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Juul and the Upsurge of E-Cigarette Use among College Undergraduates

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Abstract

Objective—Examine trends in e-cigarette use, and Juul use specifically, among U.S. college students.

Participants—In 2016, we established a cohort of 529 incoming first-year students to a large Midwestern University. In 2018, these students (now third-years) were re-contacted, and a new sample of 611 incoming first-year students was enrolled.

Methods—First-year students in 2016 completed a survey assessing their e-cigarette use; in 2018, first- and second-year students reported on e-cigarette use, and use of Juul specifically.

Results—From 2016 to 2018, past 30-day e-cigarette use rose from 5.9% to 27.7%. In 2018, for Juul alone, ever use was above 35% and past 30-day use was above 20% for both cohorts. Juul use did not differ by gender, but was associated with higher SES and being White.

Conclusions—Findings present disturbing possibilities for long-term nicotine addiction among the next generation, and underscore the need for a rapid public health response.

Keywords

E-cigarettes; Juul; Tobacco; Young adults; College students

Introduction

Over the past few years, researchers in the U.S. have warned of the rapid rise in e-cigarette popularity among youth. E-cigarettes are currently the most commonly-used tobacco product among youth. Nationally, and across all major racial/ethnic groups, adolescent e-cigarette use surpasses cigarette use.¹ In 2018, past 30-day use of e-cigarettes was 20.8% among high school students.¹ Among young adults aged 18–24, current e-cigarette use was over 9%, which is the highest prevalence for any adult age group.²

The high prevalence of e-cigarette use among adolescents and young adults is expected to continue due to the popularity of a particular brand of e-cigarette, known as Juul.

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Introduced in 2015, Juuls are a type of e-cigarette that resemble a USB flash drive and use an attachable cartridge, or *pod*, for storing the e-cigarette liquid. Among other contents, this liquid includes flavorings and nicotine. Anecdotal reports in the news,^{3,4} as well as research charting trends in social media content,⁵⁻⁷ suggest that Juuls are extremely popular among American youth. However, given the newness of Juul, only a few studies⁸⁻¹¹ have reported empirical data on Juul prevalence among youth, with values for ever-use ranging from 6% to 18%. Even fewer have focused on use among college students¹²—a population that often has elevated levels of substance use.¹³

The aim of the present study was to examine trends in e-cigarette use, and Juul use specifically, among U.S. college students. Beyond assessing cross-sectional and prospective changes, a secondary aim was to examine how use varies across demographic characteristics.

Methods

Participants and Recruitment

All study methods were approved by the University's Institutional Review Board. The present study drew participants from a cohort study examining tobacco use among undergraduates at a large Midwestern University. In 2016, one week before the start of the fall semester, our research team contacted 1,000 incoming freshmen (first-year) students. This list of 1,000 students was provided by the Office of the University Registrar, and was a random sample of the incoming class, stratified by gender, first generation college status, and in- vs. out-of-state family residence. All students on the list were aged 18 or older so they could consent to study participation. These students were sent an email inviting them to participate in a research study on health behaviors, and were provided with a link to an online survey. At baseline, 529 participants completed this survey. In 2018, these students (now third-year students) were re-contacted before the fall semester. At the same time, a new random sample of 1,000 incoming first-year students was contacted using the same methods as described above. This ultimately provided us with 611 new first-year student participants. For both cohorts, among the 1,000 students invited to participate in the study, enrollment (vs. non-enrollment) was not related to gender or first generation college status; for the 2018 first-year students, enrolled participants were more likely to have in-state family residence.

Procedures

The study began with an online consent form, followed by a survey that took approximately 15 minutes to complete. Students received a \$20 online gift card for participating. Participants were asked about their ever and past 30-day use of various tobacco products, including e-cigarettes. In 2018, additional survey questions were added to assess Juul use specifically (ever and past 30-day use). Age, gender, race/ethnicity, and socioeconomic status (SES) were all assessed when participants were first-year students. SES was measured in terms of three indicators: social class growing up, current social class,¹⁴ and parent education (assessed separately for mother and father). A z-score was calculated for each of these four indicators, which were then aggregated to create our measure of SES. Analyses were primarily descriptive, but t-tests and chi-squares were used to determine whether use

varied by demographic characteristics (multivariate logistic regression was not used because the prevalence for some outcomes was too low).

Results

In 2016, the sample of first-year students was, on average, 18.6 years old ($SD=0.71$); 51.6% of students were female, 76.1% were non-Hispanic White, and 13.9% were a first generation college student. Similarly, in 2018, the sample of first-year students was, on average, 18.6 years old ($SD=0.60$); 52.9% of students were female, 68.9% were non-Hispanic White, and 13.7% were a first generation college student. Of the original 2016 cohort, 356 (67%) completed a survey in fall 2018. Those third-year students who completed the 2018 survey (vs. those who did not) were less likely to be male and to have used e-cigarettes in 2016; attrition was not associated with racial/ethnic minority status.

Whereas 13.8% of first-year students reported ever using an e-cigarette in 2016, 37.3% of first-year students reported ever use in 2018 (see Figure 1). Past 30-day use likewise rose from 5.9% in 2016 to 27.7% in 2018. Prospective data indicated a similar rise: Among the first-year students in 2016, ever-use and past 30-day use rose to 42.4% and 24.4%, respectively, by the time they were third-year students in 2018.

For Juul use in 2018, ever use was above 35% for both first- and second-year students. Past 30-day use was over 20% for both first- and second-year students. Indeed, approximately one-quarter of 2018 first-year students reported past 30-day use of Juul. Among third-year students, 89.5% of past 30-day e-cigarette users were also past 30-day Juul users; among first-year students, 91.6% of past 30-day e-cigarette users were also past 30-day Juul users. Ever use of Juul use did not differ by gender, but was associated with higher SES and being White (see Supplementary Table 1). Past 30-day use of Juul likewise trended higher among high-SES and White groups, although the effect was not always significant; past 30-day use was also more prevalent among male (vs. female) third-year students.

Discussion

This paper is among the first to present the prevalence of Juul use among college students, and its prevalence findings are similar to another recent college study¹². To our knowledge, these two papers present the highest values yet reported for Juul use within a population. While alarming, the high values we observed are perhaps not surprising, given that recent work^{10,11} indicates Juul use is more common among youth who are older, White, and higher SES—characteristics that are more common for college students than the general population. Indeed, our findings indicate that, among our random college sample, students who are White and high SES are at the greatest risk for use.

Findings also demonstrate, both cross-sectionally and prospectively, how quickly overall e-cigarette use rose among undergraduates between 2016 and 2018. Perhaps most concerning is the rise in past 30-day use, which in just two years rose from 5.9% to 27.7% for college first-year students. Such findings suggest that students are not simply experimenting with e-cigarettes, but that they are using them on a somewhat regular basis.

Limitations to this study include study attrition among the third-year students. As retention was lower among e-cigarette users, prevalence of use among this college population may actually be higher than reported and demographic differences may be more pronounced. In addition, as Juul use was not specifically assessed in 2016, we cannot say with certainty that Juul was the driver of this rise in e-cigarettes. However, our finding that approximately 90% of past 30-day e-cigarette users were also past 30-day Juul users, in conjunction with other reports,^{3–11} strongly indicates a relationship.

According to Juul manufacturers, one pod of Juul contains as much nicotine as one pack of 20 cigarettes.¹⁵ With one-quarter of current first-year students engaging in past 30-day Juul use, there are disturbing possibilities for long-term nicotine addiction among the next generation. There are likewise concerns about the immediate health consequences of vaping, as investigations continue into the association between e-cigarette use and severe pulmonary disease.¹⁶ There is a need to respond rapidly to this public health crisis at all levels of the uptake continuum, including implementing prevention approaches for never-users and experimenters as well as developing cessation services for frequent users. Tobacco control interventions addressing youth and young adult e-cigarette use likewise need to quickly occur at all levels of influence. At the local level, this includes campus-based programs such as adding e-cigarettes to campus smokefree policies, providing educational interventions at student orientations, and offering cessation support at student health centers. At the national level, this includes better e-cigarette regulation and enforcement. Although the FDA is beginning to take steps to address youth use of Juul, more action is needed.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

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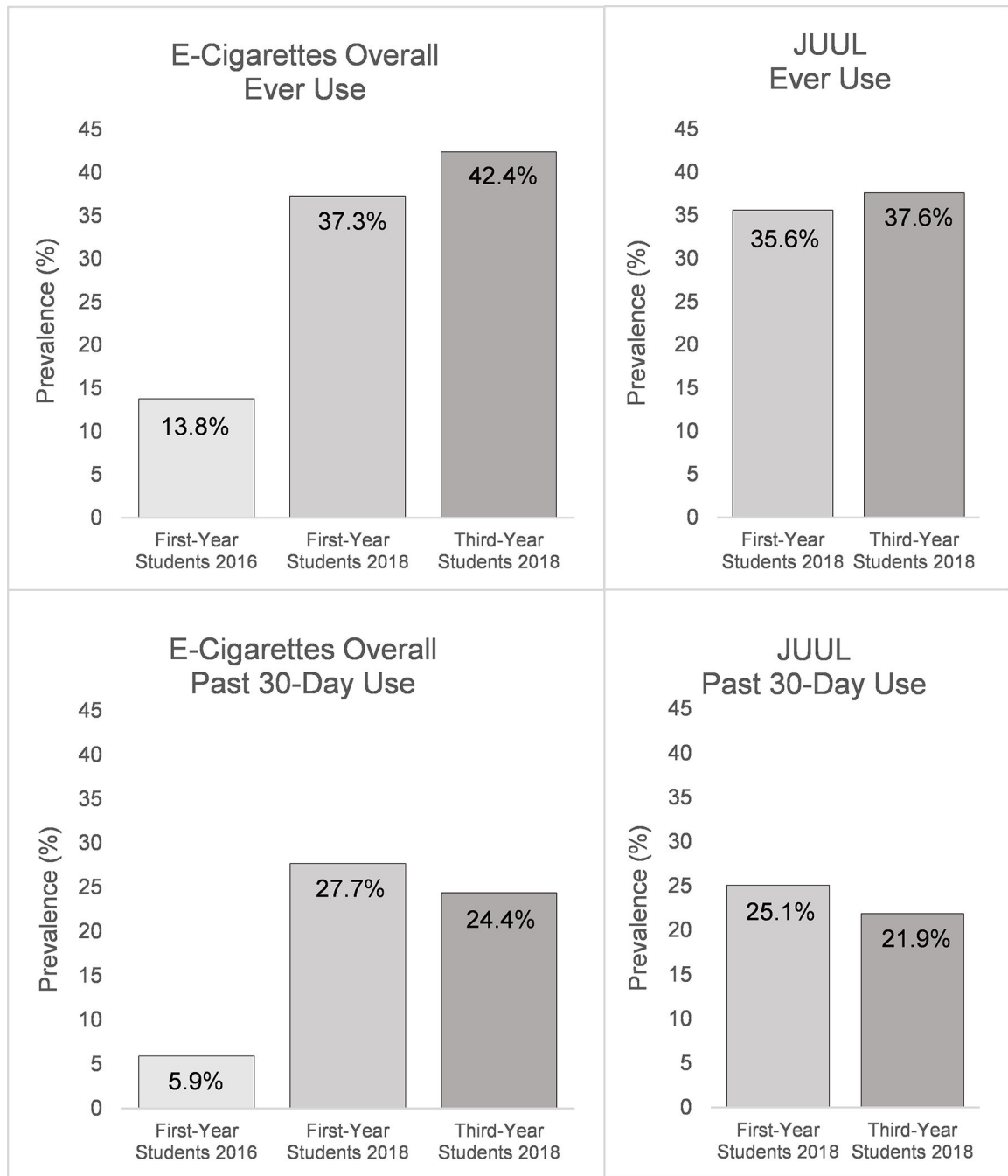


Figure 1. Prevalence for overall e-cigarette use and Juul use among college undergraduates. Top panels report ever-use, and bottom panels report any use in the past 30 days. 2016 N = 529; 2018 N = 611 for first-year and 356 for third-year students.