Journal of Racial and Ethnic Health Disparities
https://doi.org/10.1007/s40615-022-01377-5

Race, Concern About COVID-19 Discrimination, and Cigarette Smoking Behavior: Comparison Between US Asian and White Adults Who Use Commercial Tobacco

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Received: 21 April 2022 / Revised: 16 July 2022 / Accepted: 19 July 2022

Abstract
Anti-Asian discrimination incidents in the USA have resurged during the COVID-19 pandemic. It is unclear how concern about being discriminatorily treated due to the COVID-19 pandemic varies between Asian and Asian American (A&AsA) and White adults. We examined A&AsA vs. White differences in concern about COVID-19 discrimination and associations of this concern with changes in cigarette smoking behaviors before and during the pandemic. Data were from a US representative sample of A&AsA and White adults (≥ 21 years) who currently and formerly used commercial tobacco ($n = 1052$), collected through an online panel oversampling A&AsA adults in January–February 2021. Participants reported their concern, worry, and stress about COVID-19 discrimination and past-30-day cigarette consumption before and during the pandemic. We examined the association between race and overall concern about COVID-19 discrimination, and this concern's associations with changes in past-30-day cigarette smoking consumption, smoking continuation, and return to smoking using weighted multivariable logistic and linear regression models. Overall concern about COVID-19 discrimination was higher (adjusted mean = 1.7, standard error = 0.16) among A&AsA adults who currently and formerly used commercial tobacco than their White counterparts (adjusted mean = 0.60, standard error = 0.04; $p < 0.01$). Overall concern about COVID-19 discrimination was associated with increased past-30-day cigarette consumption by 26.5 cigarettes (95% confidence interval [CI] = 1.2–51.9) and 4.4 times (95% CI = 2.3–8.5) greater odds of return to smoking among adults who smoke cigarettes. A&AsA adults who currently and formerly used commercial tobacco disproportionately bore higher concern about COVID-19 discrimination, and in turn could lead to increased smoking behavior and related morbidity and mortality among A&AsA adults.

Keywords Asian · Asian American · Tobacco · Smoking · COVID · Discrimination

Introduction

The novel coronavirus (SARS-CoV-2) that causes COVID-19 was first identified in Wuhan, China in December 2019 and rapidly spread across the world leading to a global pandemic by March of 2020 [1]. Given its origin, the coronavirus has been discriminatorily racialized by some in the USA as "the Chinese Virus" and "Kung Flu" [2]. Although US adults overall have been concerned about being discriminatorily treated due to the COVID-19 pandemic, such as whether or not to engage in protective behaviors (e.g., mask wearing) [3], the resurgence of scapegoating Asian and Asian American (A&AsA) individuals in the USA on the basis of their race and national origin [4] may be associated with differences in concern about COVID-19 discrimination by race. For example, the COVID-19 pandemic has been associated with a 149.0% increase in anti-Asian racism

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Published online: 22 August 2022

and violence in 2020 alone [5]. Approximately, 81.0% of a nationally representative sample of A&AsA adults perceived that violence against them had been rising since the beginning of the COVID-19 pandemic; nearly, 45% also experienced a racially charged offensive incident against them by April 2021 [6]. Since the emergence of the COVID-19 pandemic in March 2020 through September 2021, there had been 10,370 anti-Asian hate incidents reported nationally: verbal harassment (62.9%), shunning (16.3%), and physical assault (16.1%) comprising three of the largest incident categories [7]. A comparison of types of incidents reported in 2020 vs. 2021 also showed that incidents of verbal harassment and shunning were higher in 2020, while physical assault incidents since increased by 2021, further heightening the concern and toll of COVID-19 discrimination and violence among A&AsA individuals in the USA [8–10]. Consequently, Pew research found that since the onset of the COVID-19 pandemic, 32% of A&AsA adults in the USA fear being physically threatened and/or attacked [6]. Additionally, stress caused by factors related to the COVID-19 pandemic has been associated with both increases and return to substance use [11, 12]. By April–May of 2020, 18.2% of US adults reported either initiating or increasing their substance use [11]. Similar increases in tobacco use have also been reported. A national study found that 33% of US adults who smoked cigarettes had increased their cigarette consumption; those experiencing higher COVID-19-related stress also had ~ 1.2 times greater odds of increased cigarette smoking behavior [13]. Among a convenience sample of US adults who smoke cigarettes, 28% reported increasing their cigarette consumption due to increased stress, more time at home, and boredom while quarantined, in a cross-sectional study conducted in April–June of 2020 [14].

One specific COVID-19-related psychosocial stressor that has not been examined is concern about experiencing COVID-19 discrimination. Previous studies have associated general and racial discrimination with cigarette smoking behaviors [15–18], including among A&AsA and Pacific Islander adults [19, 20]. Asian American adults with higher levels of experience with racial discrimination and unfair treatment had about two times greater odds of cigarette smoking, respectively [20]. This previous study also found that the impact of experience with racial discrimination on cigarette smoking status surpassed unfair treatment alone [16]. Less is known about how concern about experiencing discrimination due to the COVID-19 pandemic may influence cigarette smoking behaviors. Given the ongoing COVID-19 pandemic and associated anti-Asian racism and violence [7], we compared racial differences in concern about COVID-19 discrimination among A&AsA and White adults who currently and formerly used commercial tobacco. We also examined associations between concern about COVID-19 discrimination with changes in cigarette smoking intensity, the continuation of smoking, and return to smoking among adults who smoke cigarettes.

Methods

Procedure and Participants

Data were from a US representative sample of adults (≥ 21 years) who currently and formerly used commercial tobacco ($n = 1700$), with oversampling of self-identified A&AsA and Black/African American individuals from the YouGov online panel in January-February 2021. YouGov panel members are recruited from a host of different sources, including via standard advertising and strategic partnerships with a broad range of websites. YouGov panel members who may be interested and meet eligibility criteria for a survey are then invited to participate [21]. The purpose of the overall study was to understand how COVID-19 and life experiences influence commercial tobacco use behaviors among US adults who currently and formerly use commercial tobacco. Commercial tobacco products include cigarettes, electronic cigarettes, cigars (i.e., little filtered cigars, cigarillos, or filtered cigars), hookah tobacco, other combustible tobacco products (e.g., roll-your-own cigarettes, pipe), and smokeless tobacco. Current commercial tobacco use is defined as adults who reported using commercial tobacco every day or some days at the time of the survey. Former commercial tobacco use is defined as adults who reported using commercial tobacco products in the past 12 months, but not at the time of the survey. YouGov used a sampling matching approach with weighting, derived from a number of sources including the US Census, to achieve national representation of the target population similar to traditional random-digit dialing sampling [22]. Eligible individuals completed an online survey after providing informed consent and were compensated according to YouGov policy (cooperation rate = 88.3% among those screened eligible). The current analysis was restricted to those who self-identified as A&AsA ($n = 258$) and White ($n = 794$) adults. This study used deidentified data, which does not require review or approval from the Institutional Review Board per National Institutes of Health policy and 45 CFR 46.

Measures

Demographic Characteristics

Participants reported their demographic characteristics including age, sex, education, annual household income, employment status, and marital status at the time of the survey.

COVID-19-Related Discrimination Concern

In three adapted items [23], participants were asked to rate their level of concern, worry, and stress that "they or their families may be discriminated against, harassed, or treated unfairly because of the coronavirus outbreak" with response options ranging from 0 = Not at all to 4 = Extremely. Responses were averaged across these three items to represent overall concern about COVID-19 discrimination (Cronbach's alpha = 0.93).

Past-30-Day Cigarette Consumption

Participants who reported ever smoking cigarettes were asked to report the number of days they smoked cigarettes in the past 30 days, and on average, the number of cigarettes per day they smoked on the days that they smoked. They were asked to provide this information at the time of survey (i.e., during the pandemic) and 12 months prior to the survey (i.e., before the pandemic). We then calculated past-30-day cigarette consumption at both times by multiplying the corresponding number of days smoked and number of cigarettes smoked. We also calculated changes in past-30-day cigarette consumption by subtracting past-30-day cigarette consumption before the pandemic from during the pandemic so that positive values indicated increases in past-30-day cigarette consumption.

Cigarette Smoking Continuation and Relapse

Participants were asked to report cigarette smoking status before and during the pandemic (never, used before but not now/then, some days, or every day). Among participants who reported smoking cigarettes some days and every day before the pandemic, those who reported smoking cigarettes some days or every day during the pandemic were characterized as continuing cigarette smoking; Otherwise, participants were classified as discontinuing cigarette smoking. Additionally, among participants who reported former cigarette smoking before the pandemic, those who were currently smoking cigarettes some days or every day during the pandemic were characterized as experienced return to smoking (vs. remained abstinence).

Statistical Analysis

Data were weighted to be nationally representative. First, weighted distributions of demographic characteristics by race were estimated. Racial differences in these distributions were tested with weighted Rao-Scott Chi-Square for categorical variables and weighted *t* test for continuous variables. We also estimated the weighted average overall concern scores for COVID-19 discrimination by race. Second, using weighted logistic regression models, we estimated the crude association between race as the independent variable and overall concern scores for COVID-19 discrimination as the dependent variable, and then the adjusted association controlling for age, sex, education, annual household income, employment status, and marital status. Third, among those who had ever smoked cigarettes at the time of the survey ($n = 973$), we used a weighted multivariable linear regression model to test the association between overall concern scores for COVID-19 discrimination as the independent variable and changes in past-30-day cigarette consumption as the dependent variable, adjusted for demographics and past-30-day cigarette consumption before the pandemic. We then also tested the interaction between race and overall concern scores for COVID-19 discrimination in the weighted multivariable linear regression model. Finally, we used weighted multivariable logistic regression models to examine the association between overall concern scores for COVID-19 discrimination as the independent variable and continuation of cigarette smoking as the dependent variable among those who reported smoking cigarettes before the pandemic ($n = 700$) and return to cigarette smoking among those who reported former cigarette smoking before the pandemic (i.e., used before but not now) ($n = 178$), adjusted for demographics and past-30-day cigarette consumption before the pandemic (only for continuation of cigarette smoking). In a sensitivity analysis, we further included whether participants lost jobs because of the COVID-19 pandemic, nativity (US born vs. foreign born), and past-30-day cannabis use at the time of the survey in our weighted multivariable linear and logistic regression models. We found that these variables did not significantly attenuate the associations of interest. Therefore, job loss because of the COVID-19 pandemic, nativity (U. born vs. foreign born), and past-30-day cannabis use were not included in the final models. All analyses were conducted in SAS version 9.4 (SAS Institute: Cary, NC) and were considered statistically significant if $p < 0.05$.

Results

Demographic characteristics of the weighted sample by race (A&AsA vs. White adults) are summarized in Table 1. Compared to White adults who currently and formerly used commercial tobacco, A&AsA adults who currently and formerly used commercial tobacco were younger, more likely to have college education or higher, earn an annual household income of $50,000 or more, and be employed ($p < 0.05$). On a scale of 0 to 4, the average overall concern score for COVID-19 discrimination was 1.7 among A&AsA adults who currently and formerly used commercial tobacco (standard error = 0.16), which was significantly higher than that of their White counterparts

Table 1 Demographic characteristics by race

Characteristics	Asian ($n=258$)			White ($n=794$)			p value
	n	Weighted %	Mean (SE)	n	Weighted %	Mean (SE)	
Age (years)	258		37.1 (1.3)	794		44.1 (0.77)	<0.01
Sex							
Male	141	67.9%		460	59.2%		0.18
Female	117	32.9%		334	40.8%		
Education							
High school or less	39	29.4%		256	44.4%		<0.01
Some college	59	30.6%		371	36.5%		
College or higher	160	40.0%		167	19.1%		
Annual household income							
Less than $50,000	92	41.2%		456	58.8%		0.01
$50,000 or more	166	58.8%		336	41.2%		
Employment status							
Employed	182	71.7%		359	43.8%		<0.01
Unemployed	28	15.1%		92	12.9%		
Not in labor force	48	13.2%		343	43.4%		
Marital status							
Not married/partnered	98	48.3%		332	41.9%		0.42
Partnered	19	12.9%		141	20.0%		
Married	140	38.9%		317	38.1%		
Overall concern about COVID-19 discrimination	258		1.66 (0.16)	794		0.60 (0.04)	<0.01

SE, standard error

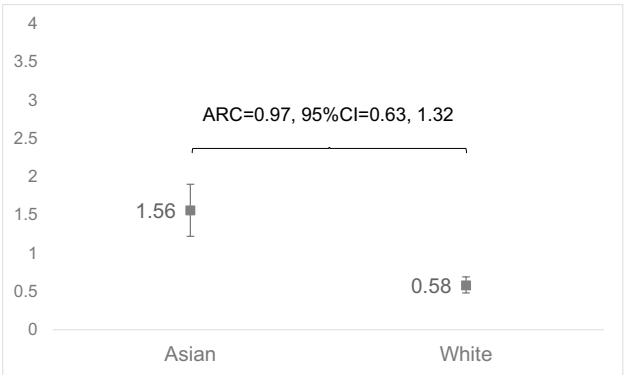

Fig. 1 Mean overall concern about COVID-19 discrimination score by race. Adjusted for age, sex, education, annual household income, employment status, and marital status. ARC, adjusted regression coefficient; CI, confidence interval

(average overall concern score for COVID-19 discrimination = 0.60, standard error = 0.04; $p < 0.01$). This difference remained statistically significant after adjusting for other demographic variables (Fig. 1), with A&AsA adults who currently and formerly used commercial tobacco scoring 0.97 points higher than their White counterparts in their concerns for COVID-19 discrimination.

When examining the association between overall concern score for COVID-19 discrimination and changes in cigarette smoking behaviors, results from the multivariable linear regression model showed that for every point increase in overall concern score, there was a corresponding increase of 26.5 cigarettes consumed per month (95% confidence interval = 1.2, 51.9; $p = 0.04$), after adjusting for demographics and past-30-day cigarette consumption before the pandemic. This association did not differ by race (race*overall concern score interaction $p = 0.14$). Furthermore, among those who formerly smoked cigarettes prior to the pandemic, for every point increase in overall concern score, there was a corresponding 4.4 times increase in odds of returning to cigarette smoking (95% confidence interval = 2.3, 8.5; $p < 0.01$). Among those who reported current smoking prior to the pandemic, overall concern scores for COVID-19 discrimination were not associated with continuation of cigarette smoking (adjusted odds ratio = 1.0, 95% confidence interval = 0.77, 1.4; $p = 0.90$).

Discussion

Our data shows that A&AsA adults who currently and formerly used commercial tobacco have significantly higher levels of concern than their White counterparts that they

or their families may be discriminated against, harassed, or treated unfairly because of the COVID-19 pandemic. This finding is consistent with results from other studies examining the impact of direct and perceived COVID-19 discrimination on A&AsA individuals' mental health [9, 10]. Among A&AsA individuals, depression symptoms more than doubled (9% vs. 21%) pre-and-post the onset of the pandemic [24]. Recent findings also indicate that perceived COVID-19 discrimination is associated with increased posttraumatic stress disorder symptoms [10] and other behaviors such as prescription drug misuse [24]. These findings suggest that culturally appropriate cigarette smoking and other commercial tobacco cessation interventions serving A&AsA adults should address psychosocial stressors, like concern about discrimination, related to the COVID-19 pandemic as triggers to commercial tobacco use and provide additional mental health resources, especially since A&AsA adults who use commercial tobacco have higher levels of concerns than their White counterparts about COVID-19-related discrimination. With the ongoing global pandemic, it will also be important for future research to continue to examine the impact of these COVID-19-related psychosocial stressors on commercial tobacco use behaviors. Additionally, future research will need to disaggregate data to better understand how A&AsA sub-populations who use commercial tobacco are affected by these stressors and to identify populations with the greatest risk to prioritize public health efforts.

This study extends the current literature by being one of the first to investigate the relationship between concern about being discriminatorily treated in relation to the COVID-19 pandemic on cigarette smoking behaviors. Our findings suggest that among those who smoke cigarettes, each additional level of overall concern about COVID-19 discrimination may be related to smoking almost an additional pack and a half of cigarettes more in the past 30 days; among those who formerly smoked cigarettes, each additional level of concern may also be associated with four times greater odds of returning to smoking. Previous research suggests these findings may be due in part to using smoking as a coping mechanism for the negative affect and cognition associated with concern about discrimination [25]. In addition to the overall negative health consequences associated with cigarette smoking [26], smoking is an independent risk factor for the progression of COVID-19-related symptoms, including mortality [27]. Future studies are needed to explore the mechanisms undergirding the association observed in this study between concern about COVID-19 discrimination and cigarette smoking behavior in addition to other commercial tobacco use behaviors. Importantly, as the COVID-19 pandemic continues and concern about COVID-19 discrimination increases [28], resources for those experiencing this concern and accessibility to culturally appropriate cessation programs may mitigate these potentially emerging disparities in cigarette smoking behaviors.

Our study's findings also support the need to include A&AsA individuals in studies focused on examining the effects of racism and health disparities research [29]. Within the context of the COVID-19 pandemic alone, A&AsA and Pacific Islander individuals are at greater risk for COVID-19 transmissions in part to their over-representation in the essential workforce and potentially cultural factors (e.g., intergenerational residency), comorbidities, experience with poverty, and lack of health insurance within this group [30]. Greater concern about COVID-19 discrimination and its potential impact on increasing cigarette smoking behaviors may worsen these COVID-19 disparities and potentially other health disparities that affect A&AsA individuals [31].

The study has limitations. Participants reported cigarette smoking behaviors 12 months prior to the survey retrospectively, which may potentially be subject to recall error. Despite our effort to oversample A&AsA adults who use commercial tobacco, the sample size for this group is modest. Together with the potential heterogeneity in commercial tobacco use behaviors across different Asian groups in the USA, the confidence interval of the estimated association between concern about COVID-19-related discrimination and changes in cigarette consumption is fairly wide. Future research with larger sample sizes may be able to obtain a more precise confidence interval on this association. Additionally, although we collected participants' native Asian origin, we were unable to further examine concern about COVID-19 discrimination and its associations to cigarette smoking behaviors stratified by Asian subgroups due to small sample sizes. The survey items we used captured overall concern about COVID-19 discrimination and did not specify race-specific concern about COVID-19 discrimination, potentially explaining some of the concern about discrimination reported among White adults who currently and formerly used commercial tobacco. Nonetheless, this study is among the first to examine concern related to COVID-19 discrimination between racial groups. Our findings also shed light on the impact of concern about being discriminatorily treated due to the COVID-19 pandemic on cigarette smoking behaviors. Future studies with larger samples of A&AsA subgroups to disaggregate our findings will provide better understanding of the role of concern about COVID-19 discrimination on commercial tobacco use across A&AsA subgroups.

Conclusions

As COVID-19-related scapegoating and anti-Asian racism and violence increase during the pandemic, we found that A&AsA adults who use commercial tobacco reported

higher levels of concern than their White counterparts for themselves and their families who may experience COVID-19 discrimination. This concern, in turn, may be associated with negative consequences for cigarette smoking behaviors and potentially hinder cessation. As the COVID-19 pandemic persists, public health efforts and policies are needed not only to address anti-Asian racism and violence, but also to help mitigate its potential downstream effects such as increased cigarette smoking that may exacerbate other health disparities affecting A&AsA individuals.

Author Contribution TL, LP, and KC equally contributed to the conceptualization of the analysis. TL led the writing and drafting of the manuscript with equal supervision from LP and KC. KC led the data curation, formal analysis, funding acquisition, investigation, methodology, project administration, resources, software, and validation of the analysis. LP, JCS, AA, KH, and BJ supported data curation. All authors equally contributed to the visualization and editing of the manuscript. All authors approved the final version of the manuscript.

Funding This study was supported by the National Institute on Minority Health and Health Disparities Division of Intramural Research. TL was supported by the AMGEN Scholars Program and Office of Intramural Training and Education, National Institutes of Health. LP, AA, KH, BJ, and KC are supported by the National Institute on Minority Health and Health Disparities Division of Intramural Research. JCS is supported by the Pathway to Independence Award in Tobacco Regulatory Science from NCI/FDA (R00CA242589), Penn/Rutgers TCORS (U54CA229973), and Rutgers Cancer Institute of New Jersey Cancer Center Support Grant (P30CA072720). The views presented in this paper do not necessarily reflect those of the US Government, Department of Health and Human Services, National Institutes of Health, and National Institute on Minority Health and Health Disparities.

Declarations

Ethics Approval This study used deidentified data, which does not require review or approval from the Institutional Review Board per National Institutes of Health policy and 45 CFR 46.

Competing Interests The authors declare no competing interests.

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