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High Vaccine Confidence Is Associated with COVID-19 Vaccine Uptake in Gay, Bisexual, and Other Men Who Have Sex with Men Who Use Substances

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Abstract

Purpose: We examined associations between vaccine confidence and COVID-19 vaccine uptake among gay, bisexual, and other men who have sex with men (GBMSM).
Methods: Computer-assisted self-interviews were conducted among 249 GBMSM participating in mSTUDY from May to October 2021—a cohort of GBMSM with a history of substance use in Los Angeles. Data were collected using a vaccine confidence index. The association between vaccine confidence and COVID-19 vaccine uptake was assessed using multivariable log-binomial regression.
Results: Two-thirds (64.7%) of GBMSM reported receiving at least one dose of COVID-19 vaccine. Vaccine confidence was positively associated with COVID-19 vaccine uptake. Participants expressed neutral attitudes on government trust and vaccine safety. Perceived health benefit and vaccine effectiveness were statistically significantly associated with vaccine uptake (adjusted prevalence ratio [APR] = 1.59, 95% confidence interval [CI]: 1.20–2.16; APR = 1.51, 95% CI: 1.07–2.15).
Conclusions: Public health programs should prioritize public benefit and vaccine effectiveness messaging to advance vaccination among GBMSM who use substances.

Keywords: COVID-19, men who have sex with men, substance use, vaccine confidence, vaccine uptake

Introduction

The COVID-19 pandemic has caused disruptions to sexual health services, including HIV prevention, treatment, and care services,[1,2] and has disproportionately impacted sexual and gender minority (SGM) populations, including gay, bisexual, and other men who have sex with men (GBMSM).[3] There is growing evidence in the literature, which suggests that GBMSM reported having barriers to health care utilization and routine HIV/sexually transmitted infection services and experiencing high rates of psychological distress since the pandemic began.[4,5] Indeed, compared with their heterosexual counterparts, GBMSM are more likely to experience multilevel minority stress and syndemics such as substance use, mental health problems, risk of HIV, and these vulnerabilities are mutually reinforcing and could increase the risk of adverse health outcomes related to COVID-19.[6–9]

These impacts can be even more profound among racial/ethnic minority GBMSM.[10] A recent Centers for Disease Control and Prevention (CDC) report notes that non-Hispanic Black SGM individuals had the lowest COVID-19 vaccine coverage across all sexual orientation and gender identity categories.[11] Since the pandemic, researchers have

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examined and identified the factors associated with COVID-19 vaccine uptake among vulnerable populations, which include demographic characteristics and behavioral health factors. One factor thought to contribute to the slow and uneven uptake of COVID-19 vaccine is vaccine confidence and hesitancy.[12–14] Focusing on associations between vaccine confidence and uptake among GBMSM with multilevel vulnerabilities, in particular, may be useful in future public health efforts to curb disease outbreaks, that disproportionately impact GBMSM, including recent mpox outbreaks across the globe.[15] Therefore, the aim of this study was to describe the prevalence of COVID-19 vaccine uptake and examine its association with vaccine confidence among a sample of racially and ethnically diverse GBMSM who use substances.

Methods

Participants and procedures

Data were collected as part of an ongoing cohort study, the mSTUDY, an NIH/NIDA-funded cohort of diverse GBMSM who use substances in Los Angeles County, the methods of which have been described elsewhere.[16] Briefly, the cohort includes mostly Black/African American and Latino/Hispanic GBMSM 18–45 years of age with a history of substance use, half of whom are living with HIV. Study enrollment started in 2014 and follow-up is ongoing. Participants in the cohort were invited to complete a survey assessing their attitudes about and uptake of the COVID-19 vaccine during their cohort study visit from May to October 2021. All study participants provided informed consent and the study was approved by the Institutional Review Board at the University of California, Los Angeles.

Measures

Vaccine confidence index. Vaccine confidence was measured using a vaccine confidence index (VCI), which was developed and validated among GBMSM in a previous study.[17] Participants were asked how much they agree or disagree with 10 statements in the following five domains: (1) *perceived health benefit,* (2) *government trust,* (3) *vaccine effectiveness,* (4) *vaccine safety, and* (5) *medical trust*. Each item was scored on a 1–5 Likert scale, representing ''Strongly disagree'' to ''strongly agree.'' A full description of the 10 questions is presented in Table 1. Total scores were summed with higher scores indicating higher vaccine confidence. The Cronbach's alpha of the VCI in the study sample was 0.95, indicating high internal consistency.

COVID-19 vaccine uptake. We asked participants, ''Do you plan on getting the COVID-19 vaccine?'' Response options included: ''Yes, I have already received at least one dose/Yes (but not received yet)/No/Don't know/Decline to answer.'' We created a dummy variable with *1* = ''Yes, I have already received at least one dose'' and *0* = the remaining options. Those who received at least one dose of COVID-19 vaccine were then asked, ''Have you received the second dose of the vaccine?'' Response options included ''Yes; Not yet, but I plan to get my second dose; No; No, and I do not plan on getting a second dose.'' At the time of the study a booster shot was not yet recommended among adults under

TABLE 1. DISTRIBUTION OF VACCINE CONFIDENCE INDEX ANSWERS AMONG PARTICIPANTS ($n = 249$)

		Strongly disagree (1)	*Disagree (2)*	*Neutral (3)*	*Agree (4)*	*Strongly agree (5)*	*Median (IQR)*
Perceived health benefit ($\alpha = 0.82$)	Getting immunized is one of the best things to do to improve my health.	12 (4.8%)	14 (5.6%)	64 (25.7%)	55 (22.1%)	104 (41.8%)	4 (3–5)
	Not getting immunized increases my chances of getting a serious disease	15 (6.2%)	23 (9.2%)	57 (22.9%)	64 (25.7%)	90 (36.1%)	4 (3–5)
Government trust ($\alpha = 0.84$)	Independent vaccine advisory committees make trustworthy vaccine recommendations for the federal government.	12 (4.8%)	20 (8.0%)	103 (41.4%)	54 (21.7%)	60 (24.1%)	3 (3–4)
	Companies that make vaccines produce safe and effective vaccines.	16 (6.4%)	20 (8.0%)	100 (40.2%)	67 (26.9%)	46 (18.5%)	3 (3–4)
Vaccine effectiveness ($\alpha = 0.82$)	Vaccines recommended for men who have sex with men are effective.	15 (6.0%)	11 (4.4%)	82 (32.9%)	54 (21.7%)	87 (34.9%)	4 (3–5)
	Clinical trials result in safe and effective vaccines.	10 (4.0%)	15 (6.0%)	81 (32.5%)	67 (26.9%)	76 (30.5%)	4 (3–5)
Vaccine safety ($\alpha = 0.74$)	Vaccines recommended for men who have sex with men are safe.	18 (7.2%)	12 (4.8%)	75 (30.1%)	57 (22.9%)	87 (34.9%)	4 (3–5)
	Vaccines are made with safe ingredients.	17 (6.8%)	20 (8.0%)	110 (44.2%)	59 (23.7%)	43 (17.3%)	3 (3–4)
Medical trust ($\alpha = 0.89$)	My doctor/nurse is a reliable source of trustworthy vaccine information.	15 (6.0%)	11 (4.4%)	68 (27.3%)	75 (30.1%)	80 (32.1%)	4 (3–5)
	My doctor/nurse has my best health interest in mind when making vaccine recommendations.	10 (4.0%)	14 (5.6%)	68 (27.3%)	78 (31.3%)	79 (31.7%)	4 (3–5)
Total ($\alpha = 0.95$)	(*Range 10–50*)						38 (30–45)

α, Cronbach's alpha; IQR, interquartile range.

65 years of age in the United States. Among those who did not receive at least one dose of COVID-19 vaccine, we asked, ''Why do you NOT plan to get a COVID-19 vaccine?'' Multiple response options were provided (e.g., ''I'm concerned about the side effects of the vaccine,'' ''I don't trust the vaccine will be safe'').

Sociodemographic characteristics. The survey also collected participants' sociodemographic characteristics, including age, race and ethnicity, years of education, HIV status, housing situation, and employment status.

Statistical analyses

Descriptive statistics were used to summarize participants' sociodemographic characteristics, the percentage vaccinated for COVID-19, and VCI scores. The association between vaccine confidence and uptake was examined using log-binomial regression models. Multivariable analyses allowed us to adjust for sociodemographic characteristics and two separate models were considered. In the first model, we used VCI as single construct to predict COVID-19 vaccine uptake; in the second model we used the five different domains within the VCI as predictors. Results were reported as prevalence ratios with corresponding 95% confidence intervals (CI). All analyses were conducted using RStudio.

Results

Among the 249 participants included in this analysis, the average age was 36.3 years (standard deviation = 7.06), a majority identified as Hispanic/Latino (43.8%) or Black (37.8%), and 57% were living with HIV. Nearly two-thirds (64.7%, $n = 161$) reported having received at least one dose of COVID-19 vaccine (Table 2). Among these, 135 (83.9%) received a second dose and 8 (5.4%) said they planned to get their second dose. The median VCI score was 38 (maximum possible 50; interquartile range [IQR]: 30–45) indicating high vaccine confidence. VCI scores differed by race/ethnicity with Black GBMSM having a median VCI score of 33 (IQR: 30–40) and Hispanic/Latino GBMSM having a median VCI score of 39 (IQR: 31–45), whereas White GBMSM had a median VCI score of 42 (IQR: 32–48, $p = 0.005$).

VCI score did not differ by housing, employment, or HIV status. A large portion of respondents suggested being neutral on *government trust* and *vaccine safety* (e.g., 41.4% were neutral on the statement ''Independent vaccine advisory committees make trustworthy vaccine recommendations for the

Table 2. Bivariable and Multivariable Logistic Regression Examining the Associations between COVID-19 Vaccine Uptake and Vaccine Confidence Index

		Received at least one dose of COVID-19 vaccine		*Multivariable*	
	n *(%)* *Mean (SD)*	n *(%)*	*Bivariable PR*	*Model 1 APR (95% CI)*	*Model 2 APR (95% CI)*
VCI	36.80 (9.40)	39.71 (8.26)	**1.12 (1.08–1.16)**	**1.12 (1.08–1.16)**	
Perceived health benefit	7.67 (2.18)	8.40 (1.85)	**1.62 (1.41–1.90)**		**1.59 (1.20–2.16)**
Government trust	6.95 (2.03)	7.46 (1.88)	**1.47 (1.27–1.72)**		0.88 (0.65–1.20)
Vaccine effectiveness	7.49 (2.07)	8.14 (1.79)	**1.64 (1.41–1.94)**		**1.51 (1.07–2.15)**
Vaccine safety	7.10 (1.99)	7.63 (1.84)	**1.53 (1.31–1.80)**		0.82 (0.58–1.15)
Medical trust	7.59 (2.06)	8.08 (1.90)	**1.41 (1.23–1.64)**		0.95 (0.93–1.02)
Age	36.3 (7.06)	36.2 (7.16)	0.99 (0.96–1.03)	0.98 (0.94–1.02)	0.97 (0.93–1.02)
Years of education received	13.6 (2.31)	13.9 (2.25)	**1.21 (1.08–1.38)**	1.10 (0.95–1.29)	1.07 (0.92–1.25)
Race					
Black	94 (37.8%)	56 (59.6%)	—	—	—
Hispanic/Latino	109 (43.8%)	76 (69.7%)	1.56 (0.88–2.80)	1.10 (0.56–2.14)	1.12 (0.55–2.26)
White	32 (12.9%)	22 (68.8%)	1.49 (0.65–3.62)	0.93 (0.35–2.53)	0.82 (0.29–2.36)
Other	14 (5.6%)	7 (50.0%)	0.68 (0.21–2.13)	0.38 (0.10–1.37)	0.28 (0.07–1.09)
Employment status					
Employed	109 (43.8%)	73 (67.0%)	—	—	—
Employed by reduced hours	21 (8.4%)	16 (76.2%)	1.58 (0.57–5.13)	0.96 (0.31–3.36)	0.93 (0.29–3.34)
Unformal employment	26 (10.4%)	15 (57.7%)	0.67 (0.28–1.64)	0.70 (0.26–1.92)	0.57 (0.19–1.68)
Was furloughed from employment	3 (1.2%)	1 (33.3%)	0.25 (0.01–2.66)	0.55 (0.02–5.89)	0.54 (0.02–8.36)
Unemployed	90 (36.1%)	56 (62.2%)	0.81 (0.45–1.46)	0.92 (0.45–1.89)	0.72 (0.34–11.53)
Housing					
Stable housing	213 (85.5%)	138 (64.8%)	—	—	—
Temporary housing	36 (14.5%)	23 (63.9%)	0.96 (0.47–2.06)	1.73 (0.72–4.36)	2.08 (0.82–5.59)
HIV status					
HIV positive	142 (57.0%)	93 (63.3%)	—	—	—
HIV negative	107 (43.0%)	68 (66.7%)	1.16 (0.68–1.98)	1.07 (0.57–2.04)	0.93 (0.48–1.84)

Multivariable models all adjusted for sociodemographic characteristics.
Bold numbers indicate statistical significance.
APR, adjusted prevalence ratio; CI, confidence interval; PR, prevalence ratio; SD, standard deviation; VCI, vaccine confidence index.

federal government'' and 44.2% were neutral on ''Vaccines are made with safe ingredients'' (Table 1)). Among the $n = 88$ participants who had not been vaccinated for COVID-19, the most reported reasons for not planning to get vaccinated were ''I don't trust the vaccine will be safe (26.1%)'' and ''I'm concerned about the side effects of the vaccine (25.0%)'' (data not shown).

After adjusting for sociodemographic characteristics, higher vaccine confidence was positively associated with receiving at least one dose of the COVID-19 vaccine with a 12% increased odds of vaccine uptake for every one-point increase in the VCI (APR = 1.12, 95% CI: [1.08–1.16]). In exploring the five specific domains of the VCI, *perceived health benefit* (e.g., ''Getting immunized is one of the best things to do to improve my health'') and *vaccine effectiveness* (e.g., ''Vaccines recommended for men who have sex with men are effective'') were positively associated with COVID-19 vaccine uptake (APR = 1.59, 95% CI: [1.20–2.16]; APR = 1.51, 95% CI: [1.07–2.15], respectively). The remaining three subscales were not statistically significantly associated with COVID-19 vaccine uptake.

Discussion

We examined COVID-19 vaccine confidence and uptake among a sample of GBMSM who use substances. Vaccine uptake was relatively low; only about two in three GBMSM had received at least one dose of the COVID-19 vaccine by the time the study data were collected, which is lower than reported COVID-19 vaccination rates among gay men in a national sample (94.1%) and lower than reported vaccination rates among the general population in California ($\sim$75%).[11,18] Our results suggest that racial and ethnically diverse GBMSM who use drugs may experience additional barriers to and have feelings of hesitancy toward vaccination. There is an urgent need to promote COVID-19 vaccine uptake to curb the pandemic and achieve health equity. This is especially important among historically marginalized and stigmatized populations, like GBMSM, who are also at greater risk for COVID-19 and disproportionately affected by the pandemic.[3,19,20]

A higher vaccine confidence was statistically significantly associated with higher COVID-19 vaccine uptake, indicating the need to promote COVID-19 vaccine education and information dissemination among GBMSM. Increasing vaccine confidence must address historically rooted government mistrust and concerns about vaccine safety among GBMSM and strengthen beliefs about the effectiveness of the COVID-19 vaccine in preventing serious illnesses and death.[21,22] Although the reason for the difference in vaccine confidence is unclear, it is possible that GBMSM who have higher gay community connectedness may have higher vaccine confidence levels. Previous studies suggest that the LGBT community is not only an important source of social support and information, but higher LGBT community connectedness is also associated with higher sexual and mental health services' utilization, especially among racial and ethnic minority GBMSM.[23,24]

In our analysis, vaccine confidence was the strongest predictor of vaccine uptake over any demographics and behavioral characteristics. According to the Theory of Planned Behavior, attitudes and subjective norms form the backdrop of the decision-making process and influence one's actual behavior.[25] This may partially explain why vaccine confidence has such a vital impact on one's vaccine uptake behaviors. Future research may use qualitative approaches to seek in-depth explanations for this association. Therefore, culturally tailored vaccine promotion programs, public health campaigns, and community-based vaccination promotion interventions for GBMSM may be particularly important strategies to increase vaccine uptake by changing the community norms in this population.[26]

Lastly, our findings have important policy and practice implications for future interventions that aim to promote vaccine uptake and health equity among GBMSM, especially in light of the recent mpox outbreak. In fact, there are already data suggesting racial and ethnic disparities in mpox vaccine uptake, with particularly low reported vaccination among Black GBMSM in the United States,[15,27] who are already disproportionately affected by the HIV/AIDS epidemic and the COVID-19 pandemic.[28,29] There is a history of medical/government mistrust among GBMSM and other sexual and gender minority populations, and the historical mistrust has been associated with suboptimal health behaviors and outcomes, such as delayed antiretroviral treatment among GBMSM living with HIV and racial and ethnic minority communities.[30]

There is evidence that COVID-19-related medical mistrust has become a barrier to the uptake of COVID-19 treatment among Black individuals living with HIV in the United States.[30] Strategies to promote mpox vaccine uptake must address historical vaccine hesitancy, foster vaccine confidence, and overcome medical and government mistrust among the most affected yet vulnerable subpopulations, such as racial and ethnic minority GBMSM.

Limitations

There are some limitations to this analysis. First, the study sample was part of an existing cohort of GBMSM in Los Angeles who use substances and were recruited using convenience sampling. The generalizability of our findings to GBMSM in other geographic regions is unknown. In addition, subgroup analyses were not performed to investigate the differences by sexual orientation among our study participants. All study outcomes were self-reported, which may be subject to social desirability and recall bias; however, given the relative novelty of the vaccine and public health messaging about COVID-19 vaccination during the time of study, participants were likely to recall their vaccination status.

Conclusion

Promoting vaccine confidence is vital to successful COVID-19 and other vaccination efforts (e.g., mpox) among GBMSM. Public health programs and interventions prioritizing the perceived public benefit and effectiveness of the COVID-19 vaccine have the potential to increase vaccination rates among GBMSM and reduce health inequities among this priority health disparities population. These domains of vaccine confidence may also be helpful in tailoring messaging for other vaccine preventable illnesses that disproportionately impact GBMSM.

Authors' Contributions

C.H. and I.W.H. conceptualized the study. C.H. conducted the literature review, analyzed the data, and drafted the

article. P.M.G. is the Principal Investigator. All authors provided intellectual content to the article and reviewed and approved the final article.

Disclaimer

The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Author Disclosure Statement

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