near future.

2. Material and methods

2.1. Study overview

Adult smokers ($N = 1236$) throughout the US who denied intention to quit in the next 30 days were recruited into a clinical trial and randomized to receive or not receive free snus during a 6-week sampling period (clinicaltrials.gov: NCT01509586). After this period, participants were advised to quit all tobacco use and then followed for one year. This report focuses on the snus group ($n = 626$). The tobacco industry did not support this study in any way. Study procedures began after approval from the Medical University of South Carolina's institutional review board.

2.2. Eligibility criteria

Participants met these criteria based on their self-report: 1) age ≥ 19 years; 2) English-speaking; 3) residency in the contiguous US; 4) not currently pregnant, breastfeeding, or planning to become pregnant in the near future; 5) no cardiovascular event in the past six months; 6) no smokeless tobacco use in the past six months; 7) daily smoker of ≥10 cigarettes per day; 8) no smoking cessation medication use in the past three months; 9) no quit attempt lasting >1 week in the past six months; and 10) low motivation to quit smoking, operationalized as ≤7 on a 0 to 10 contemplation ladder (Biener & Abrams, 1991) and no stated intention to quit in the next 30 days based on stage of change assessment (Prochaska & Velicer, 1997). The tobacco-specific eligibility criteria ensured recruitment of regular smokers who were "unmotivated" to quit and relatively snus-naïve.

2.3. Snus

Snus participants were offered Camel Snus (Reynolds American, Inc.), a spitless, pouched moist snuff, available in either Winterchill or Robust, both 2.5–2.8 mg nicotine per pouch (Hatsukami et al., 2015; Stepanov et al., 2012). Early testing suggested Camel Snus offers greater nicotine delivery and withdrawal/craving relief than other LNST (Hatsukami et al., 2011; Stepanov et al., 2012, 2008). Twice during the sampling period, participants were offered free samples of Camel Snus. For those who accepted this offer, up to 20 tins (300 total pouches) were mailed over four shipments.

2.4. Procedures

Knowledge Networks, which maintains national market research panels, emailed a study invitation to potential participants that contained a link to a brief study description. Interested individuals then completed an online eligibility screener. A more complete study description was provided to eligible individuals, with mention of a "new, potentially safer tobacco product" and assurances that study participation required neither use of this product nor smoking cessation. Names and contact information for eligible, interested individuals were forwarded to study staff. Enrollment in this study (November 2011–August 2013) was formalized upon attainment of written informed consent and completion of a baseline assessment via a combination of mail questionnaire and phone interview.

Participants learned their group assignment during the initial call. Snus participants received information about Camel Snus, including 1) how to use it; 2) reasons for its classification as a LNST product; and 3) cautions about product safety. Between Week 0 (post-baseline assessment) and Week 6 (after which snus was no longer offered), participants received three equally spaced calls. At each call, emphasis was placed on self-determination of snus use. After the 6-week sampling period, participants were given brief advice to quit all tobacco use and their state Quitline's contact information; this occurred at the Week 6 call only. Six additional calls spanned the 1-year follow-up period. Of the 5634 scheduled calls ($626 * 9$), 85.7% were completed. Participants were reimbursed for each complete assessment (US $130 maximum).

2.5. Measures

2.5.1. Baseline

This assessment included questions about participants' demographic and tobacco use history, including the *Heaviness of Smoking Index* as a measure of nicotine dependence (Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989). Participants also rated their concern about the personal health effects of smoking ("very or somewhat" versus "only slightly or not"), motivation to quit smoking next month (0 = very definitely no to 10 = very definitely yes), and confidence about quitting smoking next month (0 = not at all confident to 10 = extremely confident). Perceived personal harm from LNST (exclusive of electronic cigarettes) was measured on a 0 = not at all harmful to 10 = very much harmful scale. Finally, expectations about the likelihood of using LNST for various purposes (e.g., reduce smoking) were measured on a 0 = not at all likely to 3 = very likely scale.

2.5.2. Tobacco use outcomes

At each follow-up assessment (Week 0 to 58), participants provided information via timeline follow-back procedures. Frequency (number of days) and quantity (number of units per day) of use in the past week was measured separately for cigarettes and snus, allowing determination of current users based on 7-day point prevalence. Additionally, participants were asked about the occurrence of any snus use since the last