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Short Communication

Decreases in smoking and vaping during COVID-19 stay-at-home orders among a cohort of young adults in the United States

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ABSTRACT

In Spring 2020, most US states and territories implemented stay-at-home orders to slow transmission of the novel coronavirus SARS-CoV2, the cause of COVID-19. Little is known about the impact of stay-at-home orders on tobacco and nicotine use including among young adults. The current study examined participants ($N = 1727$) completing three recent survey waves from a longitudinal cohort of young adults recruited in 2010 from North Carolina and Virginia, USA: Wave 13 (Spring 2019), Wave 14 (Fall 2019), and Wave 15 (Spring 2020) to assess changes in cigarette and e-cigarette use. We conducted logistic regression analyses to compare the odds that participants reported smoking or vaping in Wave 14 relative to Wave 13 to establish if there was a trend of use pre-pandemic. Then, we conducted logistic regression analyses to compare the odds that participants reported smoking or vaping in Wave 15 relative to Wave 14 to determine the impact of COVID-19 stay-at-home orders. When comparing the odds of reporting tobacco use at Wave 14 to Wave 13, no differences emerged ($p > 0.05$). However, when comparing tobacco use at Wave 15 to Wave 14, participants had 40% lower odds of reporting past 30-day cigarette use ($p = 0.02$) and 50% lower odds of reporting past 30-day e-cigarette use ($p < 0.01$). The current study provides initial evidence that young adults may have reduced their tobacco and nicotine use during the stay-at-home orders. However, more work is needed to determine the long-term impact of the COVID-19 pandemic on tobacco use and cessation in this population.

1. Introduction

The novel coronavirus SARS-CoV-2, also known as COVID-19, emerged in December 2019 with patients exhibiting severe respiratory symptoms (Zhu et al., 2020). In March 2020, the World Health Organization declared COVID-19 a pandemic (Cucinotta and Vanelli, 2020). To slow transmission, 42 states and territories in the United States implemented stay-at-home orders between March and May 2020, affecting nearly 308 million residents (Moreland et al., 2020). Many businesses temporarily closed, resulting in non-essential workers switching to remote work or experiencing furloughs or layoffs. Schools, colleges, and universities transitioned to remote learning. As a result, millions of people spent much of their time in their homes or places of residence for extended periods.

Given the unprecedented experience of the stay-at-home orders, little is known about how the pandemic and policy interventions would affect tobacco use among young adults. Since COVID-19 is a respiratory illness, early in the pandemic, there were serious concerns about the impact of the virus on people who smoked and vaped. Competing hypotheses regarding behavior change seem equally plausible among this population. Smoking and vaping could increase during stay-at-home orders due to several factors such as increased stress (McKee et al., 2011; Slopen et al., 2013), decreased exposure to indoor tobacco use restrictions (i.e., smoke-free workplaces) or simply boredom (McEwen et al., 2008) due to being at home for extended periods. Alternatively, smoking and vaping could decrease due to health concerns associated with the novel respiratory virus, reduced access to purchasing products because of the stay-at-home restrictions, or people not wanting to smoke

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or vape at home. Finally, there could be no change in smoking or vaping because young adults may not have been as concerned about COVID-19 since disease transmission and mortality occurred primarily among older adults early in the pandemic. The current paper examines smoking and vaping among a cohort of young adults who completed a longitudinal cohort survey twice in the 12 months preceding the pandemic and once during the stay-at-home orders.

2. Methods

Since 2010, we have followed a cohort of young adults to measure their tobacco use during and after college. Recruitment occurred from 11 colleges and universities in North Carolina and Virginia and comprised 3146 freshman students with oversampling of males and people who smoked cigarettes or used smokeless tobacco. The data are weighted to adjust for baseline oversampling. Additional information about the sample size estimation procedures at baseline, cohort construction, or overall study aims have been reported previously (Spangler et al., 2014; Wolfson et al., 2015; Suerken et al., 2014). Between fall 2010 and spring 2020, participants received 15 survey waves to complete. The Wake Forest School of Medicine Institutional Review Board approved the study protocol. Participants provided informed consent at each survey. For additional privacy protections, we obtained a Certificate of Confidentiality from the National Institutes of Health (NIH).

The current study examined three recent surveys, Waves 13, 14 and 15, to assess the impact of COVID-19 stay-at-home orders on smoking and vaping behavior. The Wave 13 survey was fielded between April 16, 2019 and May 28, 2019 and the Wave 14 survey was fielded between November 01, 2019 and December 16, 2019 (both prior to the stay-at-home orders). For Wave 15, participant responses occurred between April 08, 2020 and June 01, 2020, with over 80% completing the survey by April 30 (during/after the stay-at-home orders). Using self-reported address information at Wave 15, we calculated the percentage of participants residing in locations with stay-at-home orders. Demographic characteristics included age, sex (male/female), race (NIH categories), ethnicity (Hispanic/non-Hispanic), employment status (Full-time/Part-time/Not employed) and income (<\$35,000/≥\$35,000).

The tobacco use questions administered in this study were adopted from the Population Assessment on Tobacco and Health (PATH) Survey (Hyland et al., 2017). Participants reported current smoking on the following question: “Do you now smoke cigarettes every day, some days, or not at all?” For participants who responded with ‘every day’ or ‘some days’, they answered a frequency of use question: “In the past 30 days, on how many days did you smoke cigarettes?” with response options 1–2 days, 3–5 days, 6–9 days, 10–14 days, 15–19 days, 20–29 days or all 30 days. Participants reported current vaping on the following question: “Do you use e-cigarettes or other vaping devices every day, some days, or not at all?” For participants who responded with ‘every day’ or ‘some days’, they a frequency of use question: “In the past 30 days, on how many days did you use an e-cigarette or other vaping device?” with response options 1–2 days, 3–5 days, 6–9 days, 10–14 days, 15–19 days, 20–29 days or all 30 days.

First, we conducted separate logistic regression analyses comparing the odds participants reported past 30 day smoking or vaping and frequency of use (greater than or equal to 15 days out of the past 30) in Wave 15 relative to Wave 14. To determine if there was a trend in the prevalence of smoking and vaping before the COVID-19 stay-at-home orders, we used the same logistic regression analyses but compared Wave 14 to Wave 13. We used survey sampling procedures in SAS® (version 9.4) to account for the oversampling of males and tobacco users at baseline and random-effects logistic regression models to account for the repeated measures. We dichotomized frequency of product use (≥15 days per month or < 15 days per month) among past 30-day users to determine whether changes in smoking or vaping behavior were more common among less frequent tobacco users. Models were generated using proc. glimmix using a binomial distribution with a logit link

function. We present 95% confidence intervals for the odds ratios and *p*-values from the F-tests.

3. Results

The analytic sample includes 1727 respondents who completed all three survey waves. At Wave 15, participants were, on average, 27.6 years old (standard deviation [SD]: 0.6); 52.1% female; 7.6% identify as Black or African American persons; and 6.3% identify as Hispanic persons. Table S1 reports additional demographic characteristics. More than 95% of respondents reported living in a US state, territory or foreign country that implemented stay-at-home policy restrictions during March–May 2020.

Fig. 1 displays self-reported tobacco use by wave. At Wave 15, 4.6% of participants reported past 30-day cigarette use compared to 6.2% of participants at Wave 13 and 6.1% at Wave 14. For e-cigarettes, 5.0% of participants reported use at past-30 day use at Wave 15 compared to 8.1% at Wave 13 and 7.4% at Wave 14. Frequency of use data are reported in Table S2. When comparing the odds of reporting tobacco use at Wave 14 to Wave 13, no significant differences emerged. However, when comparing tobacco use at Wave 15 to Wave 14, participants had 40% lower odds of reporting past 30-day cigarette use and 50% lower odds of reporting past 30-day e-cigarette use (see Table 1). No significant differences emerged in frequency of use, though we may be underpowered to detect differences.

4. Discussion

We found changes in smoking and vaping behavior during COVID-19 stay-at-home policies. Respondents had significantly lower odds of reporting past 30-day cigarette or e-cigarette use during Wave 15 compared to Wave 14. Given the relatively short timeframe between the two assessments (approximately 5 months), the decrease in prevalence by 1.5% for smoking and 2.4% for vaping is somewhat unexpected and at least partially attributable to the societal upheaval of the COVID-19 pandemic, especially since we found no differences in tobacco use between the two waves prior to COVID-19. One potential explanation is that social smoking and vaping among young adults declined due to the stay-at-home orders. People who use tobacco in specific contextual situations (e.g., with friends or out at bars), likely had reduced opportunities for smoking and vaping. Indeed, a qualitative study reported decreasing smoking during stay-at-home orders among people who smoke socially (Giovenco et al., 2021). Further, it is plausible that people who predominantly use tobacco in social settings may not purchase their own products but will use other people’s products. With stay-at-home orders intended to minimize socialization with others outside of one’s immediate residence, participants in this study may have had limited access to tobacco products via other people. Additionally, stay-at-home orders included closures of non-essential businesses and

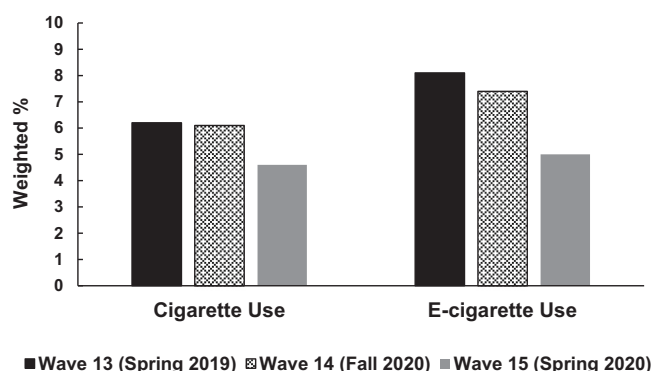


Fig. 1. Past 30-day cigarette and e-cigarette use by Wave.

Table 1
Unadjusted logistic regression analyses.

	Reference group	Odds ratio	95% confidence interval		p-value
			Lower bound	Upper bound	
Comparison of Fall 2019 (Wave 14) to Spring 2019 (Wave 13)					
Any past 30-day cigarette use	No reported use	1.0	0.7	1.4	0.922
Any past 30-day E-cigarette use	No reported use	0.8	0.6	1.2	0.308
Cigarette use 15+ days past month [#] (n = 305)	<15 days per month	1.1	0.5	2.4	0.813
E-cigarette use 15+ days past month [#] (n = 368)	<15 days per month	0.9	0.4	1.8	0.717
Comparison of Spring 2020 (Wave 15) to Fall 2019 (Wave 14)					
Any past 30-day cigarette use	No reported use	0.6	0.4	0.9	0.019
Any past 30-day E-cigarette use	No reported use	0.5	0.4	0.7	< 0.001
Cigarette use 15+ days past month [#] (n = 268)	<15 days per month	1.8	0.7	4.3	0.200
E-cigarette use 15+ days past month [#] (n = 302)	<15 days per month	1.8	0.9	3.6	0.108

Unadjusted logistic regression analyses comparing cigarette and e-cigarette use at Wave 14 to Wave 13 and Wave 15 to Wave 14. [#]Analysis restricted to participants reporting past 30-day cigarette or e-cigarette use.

provided recommendations to limit patronizing essential businesses. Therefore, decreases in tobacco use may also be attributed to decreased access to retailers, an unwillingness to patronize in-person retail locations to purchase products, or due to changes in daily routines associated with tobacco purchasing (i.e., not going to the convenience store on the way to work). A concept-mapping study of e-cigarette users found that some respondents reported decreased use or rationing their e-cigarettes due to challenges obtaining products during the stay-at-home phase; however, others noted increasing use or stockpiling e-cigarettes (Soule et al., 2020). Finally, reductions in tobacco use might be attributable to some extent to smoke-free home policies. If people who smoke typically smoke away from home and have smoke-free home restrictions, they might not compensate by smoking at home. Moreover, studies have shown that tobacco product users with smoke-free homes have higher rates of quit attempts and cessation (Haardörfer et al., 2018; Vijayaraghavan et al., 2013).

Our study bolsters and extends the literature by examining the impact of stay-at-home orders within a longitudinal cohort of young adults. The results are consistent with a study reporting lower odds of e-cigarette use among 15–20 year olds and lower odds of cigarette use among 21–24 year olds during the stay-at-home orders relative to prior assessments administered before the pandemic (Kreslake et al., 2021). Two cross-sectional surveys of adolescents and young adults found decreases in e-cigarette use and increases in quit attempts during the pandemic; however, these same studies also found evidence of increased use and e-cigarette stockpiling among smaller percentages of respondents (Berg et al., 2021; Gaiha et al., 2020). A letter to the editor of *Nicotine & Tobacco Research* reported about a quarter of respondents attributed their decreased tobacco use to COVID-19 among a convenience sample of Amazon Mechanical Turk workers who use cigarettes and/or e-cigarettes (Klemperer et al., 2020). Over 20% of respondents indicated making a quit attempt in order to reduce their COVID-19 risk.

In a convenience sample of cigars users, nearly half of respondents reported making a quit attempt since the beginning of the pandemic and over 70% indicated a goal of quitting due to COVID-19 health concerns (Kowitz et al., 2020). Compared to international studies, our results are mixed. A survey from the United Kingdom reported increased quit attempts among people who smoke during stay-at-home orders while studies from New Zealand and Belgium found increased smoking, although the samples, on average, were older than the current cohort (Jackson et al., 2020; Gendall et al., 2021; Vanderbruggen et al., 2020). Finally, our results are inconsistent with a study of high school students in California that found declines in e-cigarette use were unrelated to stay-at-home policies (Chaffee et al., 2021). However, declines in adolescent e-cigarette use may be attributable to changes in the e-cigarette marketplace and regulatory environment as well as the e-cigarette or vaping-related lung injury (EVALI) outbreak that occurred prior to the COVID-19 pandemic (Moustafa et al., 2021; Initiative T, 2018; Press, 2019; *Non-Tobacco-Flavored E-Cigarette Products*, 2019).

There are several limitations to consider. First, we finalized the survey questions prior to the stay-at-home orders, so we did not ask participants if they stopped smoking or vaping because of COVID-19. Second, the cohort is not nationally representative, so the reductions in smoking and vaping during the stay-at-home orders may not reflect the experiences of all tobacco users in the US. Further, the cohort has low rates of tobacco use relative to national averages, so the reductions in smoking and vaping observed in this cohort could be an underestimation of the impact of stay-at-home orders on tobacco use behavior. Third, the cohort is predominantly comprised of non-Hispanic, white people. Therefore, we know relatively little about how the stay-at-home policies affected tobacco use among racial and ethnic minorities, groups who disproportionately bore the burden of COVID-19 morbidity and mortality in large part due to social determinants of health and structural racism (Ogedegbe et al., 2020; Andrasfay and Goldman, 2021). Fourth, we do not have information on whether participants adhered to the stay-at-home orders and how that may have affected tobacco and nicotine use.

Despite its limitations, the current study provides evidence that young adults may have reduced their tobacco use during the stay-at-home orders. However, more research is needed to fully understand the effect of COVID-19 on tobacco use and cessation behaviors. Future studies should follow-up with people who reduced or quit using tobacco during the stay-at-home orders to examine whether acute, societal disruptions have longer-term behavioral outcomes and if young adults perceived the COVID-19 pandemic as a motivation to quit.

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Availability of data

The data underlying this article cannot be shared publicly due to privacy of individuals that participated in the study. The data will be shared on reasonable request to the corresponding author.

Declaration of Competing Interest

The authors declare they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supplementary data

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