Racial and ethnic differences in patterns of adolescent tobacco users: A latent class analysis

Hye Jeong Choi[a,*], Mansoo Yu[b], Paul Sacco[c]

[a] Department of Health Science, University of Missouri, 501 Clark Hall, United States
[b] School of Social Work, Public Health Program, University of Missouri, Columbia, United States
[c] Schools of Social Work, University of Maryland-Baltimore, 525 West Redwood Street, Baltimore, MD 21201, United States

ARTICLE INFO

ABSTRACT

Background: Little is known about how tobacco use varies among youth of different racial and ethnic groups and how these patterns are related to levels of nicotine dependence.
Objectives: This study investigated the tobacco use patterns of White, African American, and Hispanic high school students. We further explored whether tobacco use patterns were associated with levels of nicotine dependence and gender.
Methods: Data were analyzed from the 2014 National Youth Tobacco Survey (NYTS) of high school students who endorsed at least one form of tobacco use in their lifetime ($n = 4691$). Three separate latent class analysis (LCA) models were estimated using seven different types of tobacco products as indicators. Also, the level of nicotine dependence was compared with one class to another class in three racial/ethnicity groups.
Results: Four classes of White youth were identified: (1) "Non-user" (67%), (2) "Polytobacco" (6%), (3) "Chewing Tobacco" (8%), and (4) "(E)-Cigarettes" (19%) classes. The "Polytobacco" class had the highest nicotine dependence followed by "Chewing Tobacco," "(E)-cigarettes," and "Non-user." Among African American youth, two tobacco patterns were identified: "Non-user" (91%) and "Cigarette/Cigar" (9%). The "Cigarette/Cigar" class had greater nicotine dependence than the "Non-user" class. Among Hispanic youth, three subgroups were identified: "Non-user" (78%), "(E)Cigarette/Cigar" (14%), and "Hookah" (18%). "(E)Cigarette/cigar" had the highest nicotine dependence in Hispanic youth followed by the "Hookah" and "Non-users" classes.
Conclusion: We found distinct classes of youth tobacco use by race/ethnicity. Although poly-tobacco use was common, White, African American, and Latino youth used different tobacco types, suggesting that racially and ethnically targeted prevention strategies may be indicated.

1. Introduction

Although overall rates of tobacco use have decreased in recent decades (Arrazola et al., 2015; Johnston, O'Malley, Miech, Bachman, & Schulenberg, 2016), newer tobacco products, such as e-cigarettes and hookah, have become popular among adolescents (Gilreath et al., 2016; Miech et al., 2016). With the rise of new tobacco products, recent research on adolescent tobacco use (Arrazola et al., 2015; Dutra and Glantz, 2014; Gilreath et al., 2016) has been concerned with the use of multiple tobacco products. For instance, youth who use multiple tobacco products have greater exposure to nicotine and a higher probability of developing nicotine dependence than single-product users (Ali et al., 2016).

Despite the health risks associated with the use of multiple tobacco products, only a handful of studies have explored patterns of adolescent tobacco use, including multi-product use. For example, a recent study (Gilreath et al., 2016) of 11th and 12th graders in southern California (largely Hispanic and White in composition), identified four subgroups of tobacco users, "nonsmokers," "poly-tobacco experimenters," "e-cig/hookah users," and "poly-tobacco users," based on their use of five different forms of tobacco (e.g., cigarette, cigar, e-cigarette, hookah, and smokeless tobacco). Similarly, Ali et al. (2016) and Arrazola et al. (2015) analyzed national samples and classified adolescent tobacco users into three subgroups: single-, dual-, and poly-tobacco users.

In spite of the recognition of different patterns of adolescent tobacco use, only a few studies have examined patterns of tobacco product use by youth of different racial and ethnic groups. Johnston et al. (2016) found that White, African American, and Hispanic youth have different preferences for tobacco products. In this study, White 12th graders had a higher prevalence of almost all forms of tobacco use compared to their

Hispanic and African American counterparts. Conversely, African American 12th graders had a higher prevalence of dissolvable tobacco use than Hispanic and White youth (Johnston et al., 2016). According to a report from the Centers for Disease Control (Singh, 2016), Hispanic high school students had a higher rate of hookah and pipe use than White and African American students. African Americans had a higher rate of cigar use, but lower rate of e-cigarette use, compared with White and Hispanic youth (Singh, 2016). A study by Lee et al. (2015) showed that African American youth may display different patterns of tobacco use than other ethnic groups: African American youth were less likely to be poly-tobacco users than White youth. Given the fact that White, Hispanic, and African American youth use different tobacco products, their patterns of use likely vary as well.

Social norm theory and social learning theory may help explain patterns of different forms of tobacco use across multiple racial and ethnic groups of youth. Social norm theory (Cialdini et al., 1990) posits that the popularity and approval of certain actions leads to the same behavior within a group. Additionally, social learning theory (Bandura, 1973) suggests that tobacco use preferences are learned through observing the behavioral reinforcement of other youth (e.g., being popular among peers). Because of racial and ethnic homophily (McPherson, Smith-Lovin, & Cook, 2001) and adolescent friendship selection based upon the similar smoking behaviors (Huang et al., 2014a; Mercken et al., 2012), adolescents may display distinct ethnic and racial tobacco use patterns. Furthermore, peer influence plays a significant role not only in adolescent smoking behaviors (Huang et al., 2014b; Schaefer et al., 2013; Wang et al., 2016), but also in cigarette brand preference among adolescents and young adults (Cowie et al., 2014; Giovino et al., 2013). Youth learn which tobacco products are popular and approved by their peers in their own racial or ethnic group. In turn, racial and ethnical groups have different patterns of tobacco use.

Ethnically targeted tobacco marketing can influence tobacco product preferences. A meta-analysis by Primack et al. (2007) found that African Americans are exposed to more tobacco-related advertising (e.g., billboard) than Whites are. Studies on tobacco advertising (Anderson, 2011; Hafez and Ling, 2006) have found that the tobacco industry has focused on minorities and youth through targeted marketing techniques (e.g., young attractive African American models). Dauphinee et al. (2013) found that African American youth display greater awareness of tobacco branding than youth of other ethnicities. Due to these marketing efforts, different racial and ethnical youth may be more likely to use specific tobacco products (Giovino et al., 2013).

Gender may also be associated with patterns of tobacco use. Studies suggest that boys prefer smokeless tobacco (Agaku et al., 2013) and e-cigarettes (Miech et al., 2016), whereas girls are more likely to use hookah (Ali et al., 2016). Boys are also more likely to use multiple tobacco products than girls (Ali et al., 2016; Lee et al., 2015; Soneji et al., 2016). Girls may respond to more proscriptive smoking norms than boys do (Mermelstein and Tobacco Control Network Writing Group, 1999), and young women may have differing motives for using a given tobacco product (e.g., weight control) than young men (Cawley and Scholder, 2013). Peer influence may exert more pressure on girls. In an adolescent network analysis study (Mercken et al., 2010), female adolescent smokers significantly influenced their peers' smoking behavior, whereas male counterparts did not significantly influence their male peers. Social influence studies have documented that girls are more susceptible to peer pressure on smoking (Hoving et al., 2007) than boys. Girls may switch from one tobacco product to another based on peer pressure rather than use multiple tobacco products.

Poly-tobacco use is important because different patterns of poly-tobacco use can create various levels of nicotine dependence, which may influence whether a youth is able to quit using tobacco products. Ali et al. (2016) showed that poly- or dual-smokers had greater nicotine dependence than single tobacco users. Additionally, levels of nicotine dependence may vary even within dual- or poly-tobacco users. It is possible that e-cigarette and hookah users may have lower nicotine

dependence compared with cigarette and dissolvable tobacco product users, because some e-cigarette products contain lower nicotine than cigarettes (Czogala et al., 2013).

2. Latent class analysis

Latent class analysis (LCA) is an advanced statistical method used to classify individuals with certain behavioral characteristics into homogenous subpopulations based on specific characteristics (Collins & Lanza, 2010). Latent class analysis estimates two parameters: 1) Item-response probabilities given the class and 2) estimated prevalence of latent class. By estimating two parameters, LCA can identify qualitatively different subgroups based on individuals' multiple, different behaviors while accounting for measurement error. LCA can also include covariates by estimating associations between classes and class membership and/or distal outcomes (Asparouhov and Muthén, 2014).

Although White, African American, and Hispanic youth have different preferences for tobacco products (Singh, 2016), less is known about the heterogeneity of poly-tobacco use among adolescents in different racial and ethnic groups. Only a handful of studies (e.g., Gilreath et al., 2016) have investigated adolescent subgroups based on different forms of tobacco products, yet as far as we know none of these studies examined how White, African Amercian, and Hispanic youth would have different subgroups based on their tobacco use patterns. Our goal is to understand gender difference in tobacco use patterns within racial and ethnic subpopulations of youth due to different social norms, relationships, experiences, and attitudes (Amos and Bostock, 2006; Sullivan et al., 2011). Furthermore, our aim is to analyze whether certain patterns of use are associated with greater tobacco dependence. Few studies (Ali et al., 2016) have evaluated how the cumulative effects of different substances may lead to different levels of dependence.

Thus, the purpose of this study is to fill the gaps by addressing three research objectives: (1) To derive tobacco use classes among youth in three racial and ethnic groups (White, African American, and Hispanic) using latent class analysis (LCA); (2) to investigate associations between gender and class membership in each racial or ethnic group; and (3) to compare the levels of nicotine dependence by tobacco use class within White, African American, and Hispanic subsamples.

3. Method

3.1. Data source and respondents

We used the National Youth Tobacco Survey (NYTS) conducted in 2014. The NYTS is a nationally representative survey of youth in grades 6 to 12 focused on tobacco use (Centers for Disease Control and Prevention, 2015). The NYTS is conducted by State Departments of Health with methodological guidance from the Centers for Disease Control and Prevention. Its primary purpose is to support the development of tobacco prevention efforts by individual states. The NYTS collects data on prevalence of different forms of tobacco use and sociodemographic information, as well as a variety of relevant tobacco-related variables (e.g., exposure to cigarette advertising). The 2014 NYTS utilized a stratified cluster sampling design, consisting of primary sampling units (PSUs in this case consisted of counties or similar entities). Within each PSU, schools were randomly selected, and, finally, students within each school were randomly selected. Students completed paper-based questionnaires at their school. Data were weighted for selection probability, survey non-response, and to derive nationally representative estimates. The overall response rate for the NYTS in 2014 was 73.3%.

For the purpose of this study, we included White, African American, and Hispanic youth in high school (grades 9–12) who had lifetime experience with any form of tobacco use (*n* = 4691). For the current analyses, we selected youth who had used tobacco in their lifetime, as we were interested in levels of dependence as an outcome. Therefore,