Brief Report

Perceptions of Tobacco Product-Specific COVID-19 Risk and Changes in Tobacco Use Behaviors Among Smokers, E-Cigarette Users, and Dual Users

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Abstract

Introduction: Coronavirus Disease 2019 (COVID-19) is a public health crisis, but its effects on tobacco users remain ill-defined. This report aimed to assess the relationship between tobacco product-specific risk perceptions for COVID-19 and changes in tobacco use since the start of the pandemic.

Methods: A sample (n = 776) of past-30 day exclusive smokers (n = 238), exclusive e-cigarette users (n = 143), and dual users (n = 395) residing in the US and aged 18 or older were collected using Mechanical Turk from April 27 to June 8, 2020. Adjusted associations between tobacco product-specific COVID-19 risk perceptions (ie risk that smokers/vapers are at for COVID-19 relative to non-smokers/non-vapers) and changes in tobacco use since the pandemic began were assessed using partial proportional odds models.

Results: A majority of those who used cigarettes (63.7%) and e-cigarettes (56.1%) felt that the risk of COVID-19 was greater for users of their tobacco product than for non-users. Twenty-four percent of smokers had increased their cigarette use since the start of the pandemic and 28.0% had decreased. Similarly, 27.3% of e-cigarette users had increased their e-cigarette use since the start of the pandemic and 23.8% had decreased. Higher risk perceptions for COVID-19 were associated with reductions in tobacco use since the pandemic began for exclusive e-cigarette users and dual users.

Conclusions: These findings provide the support that tobacco product-specific COVID-19 risk perceptions may be an important correlate of changes in tobacco use during the pandemic. Targeted information to inform tobacco users regarding their risks for COVID-19 is needed during this public health crisis.

Implications: Few published studies have investigated the relationship between tobacco product-specific risk perceptions for COVID-19 and changes in tobacco product use since the pandemic began. This study enhances the current literature by providing evidence that higher tobacco product-specific risk perceptions for COVID-19 are associated with reductions in tobacco use since the pandemic began for exclusive e-cigarette users and dual users of cigarettes and e-cigarettes. Additionally, daily tobacco users may be more likely to have increased their tobacco use than non-daily users. These findings emphasize the importance of disseminating targeted health information to tobacco users regarding COVID-19 risks.

Introduction

Coronavirus Disease 2019 (COVID-19) is a pandemic level threat, has caused over 90 million cases and 1 900 000 deaths worldwide at the beginning of 2021.[1] Consequently, tremendous resources have been devoted to understanding what populations are at greatest risk for COVID-19, including users of tobacco products (defined here as "…any product made or derived from tobacco that is intended for human consumption, including any component, part, or accessory."[2]). However, the role that cigarettes and electronic cigarettes (e-cigarettes) play in influencing the incidence and severity of COVID-19 remains unclear.[3–7]

Apart from understanding the direct health effects of COVID-19 on tobacco users, characterizing the pandemic's impact on tobacco use is another important area of investigation, but findings have thus far been equivocal. A nationally representative survey in the UK found that 10% of e-cigarette users and 12% of smokers who had made recent quit attempts were motivated by COVID-19.[8] A separate survey concluded that 1 000 000+ people in the UK had stopped smoking since the pandemic began.[9] Conversely, an online survey of Australians reported that 90% of smokers had not made any changes to their smoking[10] and another survey found that 20% of Chinese smokers had increased their smoking during the pandemic.[11] Global tobacco sales data shows that purchasing of tobacco products has ebbed and flowed during the pandemic, potentially attributable to a "stock-piling effect."[12] In sum, changes in tobacco use during the pandemic remain unclear. Even still, exploring the factors influencing individual-level behavior changes is important in designing interventions to benefit the health of tobacco users. This is particularly important as tobacco users often do not perceive themselves to be at increased risk for many smoking-related diseases[13] and those with lower risk perceptions report higher levels of tobacco use[14] and fewer quit attempts.[15]

Few studies have investigated the relationship between tobacco product-specific risk perceptions for COVID-19 and changes in tobacco use since the start of the pandemic. One survey of cigar smokers (n = 777) found that while 76.0% perceived their level of risk for COVID-19 to be higher than non-smokers, 40.9% of participants increased their tobacco use since the pandemic began.[16] Those with higher COVID-19 risk perceptions had higher odds of intending to quit tobacco use and of making a quit attempt since the start of the pandemic. In another survey of 345 tobacco users on Mechanical Turk (MTurk), smokers and e-cigarette users were moderately, but similarly, concerned about the risk their tobacco use placed them at for contracting COVID-19.[17] This study also reported that while half of the respondents reported no change in their cigarette and/or e-cigarette use since the start of the pandemic, COVID-19 had prompted nearly a quarter to reduce their tobacco use. However, the authors did not find an association between risk perceptions and changes in tobacco product use, perhaps due to limited power

(n = 345) or because the study was conducted on a single day early in the pandemic (April 10, 2020).

This report aims to extend our understanding of how tobacco users' perceptions of tobacco product-specific COVID-19 risk (ie the risk that smokers/vapers are at for COVID-19 relative to non-smokers/non-vapers) relate to changes in tobacco use among a convenience sample (n = 776) of current exclusive smokers, exclusive e-cigarette users, and dual users in the United States (US), collected over 6 weeks of the pandemic.

Methods

Participants were recruited using MTurk between April 27 and June 8, 2020. To be eligible for the screening survey, respondents had to have an MTurk account registered in the US, be aged 18 or older, have completed 100 prior "Human Intelligence Tasks" (HITs), and hold at least a 90% HIT approval rating. Those who endorsed past 30-day use of cigarettes or e-cigarettes on the screener were deemed eligible for the main survey (n = 1,226). Respondents who did not submit the final page of the survey (n = 82), did not reconfirm past 30-day use of cigarettes or e-cigarettes (n = 91), missed both attention-check questions (n = 62), or had a completion time ±3 standard deviations from the mean (n = 1) were excluded from present analyses. Respondents were classified as "exclusive smokers" if they reported past 30-day use of cigarettes only, "exclusive e-cigarette users" if they reported past 30-day use of e-cigarettes only, or "dual users" if they reported past 30-day use of both products. After accounting for missing data (n = 214) we were left with an analytic sample of 776 participants. Bivariate tests comparing tobacco product-specific risk perceptions, frequency of tobacco product use, and behavior changes between those observations that were included in the analytic sample and those that were not (due to missing data) did not reveal statistically significant differences (ps < 0.05).

The primary outcome of interest was the reported change in tobacco use since the start of the COVID-19 pandemic. Exclusive smokers were asked if they were "smoking less," "smoking about the same amount," or "smoking more" since the pandemic began and exclusive e-cigarette users were asked a similar question about their e-cigarette use. Dual users were asked both questions. Questions in the survey also assessed perceptions of risk for COVID-19 for smokers compared to non-smokers and e-cigarette users compared to non-e-cigarette users, both on 5-point Likert scales. Specifically, exclusive smokers and dual users were asked to rate the level of risk for COVID-19 that they felt smokers had relative to non-smokers from "Much lower risk" to "Much higher risk." Exclusive e-cigarette users and dual users were asked to rate the level of risk for COVID-19 that they felt vapers had relative to non-vapers. Respondents also reported their gender, age, education, income, race/ethnicity, overall perceptions of their physical

and mental health, whether they used flavored tobacco products (use of menthol cigarettes or flavored e-cigarettes), the average amount of money they spent on tobacco products per week in 2019, whether they were seriously considering quitting tobacco use in the next 6 months, and their current tobacco use frequency (non-daily vs daily use). Dual users were divided into four groups depending on their tobacco use frequency responses: concurrent non-daily users, predominant smokers (daily use of cigarettes but not e-cigarettes), predominant e-cigarette users (daily use of e-cigarettes but not cigarettes), and daily dual users.

Bivariate analyses (chi-squares and t-tests) examined unadjusted differences between tobacco user groups and changes in tobacco use since the start of the pandemic, tobacco product-specific COVID-19 risk perceptions, and our set of covariates. Partial proportional odds (PPO) models with robust standard errors were used to assess adjusted associations between tobacco product-specific COVID-19 risk perceptions and changes in tobacco use since the pandemic began for each of the three tobacco user groups.[17] PPO models allow proportional odds ratios to be estimated for covariates that do not violate the proportional odds assumption and separate odds ratios for covariates that do. All analyses used STATA/IC 16.

Results

Respondent Characteristics

Of the 776 participants in our analytic sample, 238 (30.7%) were exclusive smokers, 143 (18.4%) were exclusive e-cigarette users, and 395 (50.9%) were dual users (Table 1 and Supplementary Table 1). The majority of the sample identified as male (58.6%) and "White or Caucasian" (80.0%). A plurality of respondents was 25–34 years old (43.8%). The majority (59.1%) of exclusive users were daily users of their tobacco product with no differences detected between exclusive smokers and exclusive e-cigarette users (p = .24). Similarly, among dual users, 40.5% were non-daily users, 36.2% were predominant smokers, 14.2% were predominant e-cigarette users, and 9.1% were daily dual users.

Perceived Risk for COVID-19 for Smokers and E-Cigarette Users

A majority of those who used cigarettes (63.7%) and e-cigarettes (56.1%) felt that the risk of COVID-19 was much greater or somewhat greater for users of their tobacco product than non-users (Supplementary Table 4). There was no unadjusted difference in

Table 1. Select Sample Characteristics

	Overall	Exclusive smokers	Exclusive e-cigarette users	Dual users	*p*-value
N	776	238	143	395	–
Tobacco use changes since the start of the COVID-19 pandemic[a]					
Cigarettes					.146
Increased use	24.0%	24.4%	–	23.8%	
Made no change in use	48.0%	52.5%	–	45.3%	
Decreased use	28.0%	23.1%	–	30.9%	
E-cigarettes					.286
Increased use	27.3%	–	23.8%	28.6%	
Made no change in use	48.9%	–	53.9%	47.1%	
Decreased use	23.8%	–	22.4%	24.3%	
Tobacco product-specific COVID-19 perceived risk[a]					
Mean (SD)					
Smokers compared to non-smokers	3.7 (1.1)	3.8 (1.1)	–	3.7 (1.1)	.232
E-cigarette users compared to non-e-cigarette users	3.5 (0.9)	–	3.7 (0.9)	3.5 (1.0)	.100
Demographics					
Male	58.6%	53.4%	58.7%	61.8%	.115
Age (years)					<.001
18–24	8.8%	2.9%	15.4%	9.9%	
25–34	43.8%	39.5%	46.2%	45.6%	
35–54	40.7%	45.0%	32.2%	41.3%	
55+	6.7%	12.6%	6.3%	3.29%	
Non-white/non-Caucasian	20.0%	17.7%	16.1%	22.8%	.128
Education					.003
Some college or less	43.3%	52.5%	40.6%	39.0%	
College degree or higher	56.6%	47.5%	59.4%	61.0%	
Tobacco use frequency (exclusive users)					.241
Non-daily use	40.9%	38.7%	44.8%	–	
Daily use	59.1%	61.3%	55.2%	–	
Tobacco use frequency (dual users)					–
Concurrent non-daily user	40.5%	–	–	40.5%	
Predominant smoker	36.2%	–	–	36.2%	
Predominant e-cigarette user	14.2%	–	–	14.2%	
Daily dual user	9.1%	–	–	9.1%	
Seriously considering quitting tobacco use in the next 6 months	67.5%	67.2%	60.1%	70.4%	.081
Use flavored tobacco product	46.6%	43.7%	68.5%	52.4%	<.001

Note: This table shows sample characteristics for select variables. To view sample characteristics for all variables included in these analyses, see Supplementary Table 1.

[a] The exact text for the questions and response options for these measures are available in the notes section of Supplementary Table 1.

Table 2. Select Results of Adjusted Associations Between Tobacco Use Behavior Changes Since COVID-19 Began and Tobacco Product-Specific COVID-19 Risk Perceptions

	Outcome: changes in tobacco use behavior since COVID-19 pandemic began (ie, decrease/no change/increase)[a]		
	Exclusive smokers aOR (95% CI)	Exclusive e-cigarette users aOR (95% CI)	Dual users aOR (95% CI)
N	238	143	395
Main independent variable: Tobacco product-specific COVID-19 risk perceptions[a]	0.83 (0.65–1.08)[b]	0.27 (0.15–0.49)***[c]	0.81 (0.69–0.94)**
	–	0.56 (0.32–0.98)***[d]	–
Tobacco product being assessed (dual users)	–	–	Reference group: Cigarette
Electronic cigarette	–	–	1.20 (0.90–1.61)
Self-perceived health status	Reference group: Poor/Fair	Reference group: Poor/Fair	Reference group: Poor/Fair
Good/Very good/Excellent physical health	1.22 (0.66–2.26)	2.43 (0.62–9.49)	0.89 (0.57–1.39)
Good/Very good/ Excellent mental health	0.71 (0.38–1.31)	1.55 (0.56–4.35)	1.02 (0.69–1.52)[c]
	–	–	0.59 (0.39–0.87)**[d]
Weekly spending on tobacco in 2019	Reference group: $0–$1.99	Reference group: $0–$1.99	Reference group: $0–$1.99
$2.00–$9.99	0.41 (0.13–1.30)	0.63 (0.22–1.80)	0.36 (0.19–0.69)**
$10.00–$29.99	0.50 (0.16–1.62)	0.50 (0.17–1.43)	0.26 (0.13–0.49)***
$30.00+	0.82 (0.24–2.82)	0.54 (0.17–1.70)	0.28 (0.14–0.58)**
Tobacco use frequency (exclusive users)	Reference group: non-daily user	Reference group: non-daily user	–
Daily user	3.28 (1.56–6.92)**	8.86 (2.91–27.00)***[c]	–
	–	0.97 (0.34–2.77)[d]	–
Tobacco use frequency (dual users)	–	–	Reference group: Concurrent non-daily users
Predominant smoker	–	–	2.96 (1.90–4.61)***[c]
	–	–	0.91 (0.59–1.40)[d]
Predominant e-cigarette user	–	–	1.20 (0.77–1.87)
Daily dual user	–	–	2.72 (1.65–4.51)***
Seriously considering quitting tobacco use in next 6 months	0.74 (0.33–1.64)	0.47 (0.21–1.09)	0.39 (0.26–0.58) ***[c]
	–	–	1.51 (1.03–2.21)*[d]

Note: This table shows a selection of the key results from our regression analyses. For full regression results, see Supplementary Table 2. The proportional odds assumption was violated for certain variables and instead of presenting a single adjusted odds ratio, individual odds ratios representing the differences between the three tobacco use change categories (decrease/no change/increase) are shown and denoted with [c] and [d]. CI=Confidence interval. Adjusted associations between tobacco product-specific COVID-19 risk and changes in tobacco use were tested using a partial proportional odds model with robust standard errors. *$p < .05$, **$p < .01$, ***$p < .001$.

[a]The exact text for the questions and response options for these measures are available in the notes section of Supplementary Table 1.

[b]When a variable only has one aOR associated with it, the odds can be interpreted as (for example): the odds of having made no change in use, relative to decreased use, or of having increased use, relative to no change in use, are 0.83 times lower for each 1 unit-increase in tobacco product-specific COVID-19 risk perceptions (using our defined scale), holding other variables constant.

[c]Decrease versus No change/Increase (ie, the odds of reporting either "no change in use" or "increased use" relative to "decreased use").

[d]Decrease/No change versus Increase (ie, the odds of reporting "increased use" relative to either "decreased use" or "no change in use").

average risk perception for smokers between exclusive smokers (3.79 [SD 1.12)]) and dual users (3.68 [SD 1.06)]) ("Much lower risk" = 1, "Much higher risk" = 5; p = .23). There were also no unadjusted differences in average COVID-19 risk perceptions for e-cigarette users between exclusive e-cigarette users (3.66 [SD 0.93]) and dual users (3.51 [SD 1.00]) (p = .10).

Smoking -Related Behavioral Changes Since the Start of the COVID-19 Pandemic

In terms of cigarette usage, there were no differences in the changes made by exclusive smokers (24.4% increased use, 52.5% made no change, 23.1% decreased use) and dual users (23.8% increased use, 45.3% made no change, and 30.9% had decreased use) (p = .146, Table 1). Similarly, there were no differences in changes to e-cigarette usage between exclusive e-cigarette users (23.8% increased use, 53.9% made no change, 22.4% decreased use) and dual users (28.6% increased use, 47.1% made no change, 24.3% decreased use) (p = .286). Daily users were more likely to have increased their tobacco use than non-daily users in each tobacco user group (Supplementary Table 3).

Adjusted Associations of Tobacco Product-Specific COVID-19 Risk and Changes in Tobacco Use

Higher perceived risk for COVID-19 for smokers and e-cigarette users (relative to non-users) was associated with reductions in tobacco use after controlling for covariates for both dual users (aOR = 0.81, p < .01) and exclusive e-cigarette users, though the latter violated the proportional odds assumption suggesting different adjusted associations between decrease versus no change/increase (aOR = 0.27, p < .01) and decrease/no change versus increase (aOR = 0.56, p < .05; Table 2 and Supplementary Table 2).

Discussion

We find that perceptions of risk for COVID-19 attributed to a specific tobacco product (cigarette or e-cigarette) were a significant predictor of changes in the use of that tobacco product since the pandemic began. This finding brings clarity to the literature which has thus far presented conflicting results.[16,17] Among both exclusive e-cigarette users and dual users, the higher the level of risk for COVID-19 that respondents perceived for users of a given tobacco product, the more likely those respondents were to have decreased their use of that product since the start of the pandemic. Further, it was also noted that daily tobacco users were generally more likely to have increased their tobacco use since the pandemic than non-daily users (Table 2). This is an important finding as it shows that, at least in the short-term, exclusive e-cigarette users and dual users are willing to change their tobacco use behaviors based on their tobacco product-specific COVID-19 risk perceptions but that daily user may be more likely to increase their tobacco consumption.

The results from this study should be considered alongside several important limitations. First, data were collected through MTurk, which may not generalize to all smokers or e-cigarette users. Secondly, eligibility for the survey was based on past 30-day use of cigarettes and/or e-cigarettes. Since the survey was deployed more than a month after COVID-19 was declared a "pandemic,"[19] it is possible some tobacco users had completely quit their tobacco use for more than a month and were thus excluded from this study. Social desirability in participant responses is another important consideration and responses were not biochemically validated, although observed changes in tobacco use were consistent with previously noted studies.[11,17] Additionally, these results only speak to short-term changes in behavior. Last, it should be noted that dependence was not assessed using a validated tobacco dependence scale, instead frequency of product use was used.

We also recognize that the prevalence of COVID-19 and thus, risk perceptions, could vary based on where one lives. We used bivariate tests to determine whether tobacco product-specific COVID-19 risk perceptions varied by Census region (Supplementary Table 5). We also investigated whether our main findings were sensitive to controlling for a geographic region (Supplementary Table 6), which they were not.

Despite these limitations, this study enhances the current literature by reporting that higher tobacco product-specific COVID-19 risk perceptions are associated with reductions in tobacco use since the pandemic began amongst dual users and exclusive e-cigarette users. These findings emphasize the importance of disseminating health information to tobacco users on COVID-19 risks as tobacco product-specific risk perceptions may be an important determinant of tobacco use changes during a public health crisis. This result is consistent with recent work, which found that "messages linking smoking with COVID-19 may hold promise for discouraging smoking and may have the added benefit of also discouraging vaping."[20] However, we also acknowledge that in this particular case, crafting public health messages is complicated by ongoing work attempting to define the impact of tobacco use on COVID-19 incidence and severity. Future research should be directed towards how public health messaging can better reach tobacco users during outbreaks of infectious respiratory diseases and why exclusive smokers appear to be less responsive to perceived COVID-19 risks.

References

1. COVID-19 Map. Johns Hopkins Coronavirus Resource Center website. Updated January 12, 2021. https://coronavirus.jhu.edu/map.html. Accessed January 12, 2021.
2. Center for Tobacco Products. CTP Glossary. US Food and Drug Administration (FDA). Published 17 October 2017. https://www.fda.gov/tobacco-products/compliance-enforcement-training/ctp-glossary#:~:text=Tobacco%20product%20%2D%20As%20stated%20in,other%20than%20tobacco%20used%20in. Accessed January 10, 2020.
3. Patanavanich R, Glantz SA. Smoking is associated with COVID-19 progression: a meta-analysis. *Nicotine Tob Res*. 2020;22(9):1653–1656.
4. Berlin I, Thomas D, Le Faou AL, Cornuz J. COVID-19 and smoking. *Nicotine Tob Res*. 2020;22(9):1650–1652.
5. Jackson SE, Borwn J, Shahab L, Steptoe A, Fancourt D. COVID-19, smoking and inequalities: a study of 53002 adults in the UK. *Tob Control*. 2020;0:1–11. doi:10.1136/tobaccocontrol-2020–055933.
6. Lippi G, Henry BM. Active smoking is not associated with severity of coronavirus disease 2019 (COVID-19). *Eur J Intern Med*. 2020;75:107–108.
7. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet*. 2020;395(10229):1054–1062.
8. Tattan-Birch H, Perski O, Jackson S, Shahb L, West R, Borwn J. COVID-19, smoking, vaping and quitting: a representative population survey in England. *Addiction*. 2020;116:1186–1195.
9. Action on Smoking and Health. *A Million People Have Stopped Smoking Since The COVID Pandemic Hit Britain - Action On Smoking And Health*. https://ash.org.uk/media-and-news/press-releases-media-and-news/pandemicmillion/#:~:text=On%20the%20eve%20of%20a,during%20this%20period%20%5B1%5D. Accessed September 19, 2020.
10. Stanton R, To QG, Khalesi S, et al. Depression, anxiety and stress during COVID-19: associations with changes in physical activity, sleep, tobacco

and alcohol use in Australian adults. *Int J Environ.* 2020;17(11). doi:10.3390/ijerph17114065.

11. Sun Y, Li Y, Bao Y, et al. Brief Report: Increased Addictive Internet and Substance Use Behavior During the COVID-19 Pandemic in China. *Am J Addict.* 2020;29(4): 268–270. doi:10.1111/ajad.13066.

12. Carver R. Traditional cigarette sales decline after initial stockpiling related to COVID-19 pandemic. *Winston-Salem Journal.* https://journalnow.com/business/traditional-cigarette-sales-decline-after-initial-stockpiling-related-to-covid-19-pandemic/article_eecb6812-202a-5c35-b2b2-45dd388f5b68.html. Accessed September 19, 2020.

13. Krosnick JA, Malhotra N, Mo CH, et al. Perceptions of health risks of cigarette smoking: A new measure reveals widespread misunderstanding. *PLoS One.* 2017;12(8):e0182063. doi:10.1371/journal.pone.0182063

14. Wang TW, Trivers KF, Marynak KL, et al. Harm perceptions of intermittent tobacco product use among U.S. youth, 2016. *J Adolescent Health.* 2018;62(6):750–753.

15. Huerta TR, Walker DM, Mullen D, Johnson TJ, Ford EW. Trends in e-cigarette awareness and perceived harmfulness in the U.S. *Am J Prev Med.* 2017;52(3):339–346.

16. Kowitt SD, Cornacchione RJ, Jarman KL, et al. Tobacco quit intentions and behaviors among cigar smokers in the United States in response to COVID-19. *Int J. Environ.* 2020;17(15):5368.

17. Klemperer EM, West JC, Peasley-Miklus C, Villanti AC. Change in tobacco and electronic cigarette use and motivation to quit in response to COVID-19. *Nicotine Tob Res.* 2020;22(9):1662–1663.

18. Williams R. Generalized ordered logit/partial proportional odds models for ordinal dependent variables. *Stata J.* 2006;6(1):58–82.

19. Cucinotta D, Maurizio V. WHO declares COVID-19 a pandemic. *Acta Biomed.* 2020;91(1):157–160.

20. Grummon AH, Hall MG, Mitchell CG, et al. Reactions to messages about smoking, vaping and COVID-19: two national experiments. *Tob Control.* 2020;0:1–9. doi:10.1136/tobaccocontrol-2020–055956.