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Using electronic audience response technology to track e-cigarette habits among college freshmen

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Abstract

Purpose.—The use of e-cigarette devices, specifically JUUL, is on the rise on college campuses. Traditional means of collecting and analyzing research may not be fast enough for health professionals to effectively assess, plan, and implement effective prevention/intervention strategies.

Procedures.—In August 2018, during incoming student orientation sessions at seven different college campuses, data on a specific e-cigarette, JUUL. Data on use and knowledge of JUUL, as well as traditional cigarette use, was collected via immediate electronic audience response devices. Analyses included calculating descriptive statistics for questions of interest.

Results.—Because response on each item was optional and anonymous, participation on specific questions varied and the total sample size for the questions of interest ranged from 1,940–2,027 students. Mean daily use rates were 13.7% (11.6–18.0%) for JUUL and 1.7% (1.3–2.5%) for cigarettes. Most students (67.3%) knew that JUUL always contained nicotine (38.4–84.5%), although 30.1% believed that it just contained nicotine and/or flavored vapor (15.5–50.0%), and 2.1% thought it was flavored vapor only (0.0–5.9%).

Conclusions.—This study reports the highest daily use of e-cigarettes among college students in the literature to date, with past-month e-cigarette use and daily cigarette use on par with previous estimates. Findings also highlight the knowledge gaps that some users have about JUUL specifically. In order for college health educators and professionals to best help students, adoption of methods that allow for more rapid assessment of e-cigarette trends is needed. This will help campuses more effectively address this issue, closing the research-to-practice gap in college health.

Keywords

college students; e-cigarette; prevention; JUUL

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1. Introduction

It is an unfortunate truth that the oft-heralded decline in cigarette smoking has been met with a sharp increase in e-cigarette use (Saddleson et al., 2015). This is highlighted among college-age adults and specifically college students. Notably, 13.1% of adults age 18–24 reported smoking in 2016 (Jamal et al., 2018) and the daily smoking rate among college students is at an all-time low of 2.2% (American College Health Association [ACHA], 2016). Comparatively, it has been reported that around 12–21% of college-age adults reported using e-cigarettes in 2018 (Surgeon General, 2018; Willet, 2018), up from 4.9% five years earlier (Sutfin et al., 2013), with daily rates as high as 7.7% (Goniewicz, 2018). While some claim that e-cigarettes provide a healthier alternative to traditional smoking (Abrams et al., 2018) and have been shown to help with smoking cessation (Russell et al., 2018), they are not without harm and may also lead to increased risk for cigarette smoking in a college-age population (Dunbar et al., 2018; Stratton, Kwan, & Eaton, 2018). Given how quickly trends and products change, college health professionals (e.g., clinicians, educators, administrators) need creative ways of tracking e-cigarette behaviors among college students.

The trend of growing e-cigarette use among college students is worrisome for many reasons. These devices carry harmful side effects including an increase in airborne particulate matter, exposing users to toxic substances, the potential to explode or cause burns, and significantly increasing the chance that regular use among young adults will lead to an increase in traditional cigarette use later (NAS, 2018). This latter concern of nicotine addiction is especially warranted because e-cigarettes typically have higher nicotine concentrations than traditional cigarettes. It has been demonstrated that the level of nicotine in e-cigarettes varies dramatically. One study found nicotine concentrations ranging from 21.8–56.2mg/mL per container (Goniewicz, 2018). For every 10 puffs, this leads to .77–.85mg of nicotine compared to .02–.51mg in cigarettes. Another study compared nicotine concentrations across popular e-cigarette brands and found that concentrations range from 1.6–66.7mg/mL per container, with JUUL having the highest nicotine concentrations (59.2 mg/mL–66.7mg/mL) and lowest flavor concentration (Omaiye et al., 2018). With the long-term health effects of e-cigarettes still unknown (Stratton et al., 2018) but the addictive properties of nicotine undisputed, there is a need to closely track college students' e-cigarette behaviors.

A key way to do this is via electronic audience response technology. Such technology is practical, rapid, and real-time. It has been shown to be reliable and valid ways of assessing college students' health (LaBrie et al., 2006) and is appropriate for the current problem given the constantly changing landscape of e-cigarette devices. For example, JUUL is increasingly popular among all e-cigarette users (Russell et al., 2018), especially young adults (Willet et al., 2018; Goniewicz, 2018; Allem, Dharmapuri, Unger, & Cruz, 2018). One study found that nearly 80% of e-cigarette consumers use JUUL (Goniewicz, 2018) and the product dominates the e-cigarette market (Wells Fargo Securities, 2018), indicating mass popularity. Studying the e-cigarette landscape in real-time is practical and necessary for public health programming. Specifically, this short communication serves as a call to action for colleges to implement real-time data collection tools to track e-cigarette behaviors

among students. The most up-to-date trends will be reported and we will end by suggesting specific ways to move forward in multi-level prevention and intervention efforts so that this new generation of students does not suffer from nicotine addiction.

2. Methods and Materials

Participants were a convenience sample of incoming freshmen / first year students at welcome week from across seven college campuses in the Mid-Atlantic area in August 2018. Data was collected using hand held electronic audience response technology during required orientation alcohol and drug education events. Audience response technology, sometimes referred to as “click6ers,” is a valid way of collecting anonymous and less error-prone data quickly and effectively (LaBrie et al., 2006). Clickers were randomly distributed on chairs prior to each presentation. The percentage of students who had clickers in a given session varied. In some sessions every student had the ability to use a clicker and large sessions (~1,000 students) only about a quarter had clickers. In all sessions, students were told that participation was anonymous and optional but on average over 90–95% of those who had clickers responded to questions. No other demographic information (i.e., age, race/ethnicity, gender) was collected to preserve anonymity and also due to the structure of the orientation sessions. The purpose of such sessions is to rapidly assess the climate of incoming first-year students in an interactive manner and then to correct misperceptions related to alcohol, substance use, and sex. Due to the voluntary nature of the audience response technique, total sample size across all sessions varied by question and ranged from 1,940 to 2,027 students. This study did not meet Institutional Review Board requirements for human subjects research.

Three questions were asked to students during the educational session are of interest in this short communication. First, students were asked “what best describes your use of JUUL?” with response options on an ordinal scale from “never used” to “use daily.” Second, students were asked “what is true of JUUL as made by the manufacturer?” Responses for this question were: “flavored vapor only,” “nicotine and/or just flavor,” “always contains nicotine.” Students were also asked whether they were daily smokers with binary “yes” or “no” options. Analyses included calculating descriptive statistics for these questions.

3. Results

Table 1 reveals the results of questions asked to students combined across sessions and schools. Nearly 15% of students reported using JUUL daily, with the lowest average reported daily use at 11% and the highest at 19.2%. About 18% had used JUUL in the past week or past month while 13.7% had used the product but not in the past month. A little over half (53.9%) of students had never used JUUL, with this average fluctuating from 42.3–68.2% across sessions. Overall current usage (daily, past week, and past month added together) was 32.3%. A little over two thirds third of students (67.3%) knew that JUUL always contained nicotine, with this average ranging from 38.4–84.5% across sessions. A third of students believed that JUUL contained nicotine and/or just flavor and 2.1% thought that it only contained flavored vapor. By comparison, 1.7% of students reported daily use of cigarettes with the highest average reported at 2.5%.

4. Discussion

Findings about the trends in e-cigarette use somewhat differed from previous reports. First, the daily use of JUUL found across seven colleges in the current study is the highest reported in the literature of e-cigarette devices (Goniewicz, 2018). The prevalence of daily use of JUUL is complemented by the still low rate of daily cigarette smoking by college students, which is similar to past estimates (ACHA, 2016). Second, past month usage of JUUL was on par with past reports (Willet et al., 2018). Finally, the number of students who knew that JUUL always contained nicotine was higher than previously reported (Willet et al., 2018). About two thirds of students in the current sample knew that JUUL always contained nicotine. This complements previous findings that e-cigarette users largely believe that the devices are safer than traditional cigarettes but not without the possibility of addiction or other side effects (Goniewicz, Lingas, & Hajek, 2013; Saddleson, 2015).

The data presented here highlight the need to keep up with the rapid, ever-changing substance use trends of college students. Social media has likely accelerated behavior change related to nicotine addiction in the case of JUUL. JUUL has its own sub-culture online; users often discuss it on Twitter and posts tend to reflect behaviors related to use (Allem et al., 2018). It is probable that the same will occur for others substances and products in the future. To that point, while preparing this communication JUUL released a statement that the company would eliminate its social media platforms and stop selling many of its flavored pods in retail stores (Kaplan & Hoffman, 2018), although many are still available online. This came as a reaction to the FDA crackdown on e-cigarette makers and retailers (U.S. Food and Drug Administration, 2018). Even more recently, Altria Group, Inc. acquired 35% stake in the company (Jackler et al., 2019). This new partnership indicates that JUUL will continue to be accessible to youth (Jackler et al., 2019), potentially in more traditional venues such as brick-and-mortar retailers. In a way, this reinforces our position that colleges need to adopt real-time data collection efforts to track students' e-cigarette habits. It is unclear if current college students who use JUUL will continue to do so after these recent changes. If they switch products, it is unknown if they will use a different e-cigarette or a different product. Thus, it is possible that there are new e-cigarette or other pod-devices (e.g. THC pods) that college health professionals will need to be aware of. A few months ago that device was JUUL and tomorrow it may be something currently unheard of.

In our social media culture, the research-to-practice gap in college health needs to be shortened at all levels of prevention. As we showed in this short communication, one way to do this is through practical, simple, and real-time methods such as group electronic audience response technology. Such technology may be a better option for colleges to quickly and often assess the e-cigarette habits of their students than similar but more burdensome techniques such as ecological momentary assessment. This may come in the form of clickers or even cell phones and other personal devices (e.g., [mentimeter.com](https://www.mentimeter.com)). Specific suggestions are henceforth noted.

At the primary prevention level, college health professionals can utilize educational and social norms techniques in presentations and mass public health messaging (Su et al., 2018).

These methods allow college health professionals to adjust presentations, campus-wide campaigns, and social norm techniques for rapid fluctuations in substance use, specifically e-cigarette behaviors. Again, this technology can also be used to track overall trends such as spotting an uptick in new types of e-cigarettes or pods and taking preventative measures to reduce use of the product on campus. At the secondary prevention level, better assessment data from electronic audience response technologies can inform screening practices. Specifically, these technologies could be used to target and screen populations who are at a higher risk of nicotine addiction and e-cigarette use across campus. Finally, at the tertiary level, it cannot be assumed that traditional nicotine dependence programs will work on e-cigarette device usage (e.g., smoking cessation guides, medications, peer support groups, on-campus counseling), as evidenced by the difference in trajectories for the use of JUUL versus cigarettes (Saddleson et al., 2015). For example, traditional cigarette screening and smoking cessation programs may be ineffective for e-cigarette use. This is a line of research that needs more inquiry but use of electronic audience response technology could be used to gather preliminary data on how to alter cessation programs. For example, changes in terminology that are better suited for e-cigarettes as well as personalized feedback would be easy to identify with such technology. Creation and customization of these programs is important because as we have seen with JUUL, the e-cigarette market is constantly changing. Additionally, electronic audience response technology may be useful to track changes in behavior of those who attend such programs.

These are just a few ideas for how to impact students' knowledge and use around e-cigarette usage and enhance what college health professionals know about this topic. For example, utilization of this technology uncovered the highest reported rates of daily e-cigarette to date. While there are many thorough reports on e-cigarettes (e.g., Dunbar et al., 2018; Russell et al., 2018; Stratton et al., 2018), there is a place for quick and rapid reports such as this one. Further, few past reports on e-cigarettes specifically focus on college students who are particularly vulnerable to substance misuse. Our focus on college students is a significant contribution to the extant literature.

Limitations of this study include not being able to collect and report demographic information such as race/ethnicity and gender to assess for their potential significant covariance. The current methodology also prevented the assessment of more pointed perceptions around JUUL (e.g., how much students think their peers use JUUL compared to how much they actually use). Further, the questions asked during the orientation week were not assessed for reliability or validity. Finally, given the voluntary nature of the study, there is a possibility of response bias in the sample and caution should be taken when comparing the current prevalence rates of e-cigarette to those of past studies. Nevertheless, this study adds to the growing literature on the habits of e-cigarette use among college students and suggestions for how to close the research-to-practice gap in this area.

5. Conclusions

There is much to be done to address nicotine addiction related to e-cigarette devices. This study highlights that use of e-cigarettes is increasing among freshmen college students and serves as a call to action to shorten the research-to-practice gap in detecting substance use

trends and acting on them. Electronic audience response methodology (e.g., clickers, cell phone polling) is a possible way to stay on top of changing e-cigarette trends among college students. College health educators must take note of not only the trends reported for e-cigarette daily use (compared to cigarette use), but for ideas of how to translate such information into practice.

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Highlights

- The use of e-cigarettes is increasing among college students
- A significant number of students are not aware that JUUL always contains nicotine
- Cigarette use among college students is still low
- Electronic audience response methods can be used to stay on top of trends
- Such methods can be used by college health providers to close the research-practice gap

Table 1.

Breakdown of responses to questions about freshmen students' use and knowledge of JUUL and use of cigarettes.

Question	Response Options	Total <i>n</i> Across Sessions and Colleges	Total Average Across Sessions and Colleges	Range of Averages	
				Min	Max
What best describes your use of JUUL?	Never used	1092	53.9%	42.3%	68.2%
	Used but not in past month	278	13.7%	11.6%	18.0%
	Used in past month	165	8.1%	5.9%	9.8%
	Used in past week	199	9.8%	5.9%	17.6%
	Use daily	293	14.4%	11.0%	19.2%
	Total clicker responses	2027			
What is true of JUUL as made by the manufacturer?	Flavored vapor only	42	2.1%	0.0%	5.9%
	Nicotine and/or just flavor	557	30.1%	15.5%	59.0%
	Always contains nicotine	1341	67.3%	38.4%	84.5%
	Total clicker responses	1940			
Are you a daily cigarette smoker?	Yes	34	1.7%	1.3%	2.5%
	No	1976	98.3%	97.5%	98.7%
	Total clicker responses	2010			