Full length article

Cigarette use trajectories in young adults: Analyses of predictors across system levels

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ABSTRACT

Background: Cigarette smoking escalates most in early to middle young adulthood. However, little research has examined a range of multilevel factors in relation to smoking trajectories during this time.
Methods: We examined: 1) trajectories of cigarette smoking among 2967 US college students (aged 18–25) in a two-year, six-wave longitudinal study (using growth mixture modeling); and 2) intrapersonal- (i.e., other substance use, depressive symptoms, ADHD symptoms,); interpersonal- (i.e., adverse childhood events, social support, parental tobacco and marijuana use), and community-level (i.e., type of college, rural vs. urban setting) predictors of differing trajectories (using multinomial logistic regression).
Results: We identified three trajectory classes: 1) Dabblers, who used cigarettes at one point in their life or not at all (85.6%); 2) College Onset Smokers, who began smoking regularly during the college years (6.2%); and 3) Later Onset Smokers, who began smoking during the mid- to late-20 s (8.2%). Multinomial regression (with Dabblers as the reference group) showed that predictors of being College Onset Smokers included being male (p = .031); Asian (p = .001) but not Black (p = .008; Ref: White); early onset smokers (i.e., initiation before age 15; p = .006); past 30-day users of little cigars/cigarillos (p = .024), alcohol (p < .001), and marijuana (p = .008); children of tobacco users (p = .050); and public (p = .031) or a technical college students (p < .001; Ref: private college); predictors of being Later Onset Smokers were being male (p = .019) and technical college students (p = .005).
Conclusions: Despite some young adults' smoking initiating/escalating in middle young adulthood, few risk factors were documented. This understudied period warrants greater examination to inform intervention.

1. Introduction

Tobacco use is the number one preventable cause of death in the US (USDHHS, 2014). Nearly all cigarette use in the US starts during adolescence with experimentation, often leading to nicotine dependence and regular use (National Center for Chronic Disease et al., 2012, 2014). Smoking in young adulthood is of particular concern given that the 20 s are the decade when the intensity and frequency of smoking escalates the most (Johnston et al., 2014). Currently, 17.0% of adults aged 18–24 and 21.4% aged 25–44 smoke cigarettes (Hu et al., 2016).

Various trajectories of tobacco use have been documented across the young adulthood years, with some research extending from adolescents to young adulthood (Bernat et al., 2008; Brook et al., 2006; Dutra et al., 2017; Park et al., 2018; Riggs et al., 2007). Studies including the broader range from adolescence to young adulthood commonly found categories approximating never smokers, experimenters, light or occasional smokers, early established smokers, late escalators, and quitters or decliners (Bernat et al., 2008; Dutra et al., 2017; Riggs et al., 2007). Particularly relevant to the current study, one recent study analyzing a nationally representative, longitudinal sample of 9791 young adults (aged 18–34) modeled the distribution of cigarette smoking intensity over time and found three discrete classes, including no current use of cigarettes (79.3%), rapid escalators or daily cigarette users (11.3%), and dabblers (9.4%); moreover, smoking patterns were

found to be stable by the age of 21 (Hair et al., 2017). Another study similarly documented three profiles among those in emerging adulthood (ave. age 19.87 years, SD = 1.54), with both progression and reduction in the lower-use groups and notable changes in tobacco use behaviors over the span of six months (Schweizer et al., 2014). These prior studies, as well as others (Mays et al., 2014; Nelson et al., 2015; Rose et al., 2012; Windle & Windle, 2012; Zhan et al., 2012), suggest that young adults' tobacco use is a temporally unstable behavior warranting future longitudinal research. This is particularly relevant given the current context of diverse tobacco product offerings in the US market that have disproportionately impacted the tobacco use patterns of young adults (McMillen et al., 2012).

According to the Socioecological Developmental Model (McLeroy et al., 1988) and Social Cognitive Theory (Bandura, 2004), tobacco use and use trajectories over time among young adults are influenced by a range of interacting multilevel factors (individual, interpersonal, community). Attending to the range of multilevel factors is critical during this pivotal developmental period (Bonnie et al., 2014).

At the *individual level*, sociodemographic differences in young adult tobacco use trajectories exist. Greater smoking progression is found among men (Chen & Jacobson, 2012; Hair et al., 2017; Mendel et al., 2012) and those with lower educational attainment and annual income (Hair et al., 2017). Also, the prevalence of smoking among Whites, albeit higher than Blacks in emerging adulthood (18–25 years), declines during the 20 s; in contrast, smoking prevalence does not decline among Blacks (Hair et al., 2017; Keyes et al., 2015; Watt, 2008). This results in roughly equal prevalence by age 30 (Keyes et al., 2015; Watt, 2008).

Tobacco use characteristics, such as early onset smoking (i.e., before the age of 15), have been associated with early onset tobacco dependence (Mays et al., 2014; Rose et al., 2012; Zhan et al., 2012). Moreover, cigarette smoking is highly correlated with use of other alternative tobacco products (ATPs; i.e., little cigars/cigarillos [LCCs], smokeless tobacco, e-cigarettes or electronic nicotine delivery systems [ENDS], hookah) as well as polytobacco use (Jamal et al., 2014; National Center for Chronic Disease et al., 2014; Richardson et al., 2014). Of note, polytobacco use may increase risk for nicotine dependence (Etter & Eissenberg, 2015; Fagerstrom & Eissenberg, 2012; National Center for Chronic Disease et al., 2014; Tomar et al., 2010; USDHHS, 2014). Moreover, young adults are at the greatest risk for substance use, and the use of any substance is associated with use of other substances (SAMHSA, 2015). In addition to tobacco, two other commonly used substances among young adults in the US are marijuana and alcohol (SAMHSA, 2015).

Several psychological characteristics also influence smoking trajectories in young adulthood. Depressive symptoms have been robustly documented as a predictor (and consequence) tobacco use and nicotine dependence (Breslau et al., 1998; Fergusson et al., 1996; Windle & Windle, 2001). ADHD symptomatology has been highly associated with substance use more broadly (Ortal et al., 2015; Roberts et al., 2014; Sibley et al., 2014), as well as tobacco use specifically (Elkins et al., 2017; Pal & Balhara, 2016); however, a recent review of the literature suggests that this association may be confounded by comorbidities such as depression (Glass & Flory, 2010). Thus, including both in studies of cigarette smoking trajectories is important.

At the *interpersonal level*, adverse childhood events (e.g., physical or sexual threat or abuse, parental divorce/separation) (CDC National Center of Injury Prevention and Control, 2014) and other stressful life events are associated with the development of substance abuse and dependence, including cigarette smoking (Ford et al., 2011; Hovdestad et al., 2015; Windle & Mason, 2004). Moreover, greater social support has been associated with lower likelihood of smoking initiation (Berg et al., 2009; Flay et al., 1999), as well as successful attempts at smoking cessation and prevention of relapse (Carlson et al., 2002; Fisher, 1997; Hanson et al., 1990). Additionally, parental smoking is a robust predictor of children taking up smoking (Fairlie et al., 2012) and of trajectories that progress or advance more quickly among youth and

young adults (Hair et al., 2017; Mays et al., 2014).

Community-level factors influencing young adults are also important to consider. For young adults pursuing post-secondary education, the type of college they attend may influence tobacco use; for example, community or technical colleges have been shown to have higher smoking prevalence among their student populations compared to four-year colleges and universities (Berg et al., 2011). Moreover, rural communities tend to have higher prevalence of smoking relative to urban or suburban areas (Doescher et al., 2006). These levels of influence are particularly relevant for the period of young adulthood given the varied individual and sociocontextual changes likely to influence tobacco use during this period (Bonnie et al., 2014).

Few prior studies have used a socioecological perspective in examining smoking trajectories among young adults. One study analyzing data from the National Longitudinal Study of Adolescent Health examined multilevel predictors of smoking trajectories among those 13–32 years old (Fuemmeler et al., 2013). They found that conduct problems and depressive symptoms, maternal and peer smoking, and state-level prevalence of adolescent smoking predicted a greater likelihood of belonging to any of the four identified smoking groups versus nonsmokers. This study and the broader literature regarding risks for tobacco use among youth and young adults highlight the importance of contextualizing smoking trajectories within these multilevel influences.

The current study aimed to extend the literature regarding smoking trajectories during young adulthood in the context of these multilevel factors. We examined: 1) trajectories of cigarette smoking over a two-year period among young adult college students in a longitudinal cohort study; and 2) intrapersonal- (i.e., sociodemographics, early onset smoking, other substance use, depressive symptoms, ADHD symptoms); interpersonal- (i.e., adverse childhood events, social support, parental tobacco and marijuana use), and community-level (i.e., type of college, rural vs. urban setting) predictors of differing trajectories. This study adds to the literature in particular by including some novel predictors, such as ATP and marijuana use, adverse childhood events, and college campus context, as limited (if any) prior research examined these factors in relation to *trajectories* of cigarette use in young adults. Based on the aforementioned literature, we hypothesize that being male, being racial/ethnic minority, lower socioeconomic status, earlier initiation of cigarette smoking, other tobacco and substance use, greater symptoms of depression and ADHD, more adverse childhood events, less social support, parental substance use, attending a technical college, and residing in a rural setting will predict greater escalation in cigarette smoking through young adulthood.

2. Materials & methods

2.1. Procedure and participants

The current study was conducted as part of a larger study, Project DECOY (**D**ocumenting **E**xperiences with **C**igarettes and **O**ther Tobacco in **Y**oung Adults), which is a two-year, six-wave longitudinal cohort study that involves 3418 racially/ethnically diverse students (ages 18 to 25) from seven colleges and universities in Georgia, a state ranked among the least progressive in tobacco control consistently (American Lung Association, 2016). Project DECOY was approved by the Emory University and ICF Institutional Review Boards as well as those of the participating colleges and universities. Data collection began in Fall 2014 and consisted of self-report assessments via an online survey every four months for two years (Fall, Spring, Summer). Two campuses had existing tobacco-free campus policies established prior to the launch of the study (one in 2009 [technical college] and one in 2012 [private]); three implemented such policies in October 2014 [two public, one HBCU]; one implemented such a policy in August 2015 [private]; and one remains without a comprehensive smoke-free air policy [technical college]).

Detailed information on sampling and recruitment of the parent