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Did prioritizing essential workers help to achieve racial/ethnic equity in early COVID-19 vaccine distribution? The LA pandemic surveillance cohort study

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Abstract

Background: Most US states and counties prioritized essential workers for early access to COVID-19 vaccines due to their heightened occupational risk. Racial/ethnic groups most impacted by COVID-19 are overrepresented among essential workers. This study estimates the effects of prioritizing essential workers on racial/ethnic equity in COVID-19 vaccination.

Methods: Survey data were collected from 5500 Los Angeles County adult residents in March and April 2021. Multivariate regression models were used to assess marginal changes in probabilities of vaccination attributable to essential worker status by race/ethnicity. These probabilities were multiplied by population proportions of essential workers in each racial/ethnic group to estimate the effects of prioritizing essential workers on vaccine equity in the population.

Results: While Latinos (24.9%), Blacks (22.4%), and Asians (21.4%) were more likely to be prioritized essential workers than Whites (14.3%), their marginal gains in vaccine uptake due to their essential worker status did not significantly differ from that of Whites. At the population-level, prioritizing vaccines for essential workers increased the probabilities of vaccination by small and similar amounts among Asians (5.3%; 95% confidence interval [CI]: 3.3%, 7.5%), Blacks (4.0%; 95% CI: 1.7%, 6.5%), Latinos (3.7%; 95% CI: 2.3%, 5.1%), and Whites (2.9%; 95% CI :1.9%, 3.9%).

Conclusions: Prioritizing essential workers did not provide proportionally greater early vaccine uptake benefits to racial/ethnic groups that were disproportionately affected by COVID-19. Early prioritization of essential workers during vaccine campaigns is an important but insufficient strategy for reducing racial/ethnic disparities in early vaccine uptake. Additional strategies addressing access and trust are needed to achieve greater equity in vaccine distribution.

KEYWORDS

COVID-19, occupational health, racial/ethnic equity, vaccination

1 | INTRODUCTION

In states and counties across the United States, the emergency authorization of potentially lifesaving vaccines against SARS-CoV-2 sparked considerable debate about how to prioritize sub-groups of the population for early vaccine access. Studies using pre-pandemic data alone or in combination with early COVID-19 case data found that workers in occupations involving direct patient care were at greatest risk of infection.[1,2] Epidemiological data showed that Black, Latino, Native American, and Pacific Islander individuals were suffering disproportionately from serious illness and death due to COVID-19, with a projected 40% increase in the Black-White life expectancy gap and a virtual elimination of the Latino life expectancy advantage over Whites.[3–7] Researchers seeking to explain these racial/ethnic inequities to inform mitigation efforts began to examine more closely the racial/ethnic composition of workers in essential occupations and the exposure risks faced by these workers.[8]

The Department of Homeland Security (DHS) issued guidance defining categories of essential workers during the COVID-19 response, although their definition was based on job functions and not risk of infectious disease transmission.[9] The National Bureau of Economic Research translated the DHS categories into the North American Industry Classification System and identified a subset of "frontline" essential occupations for which working from home was much less feasible—a crude proxy measure for exposure risk.[10] These frontline workers had lower wages, were less educated, and were more likely to belong to racial/ethnic minority groups than the broader DHS-defined essential worker categories.[11] Among specific frontline occupations, Blacks were overrepresented among health care support and public safety workers, Latinos were overrepresented among food related and janitorial/custodial workers, and Asians were overrepresented among health care practitioners.

A study using the Medical Expenditure Panel Survey to explore racial/ethnic disparities in COVID-19-related health and occupational risk—again defined by ability to work from home—reported similar findings, with Blacks and Asians overrepresented among health care workers overall, Latinos overrepresented among food related workers, and Blacks overrepresented among public safety workers.[12] The authors concluded that occupational exposures may be more important than personal health risk factors in explaining racial/ethnic disparities in COVID-19 outcomes.

Other studies used occupational codes from death certificates to identify occupational and racial/ethnic groups with higher COVID-19 mortality rates. In Massachusetts, the occupational categories with the highest mortality rates from March through July of 2020 were healthcare support, transportation, food related, and janitorial/custodial. Within each of those occupations, Black and Latino workers had higher mortality rates than White workers.[13] A California study of excess COVID-19-related mortality by occupation and race/ethnicity found that overall mortality from March through October of 2020 was 22% higher compared to the pre-pandemic period. The highest relative increase was among food and agricultural workers (39% higher), transportation workers (28%), and facility maintenance workers (27%). Latino food and agriculture workers experienced a 59% increase in mortality, and Asian health care workers experienced a 40% increase in mortality. The relative increase among health care workers (19%) was lower than the overall figure and the number of excess deaths among health care workers was half to two-thirds less than among the three hardest hit occupational groups.[14]

In their study of disparities in COVID-19-related occupational risk, Goldman et al. used a detailed set of questions from the US Department of Labor's Occupational Information Network to characterize exposure risk among occupations not able to be performed from home.[15] While some of these questions had been used in earlier studies that did not examine racial/ethnic disparities,[1,2] Goldman et al. added occupational standing—the percent of persons in an occupation who have completed at least 1 year of college—to their analysis. They describe occupational standing as a proxy measure for access to workplace risk mitigation strategies, which are used less frequently in lower-wage non-healthcare settings.[16,17] After stratifying occupations by occupational standing, they found that Whites and Asians were overrepresented in high-standing high-risk occupations, while Blacks and Latinos were overrepresented in low-standing high-risk occupations.

In late December 2020, Los Angeles County (LAC), in alignment with state and national guidelines,[18] began implementing a COVID-19 vaccine distribution strategy that prioritized essential workers, people aged 65+, and people with qualifying health conditions for early access to the vaccine. The purpose of the current study was to examine the extent to which prioritizing essential workers improved vaccine equity, a key strategy for reducing racial/ethnic disparities in disease burden. To address this study question, we analyzed survey data from a large representative sample of LAC residents. The surveys were administered just as the county was transitioning from its priority-group based vaccine distribution strategy to universal eligibility and included questions about essential worker status, vaccination status, and a variety of sociodemographic characteristics.

2 | METHODS

2.1 | Study design and vaccine distribution context

The survey was administered as part of the LAC COVID-19 Pandemic Surveillance Cohort Study (PSCS) which includes survey data as well as blood sample collection to monitor and study population trends in SARS-CoV-2 antibody status in relation to symptoms, testing and vaccination status, sociodemographic characteristics, and health-related behaviors.[19] The PSCS is an ongoing longitudinal study of a representative sample of LAC residents with data collection occurring every 3–4 months. For sample recruitment we used a market research firm (LRW Group; a Material Company) that maintains a proprietary database of approximately 25% of LAC residents (about 2.5 million people). Recruitment was conducted via phone calls and e-mails to a random sample of residents in the database living within a 15-mile radius of each the eight blood sample collection sites, where approximately 99% of the LAC population lives. Enrollment quotas were established for subgroups based on the age, gender, income, and racial/ethnic distribution of LAC adult residents. The

current study used survey data from all 5500 eligible adults who completed the initial survey during the first wave of data collection—March 22nd to April 24th, 2021—regardless of whether they also provided blood samples.

From December 22nd, 2020 to January 20th, 2021 vaccine eligibility in LAC was limited to health care workers and staff and residents of long-term care facilities (LTCFs). On January 20th, all people aged 65+ became eligible. On March 1st, workers in food and agriculture, public safety, and education and childcare became eligible. On March 9th, janitorial, custodial and maintenance workers became eligible. On March 15th, workers in congregate living facilities other than LTCFs, public transit workers, and people with qualifying health conditions became eligible. On April 1st, all people aged 50–64 became eligible, and on April 15th eligibility was opened to everyone age 16+.

2.2 | Measures

Frontline essential worker status was measured based on responses to the question "Since the COVID-19 pandemic began, did you work as an Essential Worker in any of these categories?" Response choices came from a master list of essential occupation categories. Only those categories corresponding to occupations prioritized for early vaccine access in LAC were coded as essential for analysis purposes. Those who responded, "health care or providing direct care to patients," or "worker in group setting (long term care facility, nursing home, assisted living facility, correctional facility, homeless shelter)" were coded as health care essential workers. Those who responded, "food supply or retail," "public safety," "education or childcare," or "janitorial/sanitation" were coded as non-health care essential workers. Respondents were also asked how they commuted to their work location and those who answered "work from home" were categorized as non-essential regardless of their response to the essential worker question. The only transportation workers eligible for early vaccine access in LAC were public transit drivers/operators, but the essential worker survey response choice, "transportation, including delivery" elicited responses from a broad range of transportation and delivery related jobs not related to public transit. Since we could not identify public transit drivers specifically, this response choice was coded as non-prioritized essential worker. All "other/specify" free text responses to the essential worker question that were not accompanied by "work from home" were manually reviewed. Responses indicating any of the prioritized health care or non-health care essential worker categories described above were re-coded into those categories. Responses not indicating any prioritized essential worker category were re-coded as either non-prioritized essential worker or non-essential worker/not working.

Vaccination status was coded as "yes" if the respondent reported having received at least one vaccine dose when the survey was completed. Data on gender, age, educational attainment, household income, health status, and prior positive COVID-19 test results were also captured in the survey. Based on LAC COVID-19 vaccine surveillance data we hypothesized that all these sociodemographic and health-related variables would also be associated with vaccine uptake.

2.3 | Statistical analyses

Descriptive, bivariate, and multivariate analyses were conducted using SAS® 9.4, copyright© 2016, SAS Institute, including the *%margins* macro for estimating adjusted marginal effects of covariates. Multivariate logistic regression models predicting vaccine uptake for each major racial ethnic group included all covariates hypothesized to influence vaccine uptake. These models yielded adjusted odds of vaccination for essential workers in each racial/ethnic group and adjusted marginal changes in probability of vaccination attributable to essential worker status. These probabilities were multiplied by the proportion of each racial/ethnic group that were essential workers to estimate the effects of vaccine prioritization of essential workers on vaccine uptake in the population, by race/ethnicity.

3 | RESULTS

Sample characteristics and available comparison data for the LA County adult population are provided in Table 1. While the sample was younger and more educated than the LAC population, the racial/ethnic and household income distribution was very similar to that of the LAC adult population in 2019.[20] The distribution of self-reported health status in the sample was similar to that of adult respondents to the most recent LAC Health Survey.[21] The percentages of respondents reporting at least one vaccine dose (62.5%) and a prior positive COVID-19 test result (14.6%) were similar to the respective percentages of LAC adults as of April 25th, 2021 (61.0% and 13.0%).[22]

Using 2020 Bureau of Labor Statistics (BLS) data, The United Way estimated 43.5% of California workforce members were essential workers (LAC data not available).[23] The BLS also estimated that in 2020 approximately 63% of the LAC population aged 16+ was in the labor force.[24] Applying this LAC labor force participation rate to the percentage of essential workers in California yields an estimated 27.4% essential workers in the total LAC population. This is slightly lower than the 29.4% in the study sample who reported being essential workers (Table 1), but the sample was limited to adults aged 18+ whose labor force participation is likely a little higher than that of the 16+ population used by the BLS. While we don't know if our sample represents the proportion of LAC essential workers by race/ethnicity, it does represent the racial/ethnic makeup of the county overall, and several other studies cited in this paper corroborate our estimates of higher proportions of non-White groups in essential occupations compared to Whites.[8,11,15]

Table 2 displays the racial/ethnic distribution of essential workers by type. Compared to the entire survey sample, Asians (14.0% vs. 13.7%) and Blacks (8.9% vs. 8.5%) were proportionally represented

TABLE 1 Characteristics of Los Angeles County COVID-19 pandemic surveillance cohort (*N* = 5500) and available LA county population estimates

	N	%	% LA County adult population[a]
Gender			
Male	2459	44.7%	48.7%
Female	3011	54.8%	51.3%
Transgender/Nonbinary	30	0.6%	NA
Race/Ethnicity			
Asian[b]	756	13.7%	15.7%
Black	468	8.5%	8.0%
Latino	2355	42.8%	45.2%
White	1682	30.6%	27.9%
AIAN/NHOPI[c]	24	0.4%	Other = 2.8%
Multiracial	135	2.5%	
Prefer not to answer	80	1.5%	
Health Status[d]			
Excellent	854	15.5%	19.3%
Very Good	1715	31.2%	28.1%
Good	1943	35.3%	31.1%
Fair	852	15.5%	17.0%
Poor	136	2.5%	4.5%
Educational Attainment[e]			
Postgraduate Degree	976	17.8%	10.1%
College Graduate	2177	39.6%	21.1%
Some College	1411	25.7%	23.4%
Highschool or below	902	15.9%	42.2%
Prefer not to answer	34	0.6%	NA
Age Group			
18–34	2042	37.1%	32.5%
35–54	2320	42.2%	34.2%
55+	1138	20.7%	33.3%
Household Income			
100k+	1445	26.3%	36.2%
50k–99k	1616	29.4%	28.0%
<50k	1973	35.9%	33.5%
Prefer not to answer	466	8.5%	NA
Prior positive COVID-19 test[f]			
Yes	803	14.6%	13.0%
No	4697	85.4%	87.0%
Vaccine Status[f]			
Yes	3436	62.5%	61.0%
No	2035	37.0%	39.0%
Not sure	29	0.5%	NA

TABLE 1 (Continued)

	N	%	% LA County adult population[a]
Occupation			
Essential Worker[g]	1617	29.4%	Precise estimates not available for LA County. See results section for validation of total % essential workers.
Essential Health Care	483	8.8%	
Health Care	424	7.7%	
Group Setting (Nursing Home, Assisted Living, Jail, Shelter)	59	1.1%	
Essential Non-Health Care	662	12.1%	
Janitorial/Custodial	37	0.7%	
Education/Childcare	231	4.2%	
Food production/Agriculture	115	2.1%	
Food Retail/Restaurant	196	3.6%	
Public Safety	83	1.5%	
Non-Prioritized Essential[h]	472	8.5%	
Construction	110	2.0%	
Manufacturing	94	1.7%	
Public Works	45	0.8%	
Transportation/Delivery	189	3.4%	
Funeral/Cemetery	5	0.1%	
Hair/Nail salon	16	0.3%	
Other	13	0.2%	
Non-Essential Worker/Not Working	3883	70.6%	

[a]For gender, race/ethnicity, age group, and household income: LA County adult population estimates from IPUMS USA. Full Citation: Steven Ruggles, Sarah Flood, Sophia Foster, Ronald Goeken, Jose Pacas, Megan Schouweiler and Matthew Sobek. IPUMS USA: Version 11.0 [ACS 1-year, 2019]. Minneapolis, MN: IPUMS, 2021.

[b]Among Asian respondents, 34.4% indicated Chinese, 19.0% Pilipino, 18.2% Korean, 8.7% Vietnamese, 8.0% other Asian, 7.5% Japanese, and 4.2% Indian.

[c]American Indian/Alaskan Native ($n = 6$) and Native Hawaiian/Pacific Islander ($n = 18$).

[d]LA County Adult population estimates from the Los Angeles County Health Survey (2018)

[e]Note: Educational attainment was not a stratification factor used in sample selection.

[f]LA County adult population estimates from the Los Angeles County Department of Public Health (April 25th, 2021)

[g]Those workers deemed to be at greater risk of occupational exposure to COVID-19 infection.

[h]Includes categories of essential workers not prioritized for early vaccine rollout in LA County.

TABLE 2 Racial/ethnic distribution of LA county COVID-19 pandemic surveillance cohort members by essential worker status ($N = 5261$)[a]

Race/ethnicity	Essential Health Care[b]	Essential Non-Health Care[c]	Non-prioritized essential[d]	All essential workers	Non-essential workers/not working	Total (% prioritized essential workers)
Asian	99 (21.4%)	63 (10.0%)	54 (11.9%)	216 (14.0%)	540 (14.5%)	756 (21.4%)
Black	45 (9.7%)	60 (9.5%)	32 (7.1%)	137 (8.9%)	331 (8.9%)	468 (22.4%)
Latino	202 (43.6%)	384 (60.9%)	262 (57.8%)	848 (54.8%)	1507 (40.6%)	2355 (24.9%)
White	117 (25.3%)	124 (19.7%)	105 (23.2%)	346 (22.4%)	1336 (36.0%)	1682 (14.3%)
Total	463	631	453	1547	3714	5261

[a]This table excludes American Indian/Alaskan Natives, Native Hawaiian/Pacific Islanders, Multiracial, and those who preferred not to answer race/ethnicity questions ($n = 239$).

[b]Includes those working in health care and group living facilities, including nursing homes, homeless shelters, and jails.

[c]Includes those working in food and agriculture, education and childcare, public safety, and janitorial and maintenance occupations.

[d]Includes categories of essential workers not prioritized for early vaccine rollout in LA County (construction, manufacturing, transportation, public works, funeral homes, and hair/nail salons).

TABLE 3 Bivariate relationships between cohort member characteristics and vaccination status[a]

	% Vaccinated	Odds ratio (CI)
Gender		
Female	61.7%	Reference Group
Male	64.3%	1.12 (1.00, 1.25)*
Race/Ethnicity		
White	64.7%	Reference Group
Asian	71.1%	1.40 (1.17, 1.69)***
Latino	61.7%	0.90 (0.80, 1.02)
Black	51.1%	0.60 (0.48, 0.73)****
Health Status		
Excellent	57.6%	Reference Group
Very Good	62.8%	1.25 (1.06, 1.48)**
Good	63.5%	1.28 (1.09, 1.51)**
Fair	64.6%	1.34 (1.10, 1.63)**
Poor	61.0%	1.14 (0.79, 1.65)
Education		
Non-College Graduate	54.5%	Reference Group
College Graduate	68.9%	1.85 (1.66, 2.07)****
Age Group[b]		
18–49	59.7%	Reference Group
50–54	64.2%	1.21 (1.06, 1.39)***
65+	84.8%	3.75 (2.89, 4.87)****
HH Income		
100k+	71.9%	Reference Group
50–99k	61.6%	0.63 (0.54, 0.73)****
<50k	56.4%	0.51 (0.44, 0.59)****
Prefer not to answer	65.5%	0.74 (0.59, 0.93)**
Occupation[c]		
Non-Essential/Not Working	60.0%	Reference Group
Essential Non-Health Care	68.8%	1.47 (1.23, 1.75)****
Essential Health Care	79.9%	2.65 (2.10, 3.33)****
Prior Positive COVID-19 Test		
No	63.9%	Reference Group
Yes	56.7%	0.74 (0.64, 0.86)****

Abbreviation: CI, confidence interval.

[a]These analyses exclude the 29 respondents who indicated they were unsure of their vaccination status; this table presents results from seven separate logistics regression models—one for each characteristic in relation to vaccination status.

[b]These age groupings were chosen to align with age-based vaccine eligibility groups in LA County.

[c]In this and all subsequent tables, non-essential workers include all workers not prioritized for early vaccine access in LA County as well as those not working.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$.

among all essential workers, while Latinos were overrepresented (54.8% vs. 42.8%) and Whites were underrepresented (22.4% vs. 30.6%). Among Whites surveyed, 14.3% were essential workers prioritized for early vaccine access, compared to 24.9% of Latinos, 22.4% of Blacks and 21.4% of Asians. There were also racial/ethnic differences in the proportions of prioritized essential workers working in health care. Asians had the highest proportion of essential workers in health care (61.1%) followed by Whites (48.5%), Blacks (42.9%), and Latinos (34.5%).

Table 3 displays bivariate relationships between cohort member characteristics and early vaccine uptake. All characteristics were significantly associated with vaccination status. Compared to non-essential workers, essential health care workers (odds ratio [OR]: 2.65; 95% confidence interval [CI]: 2.10, 3.33) and non-health care essential workers (OR: 1.47; 95% CI: 1.23, 1.57) were significantly more likely to be vaccinated. Compared to Whites, Asians were significantly more likely (OR: 1.40; 95% CI: 1.17, 1.69) and Blacks were significantly less likely (OR: 0.60; 95% CI: 0.48, 0.73) to be vaccinated. Higher education, household income, and age were also significantly positively associated with being vaccinated. Those reporting excellent health status were significantly less likely to be vaccinated than those reporting very good, good, or fair health status. Those who had received a prior positive COVID-19 test result were significantly less likely to be vaccinated than those who had not (OR: 0.74; 95% CI: 0.64, 0.86).

Table 4 shows the relationship between essential worker status and vaccination uptake within each major racial/ethnic group. In all four groups, essential health care workers were significantly more likely to be vaccinated than non-essential workers, with odds ratios ranging from 2.13 (95% CI: 1.53, 2.97) for Latinos to 6.62 (95% CI: 3.01, 14.55) for Asians. In all groups except Blacks, non-health care essential workers were also significantly more likely to be vaccinated that non-essential workers, with odds ratios ranging from 1.46 (95% CI: 1.16, 1.85) for Latino to 1.94 (95% CI: 1.03, 3.65) for Asians. Across all three employment categories, Blacks and Latinos reported lower vaccination rates than Whites and Asians.

Table 5 presents results from multivariate logistic regression models predicting vaccination uptake among each major racial/ethnic group, with all cohort characteristics from Table 3 included as covariates. For each group, the adjusted odds of being vaccinated was significantly greater among essential workers, with odds ratios ranging from 1.97 (95% CI: 1.60, 2.43) for Latino to 3.67 (95% CI: 2.20, 6.12) for Asians. Education and age also continued to be significant predictors of vaccination across groups. Lower household income was a significant negative predictor of vaccination for every group except Asians. Health status was related to vaccination uptake in the expected direction for all groups except Asians. By applying the SAS *%margins* macro, data from the logistic regression models in Table 5 were used to estimate the adjusted marginal effects of essential worker status on vaccination uptake for each racial/ethnic group (Table 6). These effects can be interpreted as the absolute differences in the probability of vaccination between essential workers and non-essential workers after controlling for all covariates. The smallest

TABLE 4 Essential employment and vaccine status, by race/ethnicity[a]

Employment	Asian ($n = 753$) % vaccinated	OR (CI)	Black ($n = 464$) % vaccinated	OR (CI)	Latino ($n = 2347$) % vaccinated	OR (CI)	White ($n = 1672$) % vaccinated	OR (CI)
Non-Essential/Not Working	66.5%	Reference Group	48.1%	Reference Group	58.80%	Reference Group	62.5%	Reference Group
Essential Other[c]	79.4%	1.94 (1.03, 3.65)*	57.6%	1.47 (0.84, 2.56)	67.6%	1.46, (1.16, 1.85)**	75.8%	1.88 (1.23, 2.88)**
Essential Health Care[d]	92.9%	6.62 (3.01, 14.55)****	66.7%	2.16 (1.13, 4.16)*	75.3%	2.13 (1.53, 2.97)****	80.2%	2.43 (1.52, 3.88)***

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]These analyses exclude the 29 respondents who indicated they were unsure of their vaccination status.

[b]Non-Essential/Not Working is the reference group for odds ratios.

[c]Includes those working in food and agriculture, education and childcare, public safety, and janitorial and maintenance occupations.

[d]Includes those working in health care and group living facilities, including nursing homes, homeless shelters, and jails.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$.

effect was for Latinos (14.7%; 95% CI: 10.2%, 19.2%) followed by Blacks (18.0%; 95% CI: 7.8%, 28.2%), Whites (20.5%; 95% CI: 13.9%, 27.2%), and Asians (24.7%; 95% CI: 15.5%, 34.0%), although the overlapping confidence intervals indicate a lack of statistically significant differences across groups. Expressed as probabilities, these effects can be multiplied by the proportions of each racial ethnic group employed as prioritized essential workers (Table 2) to produce estimates of the effect of essential worker prioritization on early vaccine uptake in the population. Formulated in this way, the prioritization of essential workers had small and non-statistically significant differences in effects across groups, ranging from 2.9% (95% CI: 1.9%, 3.9%) among Whites, 3.7% (95% CI: 2.3%, 5.1%) among Latinos, 4.0% (95% CI: 1.7%, 6.5%) among Blacks, and 5.3% (95% CI: 3.3%, 7.5%) among Asians (Table 6).

4 | DISCUSSION

To the authors' knowledge, this is the first study of racial/ethnic disparities in COVID-19 vaccine uptake to consider the effects of prioritizing essential workers during the early rollout of the vaccine. By surveying a large representative sample of LAC adults at the time when the public health department was shifting from a priority group-based distribution strategy to universal eligibility, this study was able to explore the effects of essential worker prioritization on vaccine uptake among the largest racial/ethnic groups.

Local epidemiological data had shown that, as in many other jurisdictions across the country, Black and Latino communities were disproportionately impacted by COVID-19. By the end of 2020, the COVID-19 mortality rate in LAC was already three times greater among Latinos compared to Whites.[7] As of August 28th, 2021, cumulative COVID-19 mortality was three times greater among Latinos, two times greater among Blacks and 28% greater among Asians than among Whites.[25] As part of its efforts to protect essential workers at increased risk of COVID-19 infection, the public health department, in alignment with state guidelines, used occupational status as a primary prioritization criterion in its early rollout of the vaccine. In fact, essential workers, including those in health care and LTCFs, food and agriculture, public safety, education and childcare, and janitorial and maintenance occupations were made eligible for vaccines before any age group except those over 65, and before people with qualifying health conditions except those living in LTCFs. Prioritized occupations aligned with data on excess mortality in California associated with COVID-19, which showed that the greatest disparities were among food and agriculture, janitorial and maintenance, transportation and logistics, and health care and emergency workers.[14]

By the end of the prioritization phase of the vaccine rollout, essential workers in all racial/ethnic groups were more likely to be vaccinated than non-essential workers. However, absolute disparities in vaccinations rates between groups remained such that Blacks and Latinos were less likely to be vaccinated than Whites and Asians, regardless of their essential worker status. Compared to a vaccine

TABLE 5 Multivariate logistic regression models predicting vaccination among Asians, Blacks, Latinos, and Whites[a]

Parameter	Asian OR (95% CI)	Black OR (95% CI)	Latino OR (95% CI)	White OR (95% CI)
Gender (ref. Female)				
Male	1.09 (0.78, 1.52)	0.99 (0.66, 1.47)	1.14 (0.95, 1.36)	1.08 (0.87, 1.35)
Age (ref. 18-49)				
50–64	1.14 (0.69, 1.89)	2.36 (1.54, 3.63)****	1.16 (0.91, 1.49)	1.58 (1.24, 2.01)***
65+	2.99 (0.998, 8.97)	5.54 (2.51, 12.21)****	4.33 (2.85, 6.56)****	7.25 (4.64, 11.35)****
Health Status (ref. Excellent)				
Very Good	0.64 (0.37, 1.13)	1.58 (0.85, 2.96)	1.42 (1.06, 1.90)*	1.40 (1.04, 1.87)*
Good	0.56 (0.32, .97)*	1.89 (1.01, 3.55)*	1.49 (1.13, 1.96)**	1.81 (1.33, 2.47)***
Fair	0.77 (0.40, 1.49)	2.01 (.97, 4.19)	1.87 (1.37, 2.56)****	1.79 (1.18, 2.71)**
Poor	0.73 (0.16, 3.27)	1.03 (.28, 3.85)	2.06 (1.20, 3.49)**	1.33 (0.53, 3.37)
Employment (ref. non-essential/not working)				
Essential Worker	3.67 (2.20, 6.12)****	2.28 (1.40, 3.72)**	1.97 (1.60, 2.43)****	2.76 (1.96, 3.89)****
Education (ref. Noncollege Grad)				
College Grad	1.80 (1.20, 2.69)**	1.58 (1.03, 2.43)*	2.12 (1.75, 2.58)****	1.72 (1.34, 2.21)****
Household income (ref. 100k+)				
HH income 50–99k	0.80 (0.54, 1.19)	0.55 (0.31, 0.97)*	0.61 (0.46, 0.82)***	0.58 (0.44, 0.76)****
HH income <50k	1.21 (0.76, 1.89)	0.42 (0.23, 0.76)**	0.50 (0.38, 0.66)****	0.42 (0.32, 0.56)****
Prefer not to answer	1.97 (0.90, 4.28)	0.27 (0.08, 0.84)*	0.63 (0.44, 0.90)*	0.64 (0.39, 1.05)
Prior Pos. COVID-19 Test (ref. No)				
Yes	0.78 (0.42, 1.48)	0.98 (0.52, 1.85)	0.86 (0.70, 1.06)	0.68 (0.48, 0.97)*

Abbreviations: CI, confidence interval; OR, odds ratio.

[a]This table presents the results of four separate multivariate logistics regression models—one for each racial/ethnic group. Odds ratios are adjusted for all covariates in column one.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$.

TABLE 6 Estimated effect of essential worker prioritization on change in population probability of early vaccine uptake, by race/ethnicity

	Asian Estimate (95% CI)	Black Estimate (95% CI)	Latino Estimate (95% CI)	White Estimate (95% CI)
Adjusted marginal probability of early vaccine uptake due to essential worker status	24.7% (15.5%, 34.0%)	18.0% (7.8%, 28.2%)	14.7% (10.2%, 19.2%)	20.5% (13.9%, 27.2%)
Proportion who are essential workers	21.4% (18.7%, 24.3%)	22.4% (18.7%, 26.6%)	24.9% (23.2%, 26.7%)	14.3% (13.9%, 14.9%)
Change in population probability of early vaccine uptake	5.3% (3.3%, 7.5%)	4.0% (1.7%, 6.5%)	3.7% (2.3%, 5.1%)	2.9% (1.9%, 3.9%)

Abbreviation: CI, confidence interval.

distribution strategy with no prioritization of essential workers, we estimate that Whites, Blacks, Latinos and Asians experienced small and similar increases in population-level vaccine uptake following essential worker prioritization. While Blacks, Latinos, and Asians had significantly greater proportions of prioritized essential workers compared to Whites, they did not experience significantly greater marginal gains in vaccine uptake from their essential worker status compared to Whites (Table 6).

This may be partly explained by racial/ethnic disparities in the proportions of health care workers among all prioritized essential workers (Table 2). Whites (48.5%) and Asians (61.1%) had higher proportions of health care workers than Blacks (42.8%) and Latinos (34.5%), and health care workers—likely because they were prioritized first—had higher vaccination rates than other prioritized essential workers regardless of race/ethnicity. Given that almost two thirds of Black and Latino prioritized essential workers were not

health care workers, a greater marginal increase in vaccine uptake among these workers would likely have led to larger population-level gains in early vaccine uptake among Blacks and Latinos compared to Whites and Asians.

A key limitation of this study is its design. The study was not designed to test the independent effects of a policy intervention on a population outcome. It would not have been feasible to deploy different vaccine prioritization strategies to randomly selected subgroups of the population as a means of comparison. A pre-post design, often used in studies of policy impact, would also have been unfeasible given that the outcome measure of interest—COVID-19 vaccine uptake—could only occur after the policy intervention was implemented. Due to the cross-sectional nature of the study design, findings should be interpreted as suggestions of potential policy effects. Another limitation is the lack of data on the proportion of frontline essential workers in LAC by race/ethnicity. However, using available state and local data we were able to reasonably validate our sample's representation of the overall proportion of frontline essential workers in LAC, and of the racial/ethnic makeup of LAC adults, and our sample estimates of essential workers by race/ethnicity have a high degree of face validity. Another limitation was the absence of survey items measuring factors other than education, income, and occupation that are known to influence racial/ethnic disparities in health and health care, including access and trust. Distrust of the health care system among Blacks, due to historical experiences of racism and discrimination, is well documented.[26] This distrust has influenced Black attitudes towards vaccines in general,[27,28] and toward COVID-19 vaccines specifically.[29–31] Even after accounting for willingness to get vaccinated, uptake among Blacks in the United States has been found to be lower than among Whites, suggesting persistent access barriers.[32] When we fit a single multivariate regression model (not shown) with all racial/ethnic groups and all other covariates included, we found that Blacks were significantly less likely to be vaccinated than Whites (OR: 0.65; 95% CI: 0.52, 0.81). In this same model, Asians (OR: 1.48; 95% CI: 1.21, 1.80) and Latinos (OR: 1.24; 95% CI: 1.07, 1.44) were more likely to be vaccinated than Whites.

Several features of this study and the findings strengthen the conclusions drawn. The timing of the survey allowed for a targeted examination of the relationship between initial priority eligibility criteria and early vaccine uptake. Also, the fact that the explanatory variables could be specified to mirror the vaccine prioritization criteria under study lends a degree of precision and validity to the measures. The exceptions here are that we may have failed to include some public transit workers in the essential worker category, and we may have misclassified a small number of jail or homeless shelter workers as health care essential workers. Also, while the survey did not include a question about specific health conditions that would qualify participants for early vaccine access, self-reported health status was related to vaccine uptake in the expected direction and thus appeared to be a reasonable proxy measure.

If one of the goals of prioritizing essential workers was to achieve proportionally greater gains in early vaccine uptake among Blacks and Latinos due to the greater burden of COVID-19 in these communities, then the answer to the question posed in the title of this paper is no. While larger proportions of non-Whites groups were among the essential workers prioritized for early vaccine access, a lack of significant racial/ethnic differences in the marginal effects of essential worker status on early vaccine uptake muted any potential equity gains from this vaccine prioritization strategy. Nevertheless, while prioritizing essential workers did not achieve proportionally greater gains in early vaccine uptake among Blacks and Latinos—a laudable equity goal given the disproportionate burden of COVID-19 in these communities—this strategy likely prevented a further widening of racial/ethnic disparities in vaccine uptake.

5 | CONCLUSIONS

Due to frequent close contacts, essential workers are at greater risk of exposure to infectious diseases like COVID-19. Exposure risk is also dependent on infection mitigation measures implemented at the workplace. Thus, while health care occupations involve the highest degree of exposure risk, other frontline occupations may pose equal or greater risk due to a lack of worker protections. Prior research has shown that racial/ethnic disparities in COVID-19 outcomes may be linked to an overrepresentation of non-Whites in essential occupations, particularly those with fewer workplace mitigation measures. Public health departments can address these work-related disparities in COVID-19 outcomes by prioritizing frontline workers for infection mitigation measures including early access to vaccines.

The findings of this study suggest that prioritizing essential workers during infectious disease vaccine campaigns is an important but insufficient strategy for reducing racial/ethnic disparities in early vaccine uptake. While non-Whites are overrepresented among frontline essential workers, underlying factors contributing to disparities in vaccine uptake in the general population, including access and trust, are likely also at play among essential workers. Thus, efforts to expand vaccine distribution channels and disseminate sound vaccine information through trusted sources should begin with a focus on workers in essential occupations, particularly those outside of health care. Strategies for increasing vaccine access among Blacks and Latinos in LAC have included pop-up mobile vaccine clinics in targeted neighborhoods throughout the county, not requiring appointments for vaccinations, and targeted door-to-door outreach and education about how and where to access vaccines. Local trusted community-based organizations have been key partners in these efforts. These vaccine distribution strategies should be preceded by widespread efforts to enhance infectious disease mitigation measures in essential work settings.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

John Meyer declares that he has no conflict of interest in the review and publication decision regarding this article.

ETHICS APPROVAL AND INFORMED CONSENT

This study was reviewed and approved by the Institutional Review Board of the Los Angles County Department of Public Health. Written informed consent was obtained from all study participants.

AUTHOR CONTRIBUTIONS

Will Nicholas was the lead writer and analyst; Neeraj Sood provided methodological and statistical advice and reviewed and commented on all drafts; Chun Nok Lam assisted with the analyses and reviewed and commented on all drafts; Rani Kotha assisted with the literature review and reviewed and commented on all drafts; Howard Hu reviewed and commented on all drafts; Paul Simon conceptualized the study and reviewed and commented on all drafts.

DATA AVAILABILITY STATEMENT

Research data are not shared at this time.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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