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MAJOR ARTICLE

Factors Associated With Coronavirus Disease 2019 Vaccine Uptake Among Pregnant Women and Nonpregnant Women of Reproductive Age in Jamaica

Jodian A. Pinkney,[1,2,3] Laura M. Bogart,[4] Kamali N. Carroll,[5] Lenroy Bryan,[5] Givana Witter,[5] Dina Ashour,[1] Fatma M. Shebl,[1,3] Rocio M. Hurtado,[2,3] Ilona T. Goldfarb,[3,6] Emily P. Hyle,[1,2,3] Christina Psaros,[3,7] and Bisola O. Ojikutu[2,3,8,9]

[1]Medical Practice Evaluation Center, Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts, USA, [2]Division of Infectious Diseases, Department of Medicine, Massachusetts General Hospital, Boston, Massachusetts, USA, [3]Harvard Medical School, Boston, Massachusetts, USA, [4]RAND Corporation, Santa Monica, California, USA, [5]University of the West Indies, Kingston, Jamaica, [6]Division of Maternal Fetal Medicine, Department of Obstetrics and Gynecology, Massachusetts General Hospital, Boston, Massachusetts, USA, [7]Department of Psychiatry, Massachusetts General Hospital, Boston, Massachusetts, USA, [8]Boston Public Health Commission, Boston, Massachusetts, USA, and [9]Division of Global Health Equity, Brigham and Women's Hospital, Boston, Massachusetts, USA

Background. Despite high rates of coronavirus disease 2019 (COVID-19)-related maternal mortality, Jamaica currently has little data on COVID-19 vaccine uptake among pregnant women.

Methods. We conducted a cross-sectional, web-based survey of 192 reproductive-aged women in Jamaica from February 1 to 8, 2022. Participants were recruited from a convenience sample of patients, providers, and staff at a teaching hospital. We assessed self-reported COVID-19 vaccination status and COVID-19-related medical mistrust (operationalized as vaccine confidence, government mistrust, and race-based mistrust). We used multivariable modified Poisson regression to test the association between vaccine uptake and pregnancy.

Results. Of 192 respondents, 72 (38%) were pregnant. Most (93%) were Black. Vaccine uptake was 35% in pregnant women versus 75% in nonpregnant women. Pregnant women were more likely to cite healthcare providers versus the government as trustworthy sources of COVID-19 vaccine information (65% vs 28%). Pregnancy, low vaccine confidence, and government mistrust were associated with a lower likelihood of COVID-19 vaccination (adjusted prevalence ratio [aPR] = 0.68 [95% confidence interval {CI}, .49–.95], aPR = 0.61 [95% CI, .40–.95], and aPR = 0.68 [95% CI, .52–.89], respectively). Race-based mistrust was not associated with COVID-19 vaccination in the final model.

Conclusions. Pregnancy, low vaccine confidence, and government mistrust were associated with a lower likelihood of COVID-19 vaccination among reproductive-aged women in Jamaica. Future studies should evaluate the efficacy of strategies proven to improve maternal vaccination coverage, including standing "opt-out" vaccination orders and collaborative provider and patient-led educational videos tailored for pregnant individuals. Strategies that decouple vaccine messaging from government agencies also warrant evaluation.

Keywords. COVID-19; jamaica; mistrust; pregnant; vaccine confidence.

In Jamaica, coronavirus disease 2019 (COVID-19) vaccination has been recommended for pregnant women since August 17, 2021 [1]. Yet, as of March 2023, the proportion of pregnant Jamaican women vaccinated against COVID-19 was unknown. Global trends suggest that vaccine uptake in this group is low, particularly for pregnant women in the Caribbean [2] and Black pregnant women in the United States [3, 4]. Low uptake persists despite data confirming the safety and efficacy of COVID-19 vaccines during pregnancy [5–8]. Vaccine hesitancy, defined as a delay or refusal of vaccination despite vaccine availability, is often cited as the primary reason for low vaccine uptake among pregnant women [9]. Vaccination during pregnancy is particularly critical for Jamaicans because the maternal mortality rate (MMR) reached a record high of 213 maternal deaths per 100 000 live births in 2021, 44% of which were related to COVID-19 [10]. For comparison, in 2017, the MMR in Jamaica was 80 maternal deaths per 100 000 live births [11], whereas the MMR in the United States was less than 20 [12].

Several working groups have been developed to understand the spectrum of vaccination behaviors ranging from complete refusal to complete acceptance, with "hesitancy" and "confidence" falling in the middle [13, 14]. The US National

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Correspondence: Jodian A. Pinkney, MD, Massachusetts General Hospital, 55 Fruit Street, Cox 5, Boston, MA 02114 (jpinkney@mgh.harvard.edu); Laura Bogart, PhD, RAND Corporation, 1776 Main Street, Santa Monica, CA (lbogart@rand.org).

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Vaccine Advisory Committee Vaccine Confidence Working Group (VCWG) [13] is one such group that focuses on vaccine confidence rather than hesitancy, given the positive framing and onus on the system rather than the individual. The VCWG defines vaccine confidence as trust in the vaccines recommended by the Advisory Committee on Immunization Practices (ACIP) [13].

To date, several surveys have identified low COVID-19 vaccine confidence in the general Jamaican population [15, 16]. For instance, A 2021 poll of a nationally representative sample of Jamaicans found that 54% cited distrust (ie, "don't trust the vaccine") as the primary reason for declining COVID-19 vaccination [15]. In addition, in 2021, a survey of 1071 Jamaicans found that 74% of respondents who trusted the government were vaccinated compared with 41% of people who did not trust the government [16]. Low vaccine confidence has been associated with medical mistrust among Black Americans [17–20], including Black pregnant women [3, 4]. Medical mistrust is thought to be a rational coping strategy formed in response to historical and present-day discrimination and racism in the healthcare system [17–21].

Demographically, the majority of Jamaicans (76%) identify as Black, and 18% identify as mixed-race [22, 23]. However, it is yet to be determined whether the factors influencing COVID-19 vaccination among pregnant women and other women of reproductive age in Jamaica are the same as those impacting COVID-19 vaccine uptake among reproductive-aged Black women in the United States [3, 4]. A survey of Jamaican university students provided some insight [24] with findings of disproportionately lower COVID-19 vaccination among women compared to men (27% vs 39%, respectively) [24]. The fear of unknown consequences was the most commonly cited reason for declining vaccination (35%), although details about the particular consequences of concern were not provided [24]. The belief that COVID-19 vaccines were intentionally developed for depopulation was the second most cited reason for forgoing vaccination [24]. These reasons are consistent with low vaccine confidence and medical mistrust [13, 19]. Similarly, low vaccine confidence was the main reason provided for poor uptake of COVID-19 vaccines among 448 pregnant women in the Caribbean country Trinidad [2].

Prior research has not focused on COVID-19 vaccination among pregnant women or other women of reproductive age in Jamaica. Our study aimed to investigate the association between pregnancy, vaccine confidence, medical mistrust, and COVID-19 vaccination in this population.

METHODS

We conducted a cross-sectional, web-based, anonymous survey using REDCap for a convenience sample of female patients, providers, and staff aged 18 to 44 years at a teaching hospital in Jamaica between February 1 and 8, 2022. The hospital primarily serves an urban population from the surrounding Kingston and Saint Andrew parishes.

Patient Consent Statement

The study was approved by the Institutional Review Board of the University of the West Indies (protocol no. ECP 82 21/22) and the Massachusetts General Hospital (protocol no. 2022P000407). Given the low likelihood of harm, informed consent was verbal for participants who completed the survey in person and implied for those who completed the survey online.

Participant Enrollment

Participants were recruited using 4 primary sources: (1) employees of the hospital with publicly available email addresses on the staff directory were sent a public survey link via email; (2) flyers with a QR code and public survey link URL linked to the online survey were posted in waiting rooms of the hospital's outpatient obstetrics and gynecology clinics and on the hospital's social media sites; (3) flyers were shared at the end of the hospital's internal medicine grand rounds presentation on COVID-19 vaccine hesitancy among reproductive-aged women; and (4) patients who attended the prenatal, postnatal, and gynecology clinics could choose to complete the web-based survey independently or with the help of a research assistant.

Survey Assessment

All tools described below were previously validated in US populations [4, 19, 20, 25–27].

Measures

Outcome

Vaccine Uptake. Participants were asked whether they had received the COVID-19 vaccine (1 = yes, 1 dose, 2 = yes, 2 doses, 3 = yes, 3 doses, and 4 = no). We combined the first 3 categories, creating a binary variable (yes vs no) for the analysis.

Exposure

Pregnancy Status. Participants were asked whether they were pregnant, trying to conceive, breastfeeding, or other. We created a binary variable (pregnant vs nonpregnant).

Factors

COVID-19 Vaccine Confidence and Mistrust. We adapted 27 items of confidence, mistrust, and societal beliefs around the COVID-19 vaccine from previous research [19]. Responses were on a Likert scale from 1, strongly disagree, to 5, strongly agree. See Supplementary Table 1 for the complete item list.

Confounders

Sociodemographic and Other Health and Healthcare Characteristics. We assessed age, race, education level, employment status, household income, and type of occupation

Table 1. Population Characteristics by Pregnancy Status

Characteristic	Total (N = 192) N (%)	Pregnant (n = 72) n (%)	Nonpregnant (n = 120) n (%)	*P* Value[a]
Age—year, median (IQR)	33 (28–37)	30 (25–35)	35 (29–39)	<.0001
Race				.049
Black	178 (92.7)	71 (98.6)	107 (89.2)	
White	3 (1.6)	0 (0)	3 (2.5)	
Other	11 (5.7)	1 (1.4)	10 (8.3)	
Health insurance coverage	145 (77.5)	49 (71.0)	96 (81.4)	.102
Employed	160 (83.3)	58 (80.6)	102 (85.0)	.424
Occupation				<.0001
Healthcare	56 (35.4)	5 (8.6)	51 (51.0)	
Other	102 (64.6)	53 (91.4)	49 (49.0)	
Education				.001
Less than college	55 (28.8)	31 (43.7)	24 (20.0)	
Some college or higher	136 (71.2)	40 (56.3)	96 (80.0)	
Survey Type				<.0001
Online	113 (58.9)	23 (31.9)	90 (75.0)	
In person	79 (41.2)	49 (68.1)	30 (25.0)	
Comorbidities				
None	121 (63.0)	53 (73.6)	68 (56.7)	.019
Diabetes	4 (2.1)	2 (2.8)	2 (1.7)	.602
Hypertension	8 (4.2)	3 (4.2)	5 (4.2)	1.000
Obesity	10 (5.2)	5 (6.9)	5 (4.2)	.402
Other	38 (19.8)	5 (6.9)	33 (27.5)	.001
Prior COVID-19 infection	60 (32.3)	15 (22.1)	45 (38.1)	.024
Sources of COVID-19 Information				
People I know, like friends, family, neighbors, or coworkers	40 (20.8)	16 (22.2)	24 (20.0)	.714
Social media (Facebook, Twitter, WhatsApp	30 (15.6)	10 (13.9)	20 (16.7)	.608
News (TV)	54 (28.1)	19 (26.4)	35 (29.2)	.679
News (Internet)	59 (30.7)	27 (37.5)	32 (26.7)	.115
Radio (local, national)	24 (12.5)	9 (12.5)	15 (12.5)	1.00
Healthcare professionals such as doctors and nurses	140 (72.9)	47 (65.3)	93 (77.5)	.065
Local public health officials	63 (32.8)	22 (30.6)	41 (34.2)	.606
Federal government health agencies (eg, CDC or Ministry of Health)	77 (40.1)	20 (27.8)	57 (47.5)	.007
Federal government officials (JLP/Holness administration)[b]	19 (9.9)	2 (2.8)	17 (14.2)	.011
Federal government officials (PNP/Golding administration)[c]	7 (3.7)	1 (1.4)	6 (5.0)	.196
Vaccine Type				.277
AstraZeneca	51 (45.5)	15 (62.5)	36 (40.9)	
Pfizer	34 (30.4)	7 (29.2)	27 (30.7)	
J&J	2 (1.8)	1 (4.2)	1 (1.1)	
Moderna	4 (3.6)	0 (0)	4 (4.5)	
Sinopharm	1 (0.9)	0 (0)	1 (1.1)	
AstraZeneca and Pfizer	19 (17.0)	1 (4.2)	18 (20.5)	
Moderna and Pfizer	1 (0.9)	0 (0)	1 (1.1)	

Abbreviations: CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; IQR, interquartile range; JLP, Jamaica Labor Party; PNP, People's National Party.

[a] *P* values were estimated using χ^2 or Fisher exacts tests for categorical variables and Kruskal-Wallis test for continuous variables.

[b] JLP is the center-right political party in Jamaica and is led by the current prime minster Andrew Holness.

[c] PNP is the center-left political party in Jamaica and is led by Bruce Golding.

(healthcare vs nonhealthcare worker). The status of ownership of their residence and the number of other people living in the same residence were also assessed. Comorbidities such as obesity and diabetes were self-reported and based on participants' recall. Participants were also asked to recall prior COVID-19 infections and COVID-19-related prevention behaviors, such as wearing a face mask and hand washing. We used the 13 items of the Epidemic-Pandemic Impacts Inventory [25, 27] to evaluate the negative impact of COVID-19 on social, economic, and health measures (eg, job loss). Sources of information that participants used to get information about COVID-19 vaccines were evaluated. Self-reported influenza vaccination in the previous year was also measured.

Table 2. Population Characteristics by COVID-19 Vaccination Status

Characteristic	Total (N = 188)	Vaccinated (n = 113)	Unvaccinated (n = 75)	*P* Value[a]
Age—year, median (IQR)	33 (28–37)	35 (29–37)	31 (27–35)	.031
Pregnancy Status, no. (%)				<.0001
Pregnant	69 (36.9)	24 (34.8)	45 (65.2)	
Nonpregnant	118 (63.1)	88 (74.6)	30 (25.4)	
Race, no. (%)				.023
Black	173 (92.0)	99 (57.2)	74 (42.8)	
White	3 (1.6)	3 (100)	0 (0)	
Other	12 (6.4)	11 (91.7)	1 (8.3)	
Health insurance coverage, no. (%)	146 (77.7)	97 (66.4)	49 (33.6)	.001
Employed, no. (%)	156 (83.0)	102 (65.4)	54 (34.6)	.001
Occupation, no. (%)				<.0001
Healthcare	56 (36.4)	48 (85.7)	8 (14.3)	
Other	98 (63.6)	53 (54.1)	45 (45.9)	
Education, no. (%)				<.0001
Less than college	51 (27.3)	17 (33.3)	34 (66.7)	
Some college or higher	136 (72.7)	96 (70.6)	40 (29.4)	
Comorbidities, no. (%)				
None	121 (64.4)	68 (56.2)	53 (43.8)	.141
Diabetes	4 (2.1)	2 (50)	2 (50)	.677
Hypertension	8 (4.3)	5 (62.5)	3 (37.5)	.888
Obesity	10 (5.3)	8 (80.0)	2 (20.0)	.187
Other	39 (20.7)	24 (61.5)	15 (38.5)	.838
Prior COVID-19 infection, no. (%)	61 (32.6)	43 (70.5)	18 (29.5)	.050
Sources of COVID-19 Information, no. (%)				
People I know, like friends, family, neighbors, or coworkers	40 (21.3)	26 (65.0)	14 (35.0)	.476
Social media (Facebook, Twitter, WhatsApp	30 (16.0)	20 (66.7)	10 (33.3)	.424
News (TV)	54 (28.7)	35 (64.8)	19 (35.2)	.403
News (Internet)	59 (31.4)	39 (66.1)	20 (33.9)	.256
Radio (local, national)	24 (12.8)	18 (75.0)	6 (25.0)	.111
Healthcare professionals such as doctors and nurses	140 (74.5)	92 (65.7)	48 (34.3)	.007
Local public health officials	63 (33.5)	45 (71.4)	18 (28.6)	.024
Federal government health agencies (eg, CDC or Ministry of Health)	77 (41.0)	66 (85.7)	11 (14.3)	<.0001
Federal government officials (JLP[b]/Holness administration)	19 (10.1)	17 (89.5)	2 (10.5)	.006
Federal government officials (PNP[c]/Golding administration)	7 (3.7)	7 (100)	0 (0)	.028
Survey Type, no. (%)				<.0001
Online	113 (60.1)	84 (74.3)	29 (25.7)	
In person	75 (39.9)	29 (38.7)	46 (61.3)	
Vaccine Type, no. (%)				
AstraZeneca	51 (45.1)	51 (100)	0 (0)	
Pfizer	34 (30.1)	34 (100)	0 (0)	
J&J	2 (1.8)	2 (100)	0 (0)	
Moderna	5 (4.4)	5 (100)	0 (0)	
Sinopharm	1 (0.9)	1 (100)	0 (0)	
AstraZeneca and Pfizer	19 (16.8)	19 (100)	0 (0)	
Moderna and Pfizer	1 (0.9)	1 (100)	0 (0)	

Abbreviations: CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; IQR, interquartile range; JLP, Jamaica Labor Party; PNP, People's National Party.

[a] *P* values were estimated using χ^2 or Fisher exacts tests for categorical variables and the Kruskal-Wallis test for continuous variables.

[b] JLP is the center-right political party in Jamaica and is led by the current prime minster Andrew Holness.

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Statistical Methods

We present descriptive data as frequencies and percentages for categorical variables and medians and interquartile ranges (IQRs) for continuous variables. We examined the bivariate associations between vaccine uptake and a set of sociodemographic and background variables using χ^2 or Fisher exact tests (when data were sparse) for categorical variables and the Kruskal-Wallis test for continuous variables.

We conducted an exploratory factor analysis using principal axis factoring and oblique equamax rotation to extract factors

on 22 survey items (Supplementary Table 1). Variables were reverse coded when necessary. We used squared multiple correlations as prior communality estimates. We retained items with factor loadings >0.40 and assessed the internal consistency of the extracted factors using Cronbach's alpha (α). In addition, we computed the "estimated factor scores", which are linear composites of the optimally weighted variables retained in each factor. We also created 3-level categorical factors using tertiles cutoff values.

We used multivariable modified (robust) Poisson regression to calculate adjusted prevalence ratios (aPR) and 95% confidence intervals (95% CIs) for the association between vaccine uptake and pregnancy status, adjusting for confounders. Using the change-in-estimate approach, we assessed an a priori set of potential confounders (sociodemographic and health-related variables). Variables that were deemed to be potential confounders (>10% change in the adjusted beta) were included in the saturated model and retained in the final multivariable robust Poisson regression model if $P < .1$. All analyses were generated using SAS 9.4 software (SAS Institute, Cary, NC).

Exclusion Criteria

The study excluded individuals who identified as male or were outside the age range of 18 to 44 years old. The final model also excluded 15 individuals due to missing responses; of the 15 excluded individuals, 6 were missing responses for COVID-19 vaccination, 2 for pregnancy status, 2 for education status, and 14 for medical mistrust factors.

RESULTS

Baseline Characteristics

Table 1 shows baseline population characteristics by pregnancy status. A total of 192 women participated in the study, of whom 72 (38%) were pregnant and 120 (63%) were nonpregnant. Pregnant women were significantly younger (median 30 years; IQR, 25–35) than those who were nonpregnant (median 35 years; IQR, 29–39) ($P < .0001$). Most pregnant and nonpregnant women trusted healthcare professionals for COVID-19 vaccine information (65% and 78%, respectively). However, other trusted sources varied between the 2 groups. Pregnant women were more likely to trust internet news sources compared with nonpregnant women (38% vs 27%), but they were less likely to trust government agencies such as the Jamaican Ministry of Health or the US Centers for Disease Control and Prevention (27% vs 47%).

Outcome Measures

As shown in Table 2, 113 (59%) of all participants were vaccinated. Vaccine uptake was significantly higher in nonpregnant women compared with pregnant women (75% vs 35%, respectively) ($P < .0001$). Vaccinated women were generally older than unvaccinated women (median 35 [IQR, 29–37] and median 31 [IQR, 27–35] years, respectively; $P = .031$). Overall, 113 of the vaccinated respondents (100%) reported the type of vaccine they received: 51 (45%) received 1 or both doses of the viral vector vaccine by AstraZeneca; 40 (35%) received 1 or both doses of an mRNA vaccine (either Pfizer BioNTech or Moderna); 2 (2%) received at least 1 dose of the J&J/Janssen viral vector vaccine; 1 (1%) received 1 or both doses of an inactivated whole virus vaccine Sinopharm; and 19 (17%) received a mix and match of the viral vector vaccine AstraZeneca and the mRNA vaccine Pfizer BioNTech.

Most participants (69%) agreed with the statement, "I'm concerned about serious side effects with the COVID-19 vaccine," and 46% agreed with the statement, "I'm worried that the vaccine could be harmful." Over one third of participants agreed with the statements, "the government cannot be trusted to tell the truth about COVID-19" and "the government is hiding information about COVID-19" (37% and 35%, respectively) (Supplementary Table 1).

Among unvaccinated pregnant women, the majority (82%) intended to get vaccinated in the future. Of these, 22% planned to get vaccinated after childbirth, 29% after breastfeeding, and 29% at some other time in the future (Supplementary Table 2). Only 18% of pregnant women had no intention of getting vaccinated, 50% of whom cited concerns of harm to the current pregnancy, and 36% endorsed fears of vaccine side effects. Of the 30 nonpregnant women who were unvaccinated, 83% intended to get vaccinated in the future (Supplementary Table 2). Vaccinated nonpregnant women were more likely to advise their pregnant friends to get vaccinated compared with vaccinated pregnant women (99% vs 92%, respectively; $P = .026$), as reported in Supplementary Table 2.

Exploratory Factor Analysis

As shown in Table 3, 3 factors were extracted, which conceptually aligned with 3 subscales: vaccine confidence ($\alpha = 0.93$), government-related COVID-19 medical mistrust ($\alpha = 0.88$), and race-based COVID-19 medical mistrust ($\alpha = 0.68$). Bivariate analyses showed that each of the 3 subscales' scores was higher in pregnant women than in nonpregnant women ($P < .0001$, $P < .0001$, and $P = .002$, respectively) (Supplementary Table 3) and in unvaccinated compared with vaccinated women (all $P < .0001$) (Supplementary Table 4).

The adjusted robust Poisson regression model for vaccine uptake is shown in Table 4. The final model included education level, lack of vaccine confidence, and government-related COVID-19 medical mistrust. Pregnant women were less likely to get vaccinated than nonpregnant women (aPR = 0.68 [95% CI, .549–.95], $P = .014$). Low vaccine confidence and government mistrust factors were associated with a lower likelihood of COVID-19 vaccination (aPR = 0.61 [95% CI = .40–.95], $P = .069$ and aPR = 0.68 [95% CI = .52–.89], $P = .005$, respectively). Race-based mistrust was not significantly associated with COVID-19 vaccination (Supplementary Table 5); therefore, this was not retained in the final model (Table 4).

Table 3. Questionnaire Items of Vaccine Confidence and Mistrust Instrument and the Factor Loadings of Retained Subscales

Item	Factor Loading	Median (IQR)	%Strongly Agree	% Agree	%Don't Know	% Disagree	%Strongly Disagree
COVID-19 Vaccine Confidence Subscale ($\alpha = 0.93$)[a]							
COVID-19 vaccines are effective	0.69	4 (3–4)	19.9	33.9	35.5	6.5	4.3
Getting vaccines is a good way to protect me from disease	0.63	4 (3–5)	39.3	15.1	32.8	7.5	5.4
Getting vaccinated for COVID-19 is important for the health of others in my community	0.64	4 (3–5)	25.7	40.6	25.7	6.4	1.6
The COVID-19 vaccine is important for my health	0.62	4 (3–5)	26.1	28.2	33.0	9.6	3.2
COVID-19 vaccines are safe	0.61	3 (3–4)	12.8	30.9	45.7	6.9	3.7
I don't trust the COVID-19 vaccine	0.60	3 (1–3)	12.4	11.4	26.5	24.3	25.4
I am worried that COVID-19 vaccines could be harmful	0.48	3 (2–4)	13.9	32.1	18.2	21.4	14.4
Government-Related COVID-19 Mistrust Subscale ($\alpha = 0.88$)							
The government is hiding information about COVID-19	0.89	3 (3–4)	15.1	19.4	41.4	15.6	8.6
The government cannot be trusted to tell the truth about COVID-19	0.88	3 (2–4)	16.0	21.3	32.5	18.6	11.7
Black people should be suspicious of information from the government about COVID-19	0.50	3 (2–3)	3.2	17.6	32.5	29.3	17.6
Race-Based COVID-19-Related Mistrust Subscale ($\alpha = 0.68$)							
Within the healthcare system, people from my race are treated differently than people from other racial groups	0.60	3 (2–4)	7.5	22.5	31.0	28.9	10.2
I would be more comfortable having a COVID-19 vaccine explained to me from a doctor or healthcare worker with the same race as mine	0.51	3 (2–4)	8.5	34.6	12.2	34.0	10.6
When it comes to COVID-19, Black people cannot trust healthcare providers	0.46	2 (2–3)	2.7	8.6	29.6	40.3	18.8
People who take the vaccine will be like human guinea pigs	0.40	3 (2–3)	4.8	14.9	32.5	30.3	17.6

Abbreviations: COVID-19, coronavirus disease 2019; IQR, interquartile range. [a] The COVID-19 vaccine confidence subscale also included the item "what advice would you give to your pregnant friend regarding COVID-19 vaccination?" with three response options: (1) don't get vaccinated; (2) wait to get vaccinated; and (3) get vaccinated right now. The factor loading for this item on the COVID-19 vaccine confidence subscale was 0.52 ; Meadian (IQR): 1 (1,2); % of participants recommended option (1) dont get vaccinated = 7.6%; % of participants who recommended option (2) wait to get vaccinated = 31.4%; and % of participants who recommended (3) get vaccinated right now = 61.1%.

Table 4. Multivariable Modified Poisson Regression of the Association of Pregnancy With COVID-19 Vaccine Uptake

Variable	Vaccine Uptake	
	Adjusted Prevalence Ratio (95% CI)	*P* Value[a]
Pregnancy		.014
Not pregnant	Ref	
Pregnant	0.68 (.49–.95)	
Education		.075
Some college, or more	Ref	
Less than college	0.71 (.48–1.07)	
Vaccine Confidence Subscale		.069
High confidence	Ref	
Moderate confidence	0.92 (.75–1.12)	
Low confidence	0.61 (.40–.95)	
Government-Related COVID-19 Medical Mistrust Subscale		
Low mistrust	Ref	.005
Moderate mistrust	0.96 (0.64–1.43)	
High mistrust	0.68 (0.52–0.89)	

Abbreviations: CI, confidence interval; COVID-19, coronavirus disease 2019; Ref: reference group.

[a]Variables with $P < .1$ were retained in the final model.

DISCUSSION

In this survey of reproductive-aged women in Jamaica performed in February 2022, approximately 6 months after the local Ministry of Health recommended COVID-19 vaccination for pregnant women [1], pregnant women were significantly less likely to be vaccinated compared to nonpregnant women, similar to previous reports in the United States and the Caribbean [2–4]. In our study, only 35% of pregnant women reported receipt of 1 or more doses of a COVID-19 vaccine, which was higher than the 24% vaccine uptake for pregnant women in the Caribbean country Trinidad [2], but lower than the 55% vaccination coverage of Black pregnant people in the United States by the end of February 2022 [28]. We also found that vaccine confidence was low, with most respondents (69%) expressing concerns about serious side effects. Lower vaccine confidence was associated with a lower likelihood of vaccination, consistent with a Trinidad-based study [2] and United States-based studies of 207 Black Americans [19] and 477 pregnant individuals [29]. Most pregnant women in our study trusted healthcare professionals more than the government for COVID-19 vaccine information (65% vs 28%, respectively).

The lower uptake observed among pregnant Jamaican women compared with Black pregnant people in the United States may have been linked to differences in the availability of mRNA vaccines and adenoviral vector vaccines. AstraZeneca was the only vaccine type available in Jamaica from March to August 2021 [30], after which Pfizer BioNTech became available [31]. In the United States, Pfizer BioNTech has been available and recommended for administration to pregnant women since December 2020 [32], whereas AstraZeneca is currently not authorized by the US Food and Drug Administration [32]. The American College of Obstetrics and Gynecology (ACOG) currently advises that mRNA vaccines be used instead of adenoviral vaccines for pregnant women due to limited safety data on adenoviral vaccines during pregnancy [32]. The clinical safety data for AstraZeneca during pregnancy is still limited to 1 small observational study of 107 pregnant women, which found no difference in rates of miscarriage or preterm deliveries between those who received the AstraZeneca vaccine and those who did not [6]. A meta-analysis of 1731 women who received an adenoviral vector vaccine during pregnancy also found no increased incidence of thrombosis or coagulopathy [33].

Our findings suggest an urgent need to improve vaccine confidence among reproductive-aged women in Jamaica, particularly among pregnant women. One key step to improving vaccine confidence for pregnant women in the future will be the inclusion of pregnant women in vaccine clinical trials [34]. This step will provide the critical safety data needed for healthcare providers to confidently advise their patients; such information would have been particularly helpful for the AstraZeneca vaccines, which were the only vaccines initially available in Jamaica [30]. In addition, a few studies have evaluated strategies to improve vaccine confidence and subsequently increase vaccine uptake of the Tdap (tetanus, diphtheria, acellular pertussis) and influenza vaccines among Black pregnant women [35–37]. One such study looked at Tdap uptake among 106 Black pregnant women in Atlanta and found that maternal Tdap vaccine uptake increased from 18% to 29% after exposure to a culturally tailored educational video that included physicians explaining (1) the severity of pertussis and influenza, (2) how vaccines protect pregnant women and newborns from vaccine preventable diseases, (3) vaccine safety information, and (4) the current ACIP recommendations [37]. In addition, a qualitative study of 21 Black pregnant women in Atlanta explored messaging strategies to increase maternal influenza vaccination and found that there was a preference for positively framed messages that emphasized the benefits to the infant and a preference to hear about the influenza vaccine from their obstetrician [38]. Similar models could be developed for prenatal visits in Jamaica.

In our study, government mistrust was negatively associated with COVID-19 vaccination, consistent with a September 2021 study of 1000 Jamaicans, which found that persons who lacked trust in the government were significantly less likely to be vaccinated against COVID-19 [16]. The origin of government mistrust among pregnant women and other women of reproductive age in the Caribbean is not well studied but likely lies in colonialism, slavery, racism, and social inequities in westernized healthcare [39]. Enslaved pregnant Jamaican

women experienced high maternal mortality rates, which persisted in the postcolonial era, with the first ever recorded MMR in 1878 being 600 maternal deaths per 100 000 live births [40]. Comparatively, the MMR in the United States was approximately 100 maternal deaths per 100 000 live births during that time period [41]. Jamaica's high MMR was partly attributed to colonial policies, such as the lack of proper healthcare, including obstetric care for enslaved women, at a time when slave reproduction was not considered economically profitable [40]. Medical experimentation also played a role, such as British physician John Quier's experimental inoculation of enslaved pregnant women with smallpox [42, 43]. The political and social systems that existed during colonial rule served as the foundation for the postindependence government in Jamaica [22, 44, 45], likely contributing to present-day mistrust of the government.

In a 2006 study examining generalized trust in Jamaica, 1338 individuals were surveyed, 723 (54%) of whom were women. The results showed low levels of trust, with only 6% of women expressing trust in the government, and 3% reporting generalized trust (ie, combined trust in organizations, institutions, political entities, and interpersonal relationships) [39]. Low trust was attributed to a history of unbalanced power dynamics in male-female relationships, as well as historical corruption in politics [39].

Various strategies have been suggested to reduce mistrust among Black pregnant women, including incorporating compassion and acknowledgment of past injustices in vaccine decision-making conversations [9], community engagement and advocacy [46, 47], collaborative care, and policy reform [46]. For Jamaican women specifically, an important strategy to decrease mistrust may be to divert COVID-19 vaccine messaging from government agencies to healthcare professionals, given the greater trust in healthcare professionals in this cohort. Healthcare provider recommendation has been found to improve COVID-19 vaccine confidence and uptake in pregnancy [29]. A United States-based study of 477 pregnant people found that people whose healthcare providers recommended COVID-19 vaccines in pregnancy were 5 times more likely to be vaccinated [29].

Unlike a prior United States-based study conducted among Black Americans [19], race-based medical mistrust was not found to be significantly related to vaccine uptake in the final model for this cohort of predominantly Black women, likely related to Jamaica's identity as a nonracial society [22, 44, 48]. Most recent studies have found that socioeconomic factors in Jamaica, such as education, are better predicted by skin color rather than race, although a racial hierarchy still exists [44]. Race-based mistrust and self-reported COVID-19 vaccination were not stratified by race/ethnicity in our study; due to the small number of non-Black study participants, valid statistical comparisons of these outcome measures by race/ethnicity could not be conducted.

Future Directions

Mixed methods studies are needed to better understand and describe the predictors of vaccine uptake in women of reproductive age, for instance, the specific side effects that are of concern to this population. Knowledge gained from mixed methods studies can be used to design effective strategies and improve messaging for vaccination campaigns. There is also a need to implement strategies founded on 3P (practice, provider, patient) level interventions previously shown to improve maternal Tdap vaccine uptake by as much as 56%, such as standing "opt-out" vaccination orders, provider performance feedback, culturally congruent patient education videos, and patient incentives [38], in Jamaica and other middle-income countries. Studies that assess the impact of collaborative care and policy reform on COVID-19 vaccine mistrust in this population should also be pursued. Finally, future studies should seek to recruit more breastfeeding individuals and people trying to conceive to assess the unique factors influencing uptake in these populations.

Limitations

The present study used a convenience sample recruited from 1 urban healthcare facility; thus, the sample is not necessarily representative of women in Jamaica. We could not calculate a response rate because we could not differentiate between respondents who completed the survey using the QR code from flyers or emails posted in the hospital or on University Hospital of the West Indies social media pages. The small sample size limited our ability to compare outcome measures among specific subgroups, such as women who identified as breastfeeding, trying to conceive, and non-Black. Comorbidities were self-reported and were therefore subject to recall bias. The prevalence and distribution of comorbidities in the sample may therefore be inaccurate. This could have indirectly influenced the outcome measure of self-reported vaccination because respondents with high-risk underlying conditions may be more likely to report vaccination.

CONCLUSIONS

The record high maternal mortality rate experienced by Jamaica in 2021, primarily due to COVID-19-related deaths, demands urgent attention. Because COVID-19 vaccination has been shown to reduce symptomatic COVID-19 infection and hospitalization during pregnancy, maximizing COVID-19 vaccination coverage among pregnant women on the island should be prioritized. Implementation and evaluation of strategies proven to improve maternal vaccine confidence and uptake (eg, healthcare provider recommendations and educational videos) may increase COVID-19 vaccine uptake in this population.

Supplementary Data

Supplementary materials are available at *Open Forum Infectious Diseases* online. Consisting of data provided by the authors to benefit the reader, the posted materials are not copyedited and are the sole responsibility of the authors, so questions or comments should be addressed to the corresponding author.

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