Disparities in COVID-19 vaccine hesitancy among Los Angeles County adults after vaccine authorization

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**ABSTRACT**

An equitable COVID-19 vaccine rollout is a necessary piece of the public health strategy to end the current pandemic; however, vaccine hesitancy may present a major hurdle. This study examines racial/ethnic and income-based disparities in vaccine hesitancy in Los Angeles County, a recent epicenter of the pandemic in the US, immediately after the Food and Drug Administration issued its emergency use authorization of a COVID-19 vaccine. We conducted online, stratified cross-sectional surveys of 1,984 adults living in Los Angeles County between December 2020 and January 2021 to assess hesitancy towards getting a COVID-19 vaccine. We used multivariable logistic regression to predict vaccine hesitancy after adjusting for covariates and calculated weighted population level estimates of hesitancy and reasons for hesitancy. Blacks and Hispanics were significantly more likely to be hesitant than Whites (AOR = 3.3, \(P < 0.001\); AOR = 2.1, \(P = 0.008\)) as were those in the lowest income group (annual income < $20,000 compared to > $100,000) (AOR = 1.8, \(P = 0.009\)). Additionally, those having no confidence in doing things online (AOR = 3.3, \(P < 0.001\)) were less likely to accept the vaccine than those who were confident. Compared to hesitant White respondents, Black respondents had higher mistrust of the government (36.1\% vs 22.1\%, \(P = 0.03\)) and Black and Hispanic respondents were more likely to want to wait to see how the vaccine works (41.2\% and 42.0\% vs 27.3\%, \(P = 0.02\) and \(P = 0.006\)). Our study suggests that culturally appropriate messaging that addresses concerns for lower income and racial/ethnic minority communities, as well as alternatives to online vaccine appointments, are necessary for improving vaccine rollout.

1. Introduction

At the start of 2021, Los Angeles County was the pandemic’s epicenter; cases rose steeply and over 200 people were dying each day from COVID-19 (\textit{Los Angeles County, 2021}). Racial/ethnic minority groups and lower-income persons in Los Angeles were more likely to contract, become hospitalized and die from COVID-19 (\textit{LA County COVID-19 Data, 2021}). During this surge, the Food and Drug Administration also issued its first emergency use authorization for a COVID-19 vaccine (\textit{Commissioner, 2020}). Since the beginning of the vaccine rollout, public health officials have been trying to understand how to improve vaccine acceptance rates in communities hardest hit by the pandemic (\textit{Tewarson et al., 2021}). Previous studies report significant differences in COVID-19 vaccine hesitancy by race, socioeconomic status, gender, flu vaccine acceptance and education levels (\textit{Daly and Robinson, 2020}; \textit{Jarrett et al., 2015}). However, only a few studies have surveyed individuals after a COVID-19 vaccine was available (\textit{Hamel et al., 2021}).

In this study, we examine income and racial/ethnic disparities in vaccine hesitancy as well as reasons behind this hesitancy in Los Angeles, immediately following COVID-19 vaccine authorization.

2. Methods

We conducted an online, stratified cross-sectional survey of adults living in Los Angeles County between December 5, 2020 and January 10, 2021. Participants were drawn from an online Qualtrics market research panel of volunteer survey respondents. Panelists were invited...
via an emailed electronic link or prompted on the respective survey platform to participate in a Spanish or English survey on COVID-19 in exchange for voucher incentives. We prespecified quotas for race/ethnicity, sex and income, and then reweighted responses using the 2019 American Community Survey to match the demographics of Los Angeles County. The University of Southern California institutional review board approved the study.

The survey instrument included questions that were based on validated questions from the National Health Interview Survey (National Health Interview Survey, 2021), the Behavioral Risk Factor Surveillance System (Behavioral Risk Factor Surveillance System Questionnaires, 2021), the PhenX toolkit (Toolkit and July, 2021), as well as questions proposed by our research team (Supplement). Questions were pre-tested in Spanish and English and modified to improve comprehension and understandability. We asked participants Would you be willing to get the COVID-19 once it is available and defined vaccine hesitancy as “probably” or “definitely” not on a 4-item scale. Vaccine hesitant respondents were asked why they were unwilling to get vaccinated. Participants provided demographic information and were asked about their health, risk factors for acquiring or having severe COVID-19, access to care, intention to get a flu vaccine, political preferences, and comfort with doing things online (COVID-19 and Your Health, 2020). We used multivariable logistic regression models to predict vaccine hesitancy across race/ethnicity and income groups and controlled for demographic characteristics, access to care, risk factors for COVID-19 as well as hypothesized predictors of vaccine hesitancy: US born, household size of 4 or more people, favorability of Donald Trump, health insurance type, having a regular doctor/clinic, self-rated health status, education level, worked outside the home during the past week, intention to get a flu vaccine, political preferences, and comfort with doing things online (COVID-19 and Your Health, 2020). We used descriptive statistics and Logistic Regression Models to Predict COVID-19 Vaccine Hesitancy in Los Angeles (December 2020-January 2021).”

3. Results

Of the 6,686 individuals who were invited to participate in the survey, 3,086 responded and 2,017 were eligible (defined as adults who live in Los Angeles County) – a response rate of 30.2%. We analyzed 1,984 surveys that met data quality checks.

Race/ethnicity and income were independently associated with vaccine hesitancy, even after adjusting for covariates (Table 1). Blacks and Hispanics were more likely to be hesitant compared to Whites (Adjusted Odds Ratio [AOR] = 3.3, 95% CI: 2.2, 5.0, P < 0.001; AOR = 2.1, 95% CI: 1.2, 3.6, P = 0.008). Those with the lowest incomes (<$20,000/year) were more likely to be hesitant compared to the highest income group (>100,000, AOR = 1.8, 95% CI: 1.2, 2.7, P = 0.009). Those who were age 65 or older were less likely to be hesitant (AOR = 0.5, 95% CI: 0.3, 0.9, P = 0.02) however those who had a high-risk condition (AOR = 2.7, 95% CI: 1.7, 4.2; AOR = 3.3, 95% CI: 1.8, 6.0, P < 0.001). Descriptive statistics and unadjusted and adjusted odds ratios for all covariates in the model are included in Appendix Table 1.

Overall, 28.3% of Los Angeles County Adults were estimated to have vaccine hesitancy (Table 2). Hesitancy was most common among Black (42.1%), Hispanic (30.7%) and very-low income (41.6%) and low-income participants (36.6%). Among those age 65 and over, 17.2%

| Race/Ethnicity | n (%) | OR (95% CI) | P-value | AOR* (95% CI) | P-value |
|----------------|-------|-------------|---------|---------------|---------|
| Non-Hispanic White | 396 (20.0) | Ref | Ref | | |
| Asian | 298 (15.0) | 1.0 (0.7, 1.5) | 0.94 | 0.8 (0.5, 1.5) | 0.51 |
| Black | 339 (17.1) | 3.4 (2.4, 4.8) | <0.001 | 3.3 (2.2, 5.0) | <0.001 |
| Hispanic | 922 (46.5) | 2.2 (1.6, 2.9) | <0.001 | 2.1 (1.2, 3.6) | 0.008 |
| Other | 29 (1.4) | 7.6 (3.4, 16.8) | <0.001 | 3.6 (1.4, 9.1) | 0.008 |
| **Annual household income** | | | | | |
| <$100,000 | 552 (27.8) | 1.5 (1.1, 1.9) | 0.007 | 0.9 (0.7, 1.3) | 0.57 |
| $50,000-$99,999 | 682 (34.4) | 2.1 (1.6, 2.8) | <0.001 | 1.2 (0.8, 1.7) | 0.44 |
| $20,000-$49,999 | 455 (22.9) | 3.1 (2.3, 4.2) | <0.001 | 1.8 (1.2, 2.7) | 0.009 |
| <$20,000 | 295 (14.9) | 1.8 (0.7, 5.1) | 0.25 | 1.5 (0.4, 4.8) | 0.54 |
| **Sex** | | | | | |
| Male | 910 (45.9) | 1.5 (1.2, 1.8) | <0.001 | 1.3 (1.0, 1.6) | 0.06 |
| Female | 1058 (54.1) | 0.8 (0.6, 1.0) | 0.06 | 0.8 (0.6, 1.1) | 0.25 |
| **Age** | | | | | |
| 18–29 | 652 (32.9) | 0.8 (0.6, 1.0) | 0.06 | 0.8 (0.6, 1.1) | 0.25 |
| 30–36 | 571 (28.8) | 0.6 (0.5, 0.8) | <0.001 | 0.7 (0.5, 1.0) | 0.04 |
| 40–64 | 634 (32.0) | 0.4 (0.2, 0.6) | <0.001 | 0.5 (0.3, 0.9) | 0.02 |
| >65 | 127 (6.3) | 0.7 (0.6, 0.9) | <0.001 | 0.9 (0.6, 1.3) | 0.30 |
| **High Risk Conditions** | | | | | |
| No high-risk condition | 942 (47.5) | 0.9 (0.7, 1.1) | 0.24 | 0.8 (0.6, 1.1) | 0.25 |
| Possibly higher risk conditions | 528 (26.6) | 0.7 (0.6, 0.9) | <0.004 | 0.9 (0.6, 1.3) | 0.30 |
| Highest Risk Conditions | 514 (26.9) | 0.7 (0.6, 0.9) | <0.004 | 0.9 (0.6, 1.3) | 0.30 |
| **Confidence in doing things online** | | | | | |
| Very confident | 310 (61.0) | 1.1 (0.9, 1.4) | 0.29 | 1.2 (0.9, 1.5) | 0.28 |
| Somewhat confident | 568 (28.6) | 2.6 (1.8, 3.8) | <0.001 | 2.7 (1.7, 4.2) | <0.001 |
| Only a little confident | 127 (6.4) | 4.5 (2.8, 7.1) | <0.001 | 3.3 (1.8, 6.0) | <0.001 |

**Abbreviations:** OR, odds ratio; AOR, adjusted odds ratio.

* A vaccine Hesitancy is defined as “no, probably not” or “no, definitely not willing” to get the COVID-19 vaccine once it is available vs “yes, probably” or “yes, definitely”. 

The adjusted odds ratio test uses a multivariable regression model which controls for covariates listed in this table and US born, household size of 4 or more people, favorability of Donald Trump, health insurance type, having a regular doctor/clinic, self-rated health status, education level, worked outside the home during the past week, intent to receive a flu vaccine, week survey was taken and the respondent’s geographic region in Los Angeles County (Service Planning Area).

Black race includes 55 respondents who also self-identified as Hispanic.
were hesitant; while among those with established high-risk conditions for COVID-19, 24.2% were hesitant. Most respondents were “probably” (28.4%) as opposed to “definitely” (11.3%) not willing to get vaccinated. The most common reason for hesitancy was worry about side effects or safety, followed by wanting to wait and see how the vaccine worked and a lack of trust in the government to develop the vaccines. Compared to White respondents, Black respondents had higher mistrust of the government (36.1% vs 22.1%, \( P = 0.03 \)) and Black and Hispanic respondents were more likely to want to wait to see how the vaccine works (41.2% and 42.0% vs 27.3%, \( P = 0.02 \) and \( P = 0.006 \)).

4. Discussion

Our study finds that over one in four individuals in Los Angeles is hesitant to get the COVID-19 vaccine. Additionally, racial/ethnic and income-based disparities in vaccine hesitancy persist even after COVID-19 vaccine authorization. These results are particularly concerning in high-risk conditions and those under age 65 with highest risk conditions.

| Race and Ethnicity | Total | Non-Hispanic White | Asian | Black | Hispanic | Other | Annual Household Income |
|-------------------|-------|---------------------|-------|-------|----------|-------|-------------------------|
| Vaccine Hesitant (definitely or probably will not get the COVID-19 Vaccine) | 577   | (28.4%)             | 70 (21.7%) | 143 (24.2%) | 294 (30.7%) | 18 (68.0%) | $<20,000 |
| Definitely will not get the COVID-19 vaccine | 228   | (11.3%)             | 36 (10.5%) | 13 (5.2%) | 59 (18.1%) | 112 (41.3%) | $20,000-$50,000 |
| Probably will not get the COVID-19 vaccine | 349   | (17.1%)             | 34 (11.2%) | 39 (12.6%) | 84 (24.0%) | 182 (52.9%) | $50,000-$100,000 |
| Hesitant among those under age 65 with highest risk conditions | 121   | (24.2%)             | 12 (14.9%) | 7 (17.4%) | 36 (23.7%) | 62 (29.6%) | $>100,000 |
| Hesitant among those over age 65 | 21    | (17.2%)             | 6 (13.4%) | 4 (22.3%) | 6 (20.6%) | 4 (21.5%) | |

Reason for not wanting the COVID-19 vaccine (among those with vaccine hesitancy)

| Race and Ethnicity | Total | Non-Hispanic White | Asian | Black | Hispanic | Other | Annual Household Income |
|-------------------|-------|---------------------|-------|-------|----------|-------|-------------------------|
| Worried about COVID-19 vaccine effects or safety | 346   | (59.0%)             | 44 (60.6%) | 33 (58.3%) | 81 (54.3%) | 180 (60.7%) | $<20,000 |
| Don’t think the vaccine will work | 115   | (19.7%)             | 17 (21.4%) | 6 (8.9%) | 31 (26.3%) | 57 (18.6%) | $20,000-$50,000 |
| Don’t trust the government to develop a COVID-19 vaccine | 187   | (31.4%)             | 20 (22.1%) | 15 (34.8%) | 51 (36.1%) | 96 (33.1%) | $50,000-$100,000 |
| Don’t trust the pharmaceutical companies to develop a COVID-19 vaccine | 140   | (24.8%)             | 22 (31.2%) | 13 (26.4%) | 35 (27.1%) | 66 (20.8%) | $>100,000 |
| Want to wait to see how it works first | 236   | (38.8%)             | 22 (27.3%) | 25 (44.6%) | 60 (41.2%) | 121 (83.8%) | |
| Don’t believe in getting vaccinated in general | 86    | (15.0%)             | 17 (18.6%) | 4 (6.6%) | 18 (13.3%) | 45 (31.7%) | $<20,000 |
| Don’t think I will get COVID-19 | 63    | (10.9%)             | 7 (10.0%) | 2 (6.2%) | 20 (14.0%) | 30 (9.1%) | $20,000-$50,000 |

CRediT authorship contribution statement

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Sonali Saluja: Conceptualization, Methodology, Investigation,
Resources, Writing - original draft, Visualization, Supervision, Project administration, Funding acquisition. Chun Nok Lam: Methodology, Software, Validation, Formal analysis, Data curation, Writing - review & editing. Danielle Wishart: Conceptualization, Writing - original draft. Alec McMorris: Conceptualization, Writing - review & editing. Michael Cousineau: Conceptualization, Methodology, Software, Formal analysis, Resources, Writing - review & editing, Supervision, Funding acquisition. Chun Nok Lam: Methodology, Software, Validation, Formal analysis, Data curation, Writing - review & editing. Danielle Wishart: Conceptualization, Writing - original draft. Alec McMorris: Conceptualization, Writing - review & editing. Michael Cousineau: Conceptualization, Writing - review & editing. Cameron Kaplan: Conceptualization, Methodology, Software, Formal analysis, Resources, Writing - review & editing, Supervision, Funding acquisition.

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.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2021.101544.

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