



Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.



Contents lists available at ScienceDirect

Vaccine

journal homepage: [www.elsevier.com/locate/vaccine](http://www.elsevier.com/locate/vaccine)

Short communication

# The impact of COVID-19 on income and employment and willingness to become vaccinated among African Americans enrolled in a smoking cessation randomized trial



Erica Cruvinel<sup>a,\*</sup>, Kimber P Richter<sup>b</sup>, Taneisha S Scheuermann<sup>a</sup>, Nathalia M Machado<sup>a</sup>, Matthew S Mayo<sup>c</sup>, Alexandra R Brown<sup>d</sup>, Nicole L Nollen<sup>b</sup>

<sup>a</sup> Population Health Department, University of Kansas Medical Center, Kansas City, KS, United States

<sup>b</sup> Population Health Department, Cancer Center, University of Kansas Medical Center, Kansas City, KS, United States

<sup>c</sup> Department of Biostatistics & Data Science, Cancer Center, University of Kansas Medical Center, Kansas City, KS, United States

<sup>d</sup> Department of Biostatistics & Data Science, University of Kansas Medical Center, Kansas City, KS, United States

## ARTICLE INFO

## Article history:

Received 15 November 2021

Received in revised form 26 January 2022

Accepted 31 January 2022

Available online 7 February 2022

## Keywords:

Coronavirus

COVID-19

Vaccine acceptance

Vaccine hesitancy

African Americans

Smoking

## ABSTRACT

Given vulnerability to COVID-19 among smokers and vaccine hesitancy among populations disproportionately burdened with COVID-19, it's important to understand concerns about vaccines and the impact of COVID-19 on these subgroups. Among our all African American (AA) sample of smokers (N = 172) enrolled in a larger smoking cessation clinical trial, results demonstrated an intensive burden from COVID-19; 42 (24.4%) lost employment, 56 (32.6%) lost household income, and 66 (38.4%) reported inability to pay bills and buy food due to COVID. Most, 103 (64.4%), were willing to get vaccinated. Among the vaccine-hesitant, 57 (35.6%), concerns about COVID-19 vaccine development and mistrust in vaccines were primary reasons for unwillingness to get vaccinated. Few identified doctor's advice as most valued in deciding if the vaccine was the best option. Findings highlight high openness to the vaccine among smokers impacted by COVID but reiterate the need for community-engaged versus health system-driven approaches to improve vaccine hesitancy among racial/ethnic minorities.

© 2022 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

The coronavirus disease 2019 (COVID-19) pandemic has disproportionately impacted racial and ethnic minority populations in the United States (US), with higher infection and mortality rates among Black Americans.[1,2] Potential underlying reasons for racial disparities in impacts of the pandemic include social vulnerability, indicated by higher concentrations of minority groups in lower-wage employment, essential jobs where social distancing is difficult or impossible, and high-density housing.[2] Additionally, African Americans (AAs) have higher rates of comorbidities such as diabetes, obesity, and hypertension,[3] and face inequalities in accessing healthcare.[1,2]

\* Corresponding author at: Department of Population Health, University of Kansas Medical Center, 3901 Rainbow Blvd., Kansas City, Kansas 66160, United States.

E-mail addresses: [ecruvinel@kumc.edu](mailto:ecruvinel@kumc.edu) (E. Cruvinel), [krichter@kumc.edu](mailto:krichter@kumc.edu) (K. P Richter), [tscheuermann@kumc.edu](mailto:tscheuermann@kumc.edu) (T. S Scheuermann), [nmachado@kumc.edu](mailto:nmachado@kumc.edu) (N. M Machado), [mmayo@kumc.edu](mailto:mmayo@kumc.edu) (M.S Mayo), [abrown8@kumc.edu](mailto:abrown8@kumc.edu) (A. R Brown), [nnollen@kumc.edu](mailto:nnollen@kumc.edu) (N. L Nollen).

The high prevalence of pre-existing comorbid health conditions makes AAs who smoke especially vulnerable to severe forms of COVID-19.[3] Recent studies have established that smoking increases the risk for hospitalization by 80% and doubles the risk of mortality from COVID-19.[4] Others have found that AAs who smoke have a higher risk for contracting COVID-19 as well as a poorer prognosis compared to Caucasian smokers.[5]

The COVID-19 vaccine in the US could reduce the burden of the pandemic. This is especially true in racial/ethnic minority communities that have been disproportionately burdened, but vaccine hesitancy remains prevalent due to decades of mistreatment by the medical community which has fostered mistrust.[6,7] As of September 2021, 64% of AAs remain unvaccinated.[8] Stemming from historical and ongoing bias and mistreatment by the health-care community,[9] Blacks are less likely than Whites to believe that the vaccine is effective and safe and more likely to believe that the vaccine is dangerous, more harmful than COVID-19, and that it has been rushed out too quickly.[6]

Addressing vaccine hesitancy is an important public health priority. Widespread uptake of vaccines is critical to ending the pandemic and curtailing the emergence of SARS-CoV-2 variants.[10]

Several studies have identified attitudes and beliefs associated with vaccine hesitancy among AAs but none have explored reasons for hesitancy among AA smokers or AAs engaged with medical community research, which may provide a different and more nuanced viewpoint than those from prior studies.[11–15] This study aims to better understand concerns about vaccines and the impact of the pandemic on income and employment among AA smoker participants of a randomized clinical trial (RCT). Further, the current sample is comprised solely of smokers who, given increased vulnerability to COVID, offer a unique perspective which could help clinicians and researchers better customize health communication strategies, increase vaccine uptake, and reduce adverse outcomes within this highly vulnerable population.

## 2. Methods

### 2.1. Sample

This is a secondary analysis of data from an ongoing RCT being conducted at the University of Kansas Medical Center (KUMC) to evaluate individualized smoking cessation treatments for AA adults.[16] All participants from the parent trial were invited to participate in this study. From July 2020 to January 2021, 219 AA were enrolled in the parent study and 172 answered a COVID questionnaire. The supplementary table compares characteristics of participants that completed it versus those that did not. All participants were from Missouri or Kansas, non-Hispanic Black adults ( $\geq 18$  years), daily smokers and interested in quitting smoking when enrolled in the trial. Study procedures were approved and monitored by the KUMC Institutional Review Board.

### 2.2. Measures

#### 2.2.1. Demographic and socioeconomic characteristics

Socio-demographic, smoking, and other substance use variables were collected during the baseline assessment for the parent trial. Participants reported their gender, age, race, marital status, highest level of education, employment status, estimated yearly household income, health insurance status, perceived health and financial strain.

#### 2.2.2. Smoking and other substance use variables

The number of cigarettes smoked and any marijuana use in the past seven days were assessed using a Timeline Follow-Back (TLFB) measure.[17] Participants also reported whether they smoked mentholated or non-mentholated cigarettes and the age when they started smoking regularly. Nicotine dependence was assessed using the single item of time to first cigarette after waking taken from the Fagerström Test for Nicotine Dependence.[18] Past 30-day prescription pain reliever use was assessed with a baseline question adapted from the National Survey on Drug Use and Health (NSDUH).[19]

#### 2.2.3. Impact of COVID on employment status and household income

The COVID questionnaire was developed by our research team. Participants were asked if COVID-19 changed their employment status, household income or their ability to pay bills or buy basic necessities like food. We also asked participants if they or someone from their family has tested positive for COVID-19. Additionally, we inquired about their perceived risk of exposure and whether they were worried about getting COVID-19. Finally, we asked participants to select any of the following health concerns related to COVID-19: autoimmune disease, cardiovascular, cerebrovascular, kidney or chronic lung diseases, or diabetes.

### 2.2.4. Willingness to take the COVID vaccine

COVID-19 vaccine willingness was captured through the scaled question, “If a COVID-19 vaccine were free and available to you, how likely would you be to get the COVID-19 vaccine?” Responses ranged from 0 to 10 on a Likert scale, with 0 being “not at all likely” and 10 being “extremely likely”. Responses from 0 to 4 were categorized as “not likely to take the COVID vaccine,” 5 and 6 as “somewhat likely,” and 7 to 10 as “highly likely.” We used an open-ended question to explore reasons associated with participants being not likely, somewhat likely or extremely likely to get the vaccine. We also asked participants what sources of information would influence their decision to take the vaccine.

### 2.3. Data analysis

Quantitative data were summarized using means and frequencies in SPSS. To analyze the qualitative data, EC initially created a list with keywords and categories that grouped participants together. Then, two investigators (EC, NM) used this list to open-code/categorize a subset of responses to the open-ended questions. They compared their coding and arrived at categories and definitions for participant responses. They discussed responses that were difficult to categorize, and devised categories/definitions for those responses, with a third reviewer (KR, TS or NN). These categories and definitions constituted a master code list. They both categorized all the participants' responses using the final master code list.

## 3. Results

### 3.1. Sample characteristics

A total of 172 AAs participated. Sample characteristics are displayed on [Table 1](#). One-third 50 (33.1%) of participants reported having health conditions that could place them at risk for a more severe case of COVID-19.

### 3.2. Impact of COVID among AAs

Nearly one quarter 42 (24.4%) reported loss of employment because of COVID, 56 (32.6%) reported loss of household income (of those, 30.4% lost up to 25% of their income, 26.8% lost up to 50%, 25% lost up to 100% and 17.9% up to 75%), and 66 (38.4%) reported that COVID impacted their ability to pay bills and buy food ([Fig. 1](#)). A few participants 4 (2.3%) had tested positive for COVID, and 26 (15.2%) had a family member who tested positive. Many 77 (45.1%) reported high or moderate perceived risk of exposure to COVID, and 64 (37.4%) were worried about getting COVID.

### 3.3. Willingness to get the vaccine, reasons for willingness, and concerns about the vaccine

More than four out of ten participants 66 (41.3%) reported that they were highly likely to take the vaccine when it became available ([Table 2](#)). The most common reasons associated with this were the belief that the vaccine would protect them from getting the virus and worries about the consequences of COVID. More than a third 57 (35.6%), reported that they were not likely to get the vaccine. The most common reasons for not being willing to get vaccinated were uncertainty about its development, not taking vaccines in general (including flu shots), and lack of trust in the vaccine. A number of participants 37 (23.1%) were somewhat likely to take the vaccine. Those same participants also mentioned concerns about the development of the vaccine as well as its safety and efficacy as common reasons why they were not sure if they would like to take it.

**Table 1**  
Characteristics of African American who smoke cigarettes (N = 172).

<b>Demographic Variables</b>	
Age, mean (SD),yr	54.3 (10.8)
Gender identity/Women, No. (%)	100 (58.1)
Married/Live with a partner, No. (%)	58 (33.7)
High school education or less, No. (%)	81 (47.1)
Employment status, No. (%)	
Employed Full-Time	51 (29.7)
Employed Part-Time	24 (14.0)
Unemployed	57 (33.1)
Retired	36 (20.9)
Other (Student/Homemaker)	4 (2.3)
Any health insurance, No. (%)	117 (68.0)
Poverty level, No. (%) ≤ 100 <sup>a</sup>	73 (42.4)
Financial burden/strain, n (%) not enough money to make ends meet <sup>b</sup>	55 (32.0)
Household income per family member, mean (SD), y	14,822 (12,420)
Perceived Health, n (%) very good/excellent <sup>c</sup>	52 (30.2)
Any health concerns related to COVID, No. (%)	50 (33.1)
Cardiovascular disease	17 (11.3)
Chronic Lung disease	12 (7.9)
Diabetes	11 (7.3)
Others (e.g., kidney, autoimmune diseases)	10 (6.6)
<b>Smoking Variables</b>	
CPD, mean (SD) <sup>d</sup>	13.8 (9.7)
Menthol Smoker, No. (%)	151 (87.8)
Smoking first cigarette within 30 min. of waking, No. (%)	142 (82.5)
Age when you started smoking cigarettes regularly, Mean (SD)	18.3 (5.4)
<b>Other substance use</b>	
Past 7 days Marijuana Use, n (%) <sup>e</sup>	54 (31.4)
Co-Use of Marijuana and Tobacco, n (%) <sup>f</sup>	
Both on the same occasion (sequential)	22 (40.7)
Use on separate occasions	23 (42.6)
At the same time/same device	9 (16.7)
Prescription pain relievers, n (%) who used in the past 30 days	14 (8.1)

<sup>a</sup> We calculated the percent of participants living below 100% of the 2020 Federal Poverty level based on total gross annual household income and the number of people living in the home; <sup>b</sup>Financial strain was measured using responses to the question: At the end of the month, considering all of your bills and living expenses, do you have “some money left over”, “just enough money to make ends meet” or “not enough money to make ends meet”?; <sup>c</sup>Perceived health was assessed using a 5-item scale with responses ranging from “excellent” to “poor”. <sup>d</sup> Mean calculated from the 7-day TLF. The sum of the responses was divided by 7 to obtain cigarettes per day; <sup>e</sup>Marijuana use was defined by at least one reported day of any marijuana use, including blunts, in the past 7 days; <sup>f</sup>Denominator (N = 54).

### 3.4. Information to help with the decision to take the COVID-19 vaccine

We reported respondents' most helpful source of guidance when deciding whether to take a COVID-19 vaccine. Only a few participants mentioned that a doctor's opinion would influence their decision in getting the vaccine. Rather, most participants mentioned that information about efficacy, initial outcomes in other people, safety and side effects would be the most helpful in determining if they would get the COVID vaccine.

## 4. Discussion

To our knowledge, this is the first study to evaluate the impact of COVID and reasons for vaccine hesitancy among AAs enrolled in an RCT and among AA smokers. Among this predominately low-income and already economically disadvantaged population, participants reported considerable economic burden from the effects of the pandemic including loss of employment, loss of household income, and food insecurity. Findings are consistent with data suggesting that racial and ethnic minorities have been unequally affected by the unintended economic and social consequences of COVID-19.[20]

Over 60% of participants reported willingness to get the COVID vaccine. This is much higher than previous national estimates that found rates of vaccine acceptancy among AAs ranging from 30 to 40%.[11–13] but slightly lower than estimates in Southern states in the US (68%).[14] However, measures of vaccine acceptancy differ across studies, which limits the precise comparison of findings. The higher percentage of reported willingness to get the vaccine may be due to participants having experienced a burden from COVID, having witnessed the impact of COVID on their friends, family or community, or due to their own concerns about getting sick. In our study, all participants were smokers, and one in three reported having comorbidities that are risk factors for worsening their COVID-19 prognoses. Additionally, this sample was part of an RCT and, thus, participants might have greater trust in medicine than AAs who would be unwilling to participate in clinical research.

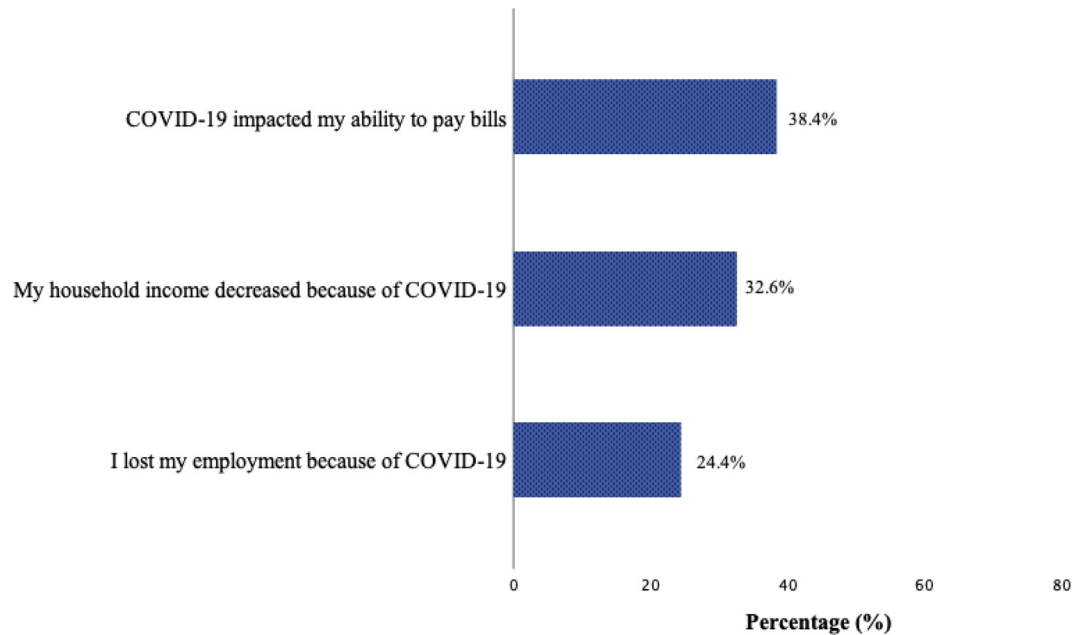
Nonetheless, our data indicate that more than one-third of AA smokers were not likely to take the COVID vaccine if it was freely available, which is a public health concern.[4] Emerging data on the impact of COVID on population subgroups finds that smokers have increased infection, inflammation, reduced immune response, and lung damage, leading to more severe forms of COVID-19.[3] Also, AAs with tobacco use disorder have an increased risk for COVID-19 and its adverse outcomes compared to white smokers.[5]

The present study found that concerns about the COVID-19 vaccine such as its development, efficacy, and trustworthiness were primary factors underlying low vaccine intentions. Similar results were found in an online survey collected in January 2021 including 235 AAs.[6] Results from a survey in the general population in the US showed that respondents who said they were not willing to take a COVID-19 vaccine expressed more concerns about side effects and also showed high levels of skepticism about vaccine effectiveness.[15] A more recent national poll showed that these concerns persist among those who have not been vaccinated and that concerns about safety and efficacy are higher among AAs compared to whites.[7]

When participants were asked what information would be most valuable to help them decide if the COVID-19 vaccine was the best option, only a few mentioned the doctor's opinion or advice. This differs from the general population, for whom, “doctor's opinion” is a top reason for getting the vaccine.[21–23] The mistrust of the vaccine among AAs is possibly related to longstanding inequalities in the health system and to deceptive practices in clinical research faced by the AA community.[9]

Concerted efforts are needed by the public health and medical systems to gain the trust of racial/ethnic minority communities as it relates to COVID vaccine hesitancy. Efforts must be firmly grounded in community-engaged approaches, involving individuals and organizations with solid reputations for trustworthiness in AA and other minority communities, including respected elected representatives, trusted local and national faith leaders, community advocates, and others.[9] Encouragingly, a representative survey of US adults suggested that COVID-19 vaccine endorsements from same-race medical professionals would increase AAs' willingness to receive the vaccine.[6] Education and outreach efforts should include information about the disproportionately adverse impact of COVID-19 infection among AAs, among smokers, and the growing magnitude of data on the safety and efficacy of the vaccine for AAs.

This study is limited in that it is based on a sample of AA smokers in the US Midwest, which limits its generalizability. Also, data were only collected during a single period. Most participants answered the surveys before COVID-19 vaccines became available, and vaccination attitudes are changing rapidly over time.



**Fig. 1.** Impact of COVID-19 on income and employment among AA smokers enrolled in a RCT. Notes: Any loss of household income, “Yes, it has decreased by up to 25%”, “Yes, it has decreased by up to 50%”, “Yes, it has decreased by up to 75%” or “Yes, it has decreased by up to 100%” was recategorized to “household income decreased”

**Table 2**

Willingness to take the COVID-19 vaccine and associated reasons among African Americans (N = 172).

If a COVID-19 vaccine were free and available to you, how likely would you be to get it?	
1. Likely to take the vaccine if it was freely available, n (%)	66 (41.3)
Reason for being likely to take the vaccine (70 comments)	
To be protected against the virus	39 (55.7)
Worried about the consequences of the virus	8 (11.4)
Because it is effective	7 (10.0)
To avoid spreading the virus	5 (7.1)
To protect my health	4 (5.7)
Because it is free	3 (4.3)
Others (I already got it, being around others)	4 (5.7)
2. Not likely to take the vaccine if it was freely available, n (%)	57 (35.6)
Reasons for being unlikely to take the vaccine (61 comments)	
Uncertainty about the development of the vaccine	10 (16.4)
I don't take vaccines	9 (14.7)
Lack of trust in the vaccine	8 (13.1)
Just don't want to/don't care for it	6 (9.8)
Concerned about safety (including side effects, getting COVID or being sick after getting the shots)	5 (8.2)
Worried about efficacy	5 (8.2)
Dislike needles/shots	5 (8.2)
Lack of trust in government	4 (6.5)
Concerned about access	2 (3.3)
Not worried about the virus	2 (3.3)
Others (e.g., I put my health in God's hands, I stay at home)	5 (8.2)
3. Somewhat likely to take the vaccine if it was freely available	37 (23.1)
Reasons for being somewhat likely to take the vaccine (37 comments)	
Worried about the development of the vaccine	8 (21.6)
Concerned about safety	7 (18.9)
Concerned about efficacy	7 (18.9)
Not sure about the vaccine yet	5 (13.5)
Dislike shots	4 (10.8)
Others (e.g., don't mind wearing masks/I stay to myself)	6 (16.2)
What information would be most helpful in determining if the vaccine is the best decision for you? (179 comments)	
Efficacy information	50 (27.9)
See outcomes in other people first	25 (14.0)
Safety information	23 (12.8)
Information about side effects	15 (8.4)
More information about the development and how it works	15 (8.4)
None/don't need more information	12 (6.7)
I'll not take it/don't want it	7 (3.9)
Information about access	5 (2.8)
Doctor's opinion/recommendation	4 (2.3)
Afraid of needles/shots	4 (2.3)
More research information	2 (1.1)
Others	17 (9.4)

This cross-sectional study demonstrates the high burden of COVID and the willingness to take the COVID-19 vaccine among AAs who are trying to quit smoking and involved with clinical research. Rates of intention to take the vaccine were higher than in previous studies among AAs but concerns about the vaccine were similar. Future results from the parent grant will shed light on COVID's impact on quitting.

## Funding

This work was supported by R01 DA046576 (N.L. Nollen) from the NIH, National Institute on Drug Abuse, Frontiers: The Heartland Institute for Clinical and Translational Research which is supported by a CTSA grant to the University of Kansas Medical Center from the NIH National Center for Advancing Translational Science (NCATS; grant # UL1TR000001), and by the National Cancer Institute Cancer Center Support Grant P30 CA168524 and used the Biostatistics & Informatics, Clinical Pharmacology, and Biospecimen Shared Resources. Funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

## Declaration of Competing Interest

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

## Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vaccine.2022.01.064>.

## References

- [1] Asch DA, Islam MN, Sheils NE, Chen Y, Doshi JA, Buresh J, et al. Patient and hospital factors associated with differences in mortality rates among black and white US medicare beneficiaries hospitalized with COVID-19 infection. *JAMA Network Open* 2021;4(6):e2112842. <https://doi.org/10.1001/jamanetworkopen.2021.12842>.
- [2] Centers for Disease Control and Prevention. Health Equity Considerations & Racial & Ethnic Minority Groups. <https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/race-ethnicity.html>. Published 2021. Accessed October 7 2021.
- [3] Kumar S, Kumar P, Kodidela S, Duhart B, Cernasev A, Nookala A, et al. Racial health disparity and COVID-19. *J Neuroimmune Pharmacol* 2021;16(4):729–42. <https://doi.org/10.1007/s11481-021-10014-7>.
- [4] Clift AK, von Ende A, Tan PS, Sallis HM, Lindson N, Coupland CAC, et al. Smoking and COVID-19 outcomes: an observational and Mendelian randomisation study using the UK Biobank cohort. *Thorax* 2022;77(1):65–73. <https://doi.org/10.1136/thoraxjnl-2021-217080>.
- [5] Wang QQ, Kaelber DC, Xu R, Volkow ND. COVID-19 risk and outcomes in patients with substance use disorders: analyses from electronic health records in the United States. *Mol Psychiatry* 2021;26(1):30–9. <https://doi.org/10.1038/s41380-020-00880-7>.
- [6] Kricorian K, Turner K, Camacho-Rivera M. COVID-19 vaccine acceptance and beliefs among black and hispanic Americans. *PLoS ONE* 2021;16(8):e0256122. <https://doi.org/10.1371/journal.pone.0256122>.
- [7] Hamel L, Lopes L, Sparks G, Stokes M, Brodie M. Kaiser Family Foundation: 2021 Kaiser Family Foundation. <https://www.kff.org/coronavirus-covid-19/poll-finding/kff-covid-19-vaccine-monitor-april-2021/>. Published 2021. Accessed October 7 2021.
- [8] Centers for Disease Control and Prevention. COVID-19 Vaccinations in the United States. <https://covid.cdc.gov/covid-data-tracker/#vaccination-demographics-trends>. Published 2021. Accessed October 7 2021.
- [9] Warren RC, Forrow L, Hodge DA, Truog RD. Trustworthiness before trust – Covid-19 vaccine trials and the black community. *N Engl J Med* 2020;383(22):e121. <https://doi.org/10.1056/NEJMp2030033>.
- [10] Hildreth JEK, Alcendor DJ. Targeting COVID-19 vaccine hesitancy in minority populations in the US: implications for herd immunity. *Vaccines* 2021;9(5):489. <https://doi.org/10.3390/vaccines9050489>.
- [11] Bogart LM, Dong Lu, Gandhi P, Klein DJ, Smith TL, Ryan S, et al. COVID-19 vaccine intentions and mistrust in a national sample of black Americans. *J Natl Med Assoc* 2022;113(6):599–611. <https://doi.org/10.1016/j.jnma.2021.05.011>.
- [12] Fisher KA, Bloomstone SJ, Walder J, Crawford S, Fouayzi H, Mazor KM. Attitudes toward a potential SARS-CoV-2 vaccine : a survey of U.S. adults. *Ann Intern Med* 2020;173(12):964–73. <https://doi.org/10.7326/m20-3569>.
- [13] Malik AA, McFadden SM, Elharake J, Omer SB. Determinants of COVID-19 vaccine acceptance in the US. *EclinicalMedicine* 2020;26:100495. <https://doi.org/10.1016/j.eclinm.2020.100495>.
- [14] Moore JX, Gilbert KL, Lively KL, Laurent C, Chawla R, Li C, et al. Correlates of COVID-19 vaccine hesitancy among a community sample of African Americans living in the southern United States. *Vaccines (Basel)* 2021;9(8):879. <https://doi.org/10.3390/vaccines9080879>.
- [15] Solís Arce JS, Warren SS, Meriggi NF, Scacco A, McMurry N, Voors M, et al. COVID-19 vaccine acceptance and hesitancy in low- and middle-income countries. *Nat Med* 2021;27(8):1385–94. <https://doi.org/10.1038/s41591-021-01454-y>.
- [16] Nollen NL, Cox LS, Mayo MS, Ellerbeck EF, Ahluwalia JS. Counseling alone or in combination with nicotine replacement therapy for treatment of black non-daily smokers: a randomized trial. *Addiction* 2020;115(8):1547–60. <https://doi.org/10.1111/add.14948>.
- [17] Brown RA, Burgess ES, Sales SD, Whiteley JA, Evans DM, Miller IW. Reliability and validity of a smoking timeline follow-back interview. *Psychol Addict Behav* 1998;12(2):101–12. <https://doi.org/10.1037/0893-164X.12.2.101>.
- [18] Heatherton TF, Kozlowski LT, Frecker RC, Fagerström KO. The fagerström test for nicotine dependence: a revision of the fagerström tolerance questionnaire. *Br J Addict* 1991;86(9):1119–27. <https://doi.org/10.1111/j.1360-0443.1991.tb01879.x>.
- [19] Nsduh. Key substance use and mental health indicators in the United States: Results from the 2017 National Survey on Drug Use and Health. In: *Substance Abuse and Mental Health Services Administration. Substance Abuse and Mental Health Services Administration*, 2018.
- [20] Centers for Disease Control and Prevention. Unintended Consequences of COVID-19 Mitigation Strategies. <https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/disparities-impact.html>. Published 2021. Accessed November 1 2021.
- [21] Reiter PL, Pennell ML, Katz ML. Acceptability of a COVID-19 vaccine among adults in the United States: how many people would get vaccinated? *Vaccine* 2020;38(42):6500–7. <https://doi.org/10.1016/j.vaccine.2020.08.043>.
- [22] Shafiq M, Elharake JA, Malik AA, McFadden SM, Aguolu OG, Omer SB. COVID-19 sources of information, knowledge, and preventive behaviors among the US adult population. *J Public Health Manag Pract* 2021;27(3):278–84. <https://doi.org/10.1097/phh.0000000000001348>.
- [23] McFadden SM, Malik AA, Aguolu OG, Willebrand KS, Omer SB, Samy AM. Perceptions of the adult US population regarding the novel coronavirus outbreak. *PLoS ONE* 2020;15(4):e0231808. <https://doi.org/10.1371/journal.pone.0231808>.