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Comparison of attitudes toward routine maternal vaccines and COVID-19 vaccines among pregnant patients in an urban safety-net setting

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Abstract: Objective: To explore attitudes toward tetanus-diphtheria-acellular pertussis (Tdap), influenza, and COVID vaccines among English- and Spanish-speaking pregnant individuals in a safety net setting.

Methods: Pregnant people aged 18 years or older were recruited from outpatient clinics between August 2020 and June 2021. Interviews were conducted via phone in English or Spanish, recorded, transcribed, and translated verbatim. Data were qualitatively analyzed using modified grounded theory and content analysis.

Results: 42 patients participated (22 English-speaking, 20 Spanish-speaking). Most participants expressed positive attitudes towards both routine prenatal vaccinations and COVID-19 vaccines, endorsing the belief that vaccines promote health and considering vaccines a social norm. Positive attitudes were similar for the three vaccines, and among Spanish- and English-speaking individuals. Participants trusted their healthcare provider's recommendations and felt comfortable receiving booster doses of vaccines they had received successfully in the past. Vaccine concerns differed by each vaccine. Despite limited knowledge, few participants expressed concerns about Tdap vaccines. Concerns around influenza vaccines often stemmed from personal experience and centered around ineffectiveness and increased risk of flu-like illnesses. Participants expressed the most concerns related to COVID vaccinations, including misinformation about serious side effects and distrust around accelerated approval of the vaccines. Many participants wished to know more about the side effects and safety of vaccinating during pregnancy, especially regarding the fetus's health.

Conclusions: Most participants supported routine prenatal vaccinations, including COVID vaccines. Clinicians are trusted information sources and can help reinforce positive attitudes and social norms of receiving vaccinations in pregnancy while addressing vaccine-specific concerns.

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Keywords: Pregnancy ■ Routine vaccines ■ Vaccine hesitancy ■ COVID-19 ■ Vaccine attitudes

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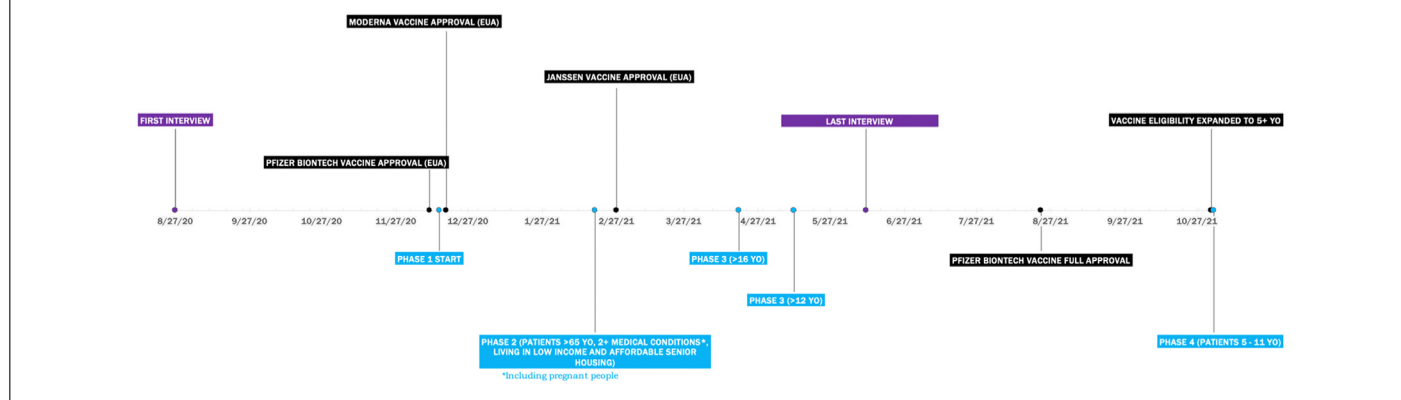
INTRODUCTION

Vaccines are one of the greatest public health advancements in history and have significantly reduced or eradicated several diseases (CDC,¹; CDC, 2016). Vaccines against influenza and tetanus, diphtheria, and pertussis vaccine (Tdap) during pregnancy are both safe and efficacious, with data demonstrating protection of both the pregnant person and fetus against severe illness and death.² However, racial, and ethnic disparities in vaccine coverage among pregnant people persist in the United States (U.S.).^{3,4} In 2020-2021, just 30.7% of all pregnant people received both flu and Tdap vaccines, with only 17.7% of Black pregnant people receiving both vaccines.³ A study reported that hesitancy around maternal vaccination is largely due to a lack of knowledge regarding vaccine recommendations, concerns about vaccine safety for the fetus, and specific concerns about the effectiveness of the influenza vaccine.⁵

Like influenza and pertussis, COVID-19 can cause significant consequences among pregnant people, CDC,⁶ including increased risk of severe disease, hospitalization, and death compared to non-pregnant people.^{7,8} Not only are pregnant people disproportionately affected by COVID-19, but pregnancies complicated by COVID-19 have higher risks of preterm delivery and stillbirth, and newborn children are also at risk for developing severe illnesses.⁹ Recent data indicates that COVID-19 vaccination can provide up to 99% protection against hospitalization during pregnancy.¹⁰ Therefore, the CDC, the American College of Obstetricians and Gynecologists (ACOG), and the Society for Maternal-Fetal Medicine (SMFM) recommend COVID-19 vaccination during pregnancy (CDC,¹¹; ACOG, 2021).

However, concerns about the rapid authorization of COVID-19 vaccines, the lack of pregnant participants in COVID-19 vaccine clinical trials, evolving SARS-CoV-2 variants leading to decreased vaccine effectiveness, and the circulation of significant misinformation online related to COVID-19 vaccine safety and fertility issues, vaccine

Fig. 1. This figure illustrates the timeline of significant changes in COVID vaccine recommendations relative to when interviews were conducted with participants during the study period.



hesitation is prevalent, particularly among pregnant individuals.^{12–16} As a result, COVID-19 vaccine coverage of pregnant people at the time of this study,¹⁸ reached only 35%.⁶

Our previous research demonstrated the importance of highlighting vaccine safety as an effective measure to encourage influenza and Tdap vaccination during pregnancy.¹⁹ However, there is limited research comparing attitudes toward routine maternal vaccines and COVID-19 vaccines and addressing the impact of the COVID-19 pandemic on vaccine attitudes among different racial and ethnic groups. The objective of this qualitative study is to describe and compare the attitudes and beliefs about routine maternal vaccinations (influenza and Tdap vaccines) and COVID-19 vaccines among English- and Spanish-speaking pregnant people in a safety-net setting.

METHODS

Participant recruitment and data collection

One-on-one interviews with pregnant people in English or Spanish were conducted between August 2020 and June 2021 (Figure 1). Pregnant people aged 18 years and older, with pregnancies of any gestational age, who were receiving prenatal care at Boston Medical Center were eligible. Participants were recruited in person or through patient reminder phone calls before clinical visits. Approximately 82% (n=42) of the patients approached agreed to participate; most individuals who declined to participate cited time constraints. Informed consent was obtained.

Recruitment and interview protocols were conducted as described in our previous study Fuss et al.¹⁹ Briefly, each interview lasted approximately 30 minutes, ranging from 17 to 53 minutes, and participants were compensated. Interviews were digitally audio-recorded, transcribed verbatim, and reviewed for accuracy by study team members.

Qualitative interview content

The interview explored topics using the constructs of the health belief model.²⁰ Specific to this study, these included perceived susceptibility to and severity of vaccine-preventable diseases, beliefs in routine vaccination during the pandemic, precautionary measures taken during the pandemic, perceived COVID-19 vaccine benefits, and barriers and motivators to vaccination including current knowledge of COVID-19 vaccines, sources of vaccine information, and perceived trustworthiness of information sources. Demographic information collected included age, gender, gestational age, relationship status, number of children, number of household members, race/ethnicity, country of origin, years lived in the U.S. if born elsewhere, religious affiliation, education level, household income level, and health insurance.

Data analysis

Qualitative analysis of the data was conducted using modified grounded theory (Akiko, 2018) and content analysis.²¹ Study team members reviewed the transcripts and collaboratively created a codebook which was then applied to subsequent transcripts. Weekly meetings were held to compare consistency in the assigned themes and resolve discrepancies. We compared attitudes toward routine vaccines and COVID vaccines between English- and Spanish-speaking participants. The Boston University Medical Center institutional review board approved this study.

RESULTS

Characteristics of participants

A total of 42 individuals participated in this study: 22 English-speaking and 20 Spanish-speaking. Table 1 illustrates participants' sociodemographic characteristics,

Table 1. Demographic characteristics (N=42).

	Total (N=42)	English-speaking (N=22)	Spanish-speaking (N=20)
	n (%)	n (%)	n (%)
Age (years; mean, range)	28 (18-41)	25 (18-38)	32 (23-41)
Gestational age (weeks; mean, range) ³	22 (11-36)	17.2 (11-31)	23.4 (11-36)
Relationship status			
Married	10 (23.8)	5 (50)	5 (50)
Non-marriage partnership	23 (54.8)	12 (52.2)	11 (47.8)
Single	9 (21.4)	5 (55.6)	4 (44.4)
Number of children ⁴			
0	19 (46.3)	15 (78.9)	4 (21.1)
1-2	18 (43.9)	6 (33.3)	12 (66.7)
3-4	4 (9.8)	0	4 (100)
Number per household			
1-2	11 (26.2)	9 (81.8)	2 (18.2)
3-4	23 (54.8)	12 (52.2)	11 (47.8)
5-9	8 (19)	1 (12.5)	7 (87.5)
Race/Ethnicity			
Black/African American (non-Hispanic)	7 (16.7)	7 (100)	0
Caucasian (non-Hispanic)	4 (9.5)	4 (100)	0
Hispanic/Latinx	23 (54.8)	4 (17.4)	19 (82.6)
Other ⁵	8 (19)	7 (87.5)	1 (12.5)
Country of origin			
United States	15 (35.7)	15 (100)	0
Other ⁶	27 (64.3)	7 (25.9)	20 (74.1)
Years lived in United States, if born elsewhere (mean, range) ⁷	9.11 (1-26)	13.7 (3-26)	7.5 (1-23)
Religion			
None	15 (35.7)	12 (80)	3 (20)
Christian	26 (61.9)	9 (34.6)	17 (65.4)
Other ⁸	1 (2.4)	1 (100)	0
Education level			
Less than high school	8 (19.0)	0	8 (100)
Some high school	4 (9.5)	3 (75)	1 (25)
High school diploma or equivalent	14 (33.3)	7 (50)	7 (50)
Some college	7 (16.7)	7 (100)	0
College graduate ⁹	9 (21.4)	5 (55.6)	4 (44.4)

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Table 1 (continued)

	Total (N=42)	English-speaking (N=22)	Spanish-speaking (N=20)
	n (%)	n (%)	n (%)
Household income level ¹⁰			
<\$20,000	18 (42.9)	10 (55.6)	8 (44.4)
\$21,000–60,000	7 (16.7)	2 (28.6)	5 (71.4)
> \$61,000	7 (16.7)	7 (100)	0
Not specified	10 (23.8)	3 (30)	7 (70)
Health insurance			
Public (Masshealth/Medicaid)	29 (69)	13 (44.8)	16 (55.2)
Private	12 (28.6)	9 (75)	3 (25)
Not specified	1 (2.4)	0 (0)	1 (100)

¹ All individuals were pregnant at recruitment; 1 pregnant Spanish-speaking interview was conducted shortly after birth.

² Primary language is English or Spanish, interviews conducted in each respective language.

³ Gestational age was not initially included when developing the interview guide but was later added. Gestational age for 25/42 individuals were recorded: English (n=5), Spanish (n=20). One individual was pregnant at time of recruitment but had given birth two days before the interview. The individual was excluded from the calculation.

⁴ Number of children was not initially included when developing the interview guide but was later added. One participant was not asked this question.

⁵ Other Race/Ethnicity; English-speaking participants: Cape Verdean (n=2), Mixed (n=2), South Asian (n=1), Not specified (n=2); Spanish-speaking participants: Mixed (n=1)

⁶ Country of origin; English-speaking participants: Cape Verde (n=1), Dominican Republic (n=2), El Salvador (n=1), England (n=1), Eritrea (n=1), Lebanon (n=1); Spanish-speaking participants: Columbia (n=2), Dominican Republic (n=2), El Salvador (n=8), Guatemala (n=4), Honduras (n=3), Mexico (n=1)

⁷ Years lived in United States, if born elsewhere; English-speaking participants: 3-15 years (n=2), 16- 30 years (n=4), 21-26 years (n=1), Not specified (n=15); Spanish-speaking participants: 1-5 years (n=11), 6- 10 years (n=5), 11-15 years (n=1), 16-23 years (n=3)

⁸ Other Religion; English-speaking participants: Muslim/Islam (n=1)

⁹ Education level; English-speaking participants: Associate's or bachelor's degree (n=1) Professional degree (n=4); Spanish-speaking participants: Associate's or bachelor's degree (n=3), Professional degree (n=1)

¹⁰ Household income level; English-speaking participants: \$21,000–40,000 (n=1), \$41,000–60,000 (n=1), \$61,000–80,000 (n=1); Spanish-speaking participants: \$21,000–40,000 (n=4), \$41,000–60,000 (n=1)

stratified by primary language. On average, participants were 28 years old, ranging in age from 18 to 41 years. Approximately half were in non-marriage partnerships (55%, n=234), 24% were married, and 21% were single. Most self-identified as Hispanic/Latinx (55%, n=23), white (10%, n=4), or Black/African American (17%, n=7). Overall, 64% (n=27) were born outside the U.S., and those 27 individuals had lived in the U.S. for an average of 9 years. Of the participants interviewed, 38% (n=16) had at least a high school education, 43% (n=18) had some high school, and 19% (n=8) of participants received less than high school education.

Both English and Spanish-speaking participants shared similar positive attitudes regarding vaccines promoting the health of their fetuses and themselves. All participants

supported routine childhood vaccination, stating vaccinations were either very important (n =27) or important (n = 15). Similarly, most participants supported receiving influenza and Tdap vaccinations, stating they were very likely/likely to receive vaccines during pregnancy if their doctor recommended them (influenza: n =33, 79%, Tdap: n=34, 81%). Regarding the COVID-19 vaccine, at the time of the interview, 52% of participants had either received or intended to receive the vaccine (n=14, 33% already received, n=8, 19% intended to receive).

Qualitative interview themes

Perceived benefits of vaccination. Both English- and Spanish speakers shared similar reasons for believing in

vaccine importance. These reasons were common to all vaccines, including influenza, Tdap, and COVID. The first main theme that emerged as a motivator for vaccination was: vaccines promote health. The following subthemes were noted: (1) prevent sickness or death, (2) protect the health of self and children, (3) minimize symptom severity, (4) passive immunity to infants, (5) high susceptibility to disease motivates vaccination, and (6) benefits of vaccination outweigh risks. The second main theme was: vaccination as a social norm. The following subthemes were noted: (1) trust in healthcare providers, (2) vaccinations are a social responsibility and for public health, and (3) habit of receiving routine vaccines/positive prior experiences (Table 2).

Vaccines promote health

Participants often stated that vaccines promoted or protected health, prevented sickness and death, and minimized the severity of symptoms experienced by those who did get sick. These beliefs were common to influenza, Tdap, and COVID-19 vaccines (Table 2). One participant stated: “I don’t want my son to go through something that I can prevent, and I don’t want him to have any risks during the pregnancy that I can avoid” (25-year-old Hispanic/Latinx Spanish-speaking participant). Minimizing symptom severity was often mentioned by Spanish-speaking participants: “Well, if you get the vaccine and you get COVID, well it is a little less risk that you’ll get a strong one” (29-year-old Hispanic/Latinx Spanish speaking participant).

Passive immunity

Another key motivator of maternal vaccination was the protection of infants through passive immunity. English and Spanish speakers alike recognized and cited the importance of maternal vaccination to protect their infants: “Basically what I eat she eats. Or what I smell, she kinda smells so. Someone told me that if I take the flu vaccine, she’ll get a little bit of it and not get sick.” (20-year-old Black/African American English-speaking participant)

Social norms

Most participants reported that they were in the habit of receiving routine vaccines for themselves (97.6%) and their children (100%). Several participants noted that they often accepted offered recommended vaccinations at primary care appointments without asking many questions: “Honestly whenever I go to my appointments and they tell me I have a shot, I’m just like okay, (laughs) I’m not sure which ones they give me and at what times.” (22-year-old Black/African American English-speaking par-

ticipant)]. Familiarity with vaccines also increased participant comfort: “The vaccines that are regular, the tetanus one, rubella, the flu, well those vaccines have gone from generation to generation so when one gets it, you know that that time has passed, already proven, you already know what will happen when you get it.” (33-year-old Hispanic/Latino Spanish-speaking participant). Familiarity leading to vaccine acceptance was commonly noted with the Tdap vaccine; participants demonstrated high levels of vaccine acceptance and trust though knowledge was often limited to name recognition as the “tetanus vaccine.”

Trust in healthcare providers

Many participants reported that they learned about vaccines through conversations with their providers and received pamphlets supplied by their healthcare provider’s office. However, many stated that they rarely read the educational materials, relying more on the recommendations of their healthcare providers, whom they believed had their best interest at heart, were experts on the topic, and therefore could be trusted to protect the health of themselves and their children: “If they told me that I needed to do any, like a booster, for my vaccination, well then I would gladly do it if I know that it won’t affect my baby and they reaffirm that nothing will happen, I would gladly get it” (25-year-old Hispanic/Latinx Spanish speaking participant).

Protection of the individual and the community

English and Spanish-speaking participants differed in whether they used an individualistic or collectivist perspective when considering routine and COVID-19 vaccinations. English-speaking participants often noted personal susceptibility to vaccine-preventable diseases as a reason to vaccinate: “[Be]cause I work in healthcare so the chances that I get [COVID-19] and bring it home are pretty high.” (32-year-old white English-speaking participant). Many Spanish-speaking participants perceived vaccination as a social responsibility to protect their family and community members: “I don’t want to get COVID and because I want to protect myself and take care of my family.” (31-year-old Hispanic/Latinx Spanish-speaking participant).

Perceived concerns about vaccination

Both English- and Spanish speakers also shared many concerns about vaccines. Unlike perceived benefits, which were generally similar for all vaccines, concerns varied by vaccine. The main themes related to concerns included: (1) side effects, especially during pregnancy, (2) influenza vaccine causing illness, (3) concerns about COVID-19

Table 2. Perceived benefits of vaccination: themes, subthemes, and example quotes.

Theme: Vaccines Promote Health	
Sub-themes	Quotes
Vaccines prevent sickness or death in self and children	<p><u>Vaccines overall</u> "I will tell them to receive the vaccines because it is very important as much for them, as a mother to be protected, because one has to take care the babies, and if you have an illness, easily can spread to them. Instead, if one is already protected by the vaccine. I will tell them that one is well protected." (31-year-old Hispanic/Latinx Spanish-speaking participant)</p>
	<p><u>Influenza vaccine</u> "Usually like if I get the vaccine, I get lower risk of contracting the flu and passing it on to the baby." (20-year-old Hispanic/Latinx English-speaking participant)</p>
	<p><u>Tdap vaccine</u> "The tetanus is for when a child has some infection or has some problem and then goes out, prevents so that they can't catch infections, problems in their development" (39-year-old Hispanic/Latinx Spanish-speaking participant)</p>
	<p><u>COVID-19 vaccine</u> "Just to avoid possible severe infection in children even though the infection wasn't really severe, but many children had complications of COVID" (30-year-old self-defined their race as "Other" English-speaking participant)</p>
	<p>"For me, for the pregnancy, if I were to get sick, I wouldn't like to have complications that you said, that on the news that in pregnancy one can get sick faster, the defenses are low, so there's risk with the baby and with oneself, that one can die and leave the baby, something like that." (37-year-old Hispanic/Latinx and white Spanish-speaking participant)</p> <p>"Because I want them to be protected, from this virus, I don't want them to get this virus. And, to end this virus, so that we can return to normal life, like before." (31-year-old Hispanic/Latinx Spanish-speaking participants)</p>
Vaccines protect the health of self and children	<p><u>Vaccines overall</u> "Just that its good so that I can stay safe, and the baby can stay safe" (20-year-old Black/African American English-speaking participant)</p>
	<p><u>Influenza vaccine</u> "Basically, getting the [flu] vaccination avoids contracting it, worsening it or having any problem during the pregnancy." (25-year-old Hispanic/Latinx Spanish-speaking participant)".</p>
	<p><u>Tdap vaccine</u> "If it prevents whooping cough like. Yes, you could give it to me because I'm protecting the health of the baby, and mine as well" (36-year-old Hispanic/Latinx Spanish speaking participant)</p>
	<p><u>COVID-19 vaccine</u> "COVID-19 is really severe infection and I think we should just get rid of it and the vaccine will be the first maybe thing that will help to do that" (30-year-old self-defined their race as "Other" English speaking participant)</p>
	<p>"Well, I talked to my husband that it is good for the baby and for me to be healthier and we made the decision that I would get [the COVID-19 vaccine]" (33-year-old Hispanic/Latinx Spanish speaking participant)</p> <p>"Well, like I was saying, for the same thing I don't want my baby to be born and I get COVID again and the baby gets sick. The first time I didn't get it as bad, but one never knows how your body changes its defenses" (34-year-old Hispanic/Latinx Spanish speaking participant)</p> <p>"100% for sure because I feel that it's necessary, it's necessary to get it, because I feel that there would be more security there" (36-year-old Hispanic/Latinx Spanish speaking participant)</p>

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Table 2 (continued)

Theme: Vaccines Promote Health

Sub-themes	Quotes
Vaccines minimize the severity of symptoms	<p><u>Vaccines overall</u> "Even if they were to get sick with really anything that could have been prevented by a vaccine, vaccines usually just help with symptoms of illness. Say you get the flu and you got vaccinated, your symptoms wouldn't be as bad as someone who didn't get vaccinated." (24-year-old Black/African American English-speaking participant)</p> <p><u>Influenza vaccine</u> "Sometimes they be saying when you get the flu vaccine, you might get the flu, but it won't be as bad as someone who didn't take the vaccine and get the flu." (19-year-old Hispanic/Latinx English-speaking participant).</p> <p><u>COVID-19 vaccine</u> "It's something that will help them, even though it's not something that is a cure, that they won't get infected, they won't get sick, but their defenses will be stronger. If they get infected, well then it will be less, and they're already vaccinated." (16 – 34-year-old Hispanic/Latinx Spanish speaking participant)</p> <p>"Well, if you get the vaccine and you get COVID, well it is a little less risk that you'll get a strong one" (10 – 29-year-old Hispanic/Latinx Spanish speaking participant)</p>
Passive immunity to infants	<p><u>Vaccines overall</u> "They're far more interested in protecting the baby than they are in protecting themselves which I think is just a gender thing we teach mothers which is super unfortunate but I think that using the infant, the passive immunity, and this will help protect the baby is often a powerful way to get them to see that it's not just for them but also for the baby. I wish that they would just do it for themselves a lot of them will do it for the passive immunity." (38-year-old white English-speaking participant)</p> <p><u>Influenza vaccine</u> "I wouldn't want my child to come out sick, you want your children to be born healthy... I prefer that they give them to me while I'm pregnant to prevent it for him." (40-year-old Hispanic/Latinx Spanish-speaking participant)</p> <p>"Like pretty much everything you were vaccinated for, almost like medicine would go straight to the baby to help boost their immune system or something like that." (20-year-old Black/African American English-speaking participant)</p> <p>"They also tell me that the child, is born with the vaccine, like it protects him for 6 months I think, or a year and I get it." (6- 31-year-old Hispanic/Latinx Spanish-speaking participant)</p> <p><u>Tdap vaccine</u> "I mean they say [Tdap vaccine] is for the baby's health, then I'm gonna have to get it" (19-year-old Hispanic/Latinx English-speaking participant)</p> <p><u>COVID-19 vaccine</u> "The truth is that for me it was one of the best decisions that I've made because for the simple fact that I'm sure that my child will be born with their defenses and everything." (25-year-old Hispanic/Latinx Spanish speaking participant)</p>
High susceptibility to disease motivates vaccines	<p><u>Vaccines overall</u> "You don't want to get sick, especially with everything going on, especially with COVID, it makes you think twice." (26-year-old Cape Verdean English-speaking participant) For children: "because they are exposed to a lot and also it prevents the viruses that we don't have to worry about coming back." (32-year-old white English-speaking participant)</p> <p>"That is good that they control that, same as with children who they give the moment that they come, enter the world, vaccinate them, to prevent illnesses. In these times, you know, there are many diseases." (40-year-old Hispanic/Latinx Spanish-speaking participant)</p>

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Table 2 (continued)

Theme: Vaccines Promote Health

Sub-themes	Quotes
Benefits outweigh the risks of vaccination	<p><u>Influenza vaccine</u> “Well for me, I need it, yes, it is good that I get it and it is necessary because I am asthmatic, it protects me and before when I would get the flu, I would get a strong one and I feel that with the vaccine, I don't get a strong one” (31-year-old Hispanic/Latinx Spanish speaking participant)</p>
	<p><u>Tdap vaccine</u> “Because there are a lot of diseases like tetanus, many infections, that you don't know about... its better [to get] the vaccines.” (40-year-old Hispanic/Latinx Spanish-speaking participant)</p>
	<p><u>COVID-19 vaccine</u> “It is my best bet because I'm around a lot of people that I don't know, and they don't wear their mask. But if it was up to me, and not being in this situation, I probably wouldn't really have thought about it.” (22-year-old Black/African American English-speaking participant)</p>
	<p><u>Vaccines overall</u> “I realized it helps boost your immune system and I'd rather he have a chance to fight off any type of infection he's high risk for than not giving his body the chance to fight it off.” (20-year-old Black/African American English-speaking participant)</p>
	<p><u>Influenza vaccine</u> “Because I'm like it's better to get it than to get sick and have to worry about that.” (22-year-old Black/African American English-speaking participant)</p>
	<p>“I prefer him to have the flu shot instead of him getting the flu. Because it's worse to be sick than having the flu shot.” (19-year-old Hispanic/Latinx American English-speaking participant)</p>
	<p><u>COVID-19 vaccine</u> “[Vaccines] are good. I think after the COVID vaccine we... see all the results have been good because from what I know there are no negative things, so I got out of my mind that the vaccines carry aftermaths. I don't think that.” (33-year-old Hispanic/Latinx Spanish-speaking participant) “Like I said I was one of the first that signed up because I said, “Well how is it going to be that the doctors got it first and no one is going to want to do something bad to the doctors so obviously if it is bad, they wouldn't want to give it to them” (41-year-old Hispanic/Latinx Spanish-speaking participant)</p>

Theme: Social Norms

Sub-themes	Quotes
Trust in healthcare providers is more important than specific vaccine-related knowledge	<p><u>Vaccines overall</u> “Some people say it's bad, you know, especially for kids because you don't know what they're getting, but honestly, I really don't go by what other people say. I go by what the doctor says or how I feel personally.” (26-year-old Cape Verdean English-speaking participant)</p>
	<p>“If my doctor can explain it better than the way I read the research then I'll probably just take my doctor's word for it” (22-year-old Black/African American English-speaking participant)</p>
	<p><u>Influenza vaccine</u> “If my doctor or healthcare provider authorizes it, I know it is convenient and I would do it because if the doctors trust in putting it on, then I trust as well.” (33-year-old Hispanic/Latinx Spanish speaking participant)</p>
	<p><u>COVID-19 vaccine</u> “If the experts recommend [the COVID-19 vaccine] and they already made the vaccine, so you should get it because we wanted them to make a cure, so now that we have this, this cure, we need to get it” (31 year old Hispanic/Latinx Spanish speaking participant)</p>

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Table 2 (continued)

Theme: Vaccines Promote Health

Sub-themes	Quotes
<p>Vaccinations are a social responsibility and for public health</p>	<p><u>Vaccines overall</u> “It’s basically a necessity it’s a prevention and also, it’s not even just for us but it also protects you know? Other people. We live in a social environment so it’s um we all hold—you know it’s also preventative for not just yourself but others around you too.” (29-year-old race self-described as other English-speaking participant) “Important because you take care of yourself from whatever bacteria, whatever virus and also you protect others, protect your children, you understand? Family, we’re close and it’s important. This is very important, getting vaccinated.” (31-year-old Hispanic/Latinx Spanish-speaking participant) “I think that it’s also the same importance, just like a baby, I think that an adult is equally as important because we help to prevent diseases, by taking care of ourselves, staying healthy and to help keep the community healthy because if the community does not get vaccinated and one person is sick, we all get sick, so I think it is very important.” (40-year-old Hispanic/Latinx Spanish-speaking participant)</p> <p><u>Influenza vaccine</u> “The flu can be particularly dangerous during pregnancy and also that getting vaccinated during pregnancy is protective for the neonate and that specifically around certain strains of the flu this is particularly impactful so definitely wanted to stay well while pregnant and also be a good member of society and get vaccinated myself.” (37-year-old South Asian English-speaking participant)</p> <p><u>COVID-19 vaccine</u> “I want to protect my family and my patients. I want to feel safer, and I want the people around me to feel safe” (37-year-old South Asian English-speaking participant) “Usually if it’s safe for protecting people from actually getting it, I would want my family member to get it because it doesn’t only protect them but also the people surrounding them.” (20-year-old Hispanic/Latinx English-speaking participant)</p>
<p>Habit of receiving routine vaccine/ positive prior experiences</p>	<p><u>Vaccines Overall</u> “I feel that a lot of these vaccines that I’ve seen that I get and that my children get when they’re babies have been around and the tests have been over and over throughout the years and there’s been clinical trials.” (36-year-old white English-speaking participant)</p> <p><u>Tdap vaccine</u> “Yes, if I’m not mistaken, yes only that it seems that they told me that yes that one I’d gotten when I was little” (37-year-old Hispanic/Latinx and white Spanish-speaking participant)</p> <p><u>Influenza vaccine</u> “My family also receives [the flu vaccine] every year and especially my mother-in-law thinks it is very important because it helps a lot.” (40-year-old Hispanic/Latinx Spanish speaking participant) “I’ve had [the flu vaccine] in the past, so, and I know that it doesn’t really have an adverse effect on me.” (29-year-old white English-speaking participant) “But since I got pregnant? Yes. I remember I got [the flu vaccine] with my first daughter, and then I just got it not too long ago” (26-year-old Cape Verdean English-speaking participant)</p>

vaccinations related to rushed development, mandates, and misinformation. (Table 3)

Concerns about vaccine side effects during pregnancy

Several participants cited limited knowledge and apprehension about side effects: “I just don’t want to have a reaction since it’s my first time and I don’t want to end up being sick when it could be avoided, I guess.” (36-year-old white English-speaking participant). Participants also expressed specific concerns related to vaccination during pregnancy. Several participants opted to delay vaccinations until after pregnancy or until after they had finished breastfeeding: “I would wait until after giving birth and then get the vaccine [COVID-19 vaccine] for myself...just because the risks of things like miscarriage or things like that because everyone’s body is different, and I don’t know necessarily how my body would react to something like that” (19-year-old Black and Hispanic/Latino English-speaking participant).

Concern about influenza vaccine causing illness

Concerns specific to the influenza vaccine centered on perceptions of ineffectiveness or vaccines causing influenza-like illness. Several participants described receiving the influenza shot then subsequently developing flu-like symptoms or experiencing more illnesses in the years they received the vaccine compared to years when they did not: “I’ve had it before. I stopped taking it within the last couple of years because every time I get the flu shot, I end up getting the flu versus when I don’t have it, I end up being alright” (29-year-old self-described as other English-speaking participant). Another stated: “Didn’t take it. I felt as though everybody who was taking the vaccine was getting [the flu].” (26-year-old Cape Verdean English-speaking participant).

Concerns about COVID-19 vaccinations: rushed development, mandates, and misinformation

Participants expressed the most concerns about COVID-19 vaccinations. At the time of the interview, 26.2% (n=11) participants were undecided about whether they would receive the COVID-19 vaccine, and 21.4% (n=9) stated that they were unlikely to receive it. Factors contributing to vaccine hesitancy included misinformation regarding vaccine ingredients, side effects, the expedited development and release of COVID-19 vaccines through emergency use authorization, and concerns related to perceptions of man-

dated vaccination: “In some ways it makes me see vaccines as more fallible because you’re sort of aware of how quickly some of the stuff gets figured out and tested and it’s not just like this inevitable thing that we even have this vaccine. Whereas many of the vaccines that I’ve had administered to me were developed and I was pretty young and you just kind of take it at face value.” (37-year-old South Asian English-speaking participant). Participants also worried about possible vaccine mandates: “I don’t want to be forced on us like the flu shot is being forced in Massachusetts because of the mandate and so I don’t know if I would have my back against the wall and have to do it like I did with the flu shot but I guess that’s something that we have to wait and see.” (36-year-old white English-speaking participant)

Many concerns regarding the COVID-19 vaccine included misinformation. Examples include that the vaccine caused deaths or miscarriages. Participants also worried that politics rather than science influenced its development and distribution, that the vaccine contained a microchip or government tracking device, and that it could cause infertility.

Wait and see approach

Several participants who stated that they were undecided or unlikely to vaccinate adopted a wait-and-see approach, citing a desire to hear from the experiences of others to increase their comfort with being vaccinated: “If I see more people taking it, and they’re fine, that would make me like, okay, maybe it’s just social media and all [...] But, I don’t really see that many people taking it, so, I don’t wanna risk my life taking it.” (20-year-old Black or African American English-speaking participant). Other factors included waiting for the release of more data on the effectiveness and safety of the vaccine and continued concerns about the side effects.

Information gaps and desired information

Though most participants felt that they received sufficient information about vaccines, some participants described inadequate information exchange at healthcare visits, “They [doctors] never explain to you directly how it is, they just simply tell you, now it’s time for the child’s vaccine against tetanus. Just like that they tell you.” (36-year-old Hispanic/Latino Spanish-speaking participant). One participant stated: “I think sometimes there’s not a lot of explanation, so people are left to do the research on their own.” (37-year-old South Asian English-speaking participant). Language barriers sometimes presented an issue: “Since the doctor talks in English, the nurse, so they give

Table 3. Perceived Concerns related to vaccination: themes, subthemes, and examples.

Themes	Example Quotes
Concerns related to side effects and vaccination in pregnancy	<p>"I mean just like anything I'm concerned about 'cause I haven't gotten [the tetanus vaccine] since I was a little kid. I'm concerned about putting anything into my body with a kid. As my first kid, I don't have experience with another" (20-year-old Black/African American English-speaking participant)</p> <p>"No, it's that I get scared. Because when I was pregnant with my child, they didn't give me any vaccine, I didn't let them give it to me." (25-year-old Hispanic/Latinx Spanish-speaking participant)</p> <p>I didn't really want to do it because I don't know how it would affect the baby or if it would affect her. So, I didn't want to do it. Because if I die, I wasn't trying to risk it and get it. So, like I said, everyone who I knew who got it, got the flu, so." (26-year-old Cape Verdean English-speaking participant)</p>
Influenza vaccine causes flu or is ineffective	<p>"I mean I don't know if vaccines are made to 100%, you know, stop you from getting the sickness, or anything like that, but I feel like even after getting a flu shot, because one time I did get the flu, and it was after I got a flu shot so I kind of just stopped believing that those things like work 100%." (19-year-old Hispanic/Latinx and Black/African American English-speaking participant)</p> <p>"The only thing I just don't really condone is the flu shot because I get sick every time." (29-year-old race self-described as other English-speaking participant)</p>
Concerns related to COVID vaccines	
COVID vaccine development was rushed	<p>"I feel the COVID vaccine is being really rushed because they just wanna appease the public to get back to normal so that's where my issue lies with that because I think although I'm not in the science research field I feel that there's a lot of things being rushed and we don't know the long-term outcomes of that being rushed." (36-year-old white English-speaking participant)</p> <p>"It was rolled out too fast." (20-year-old Black or African American English-speaking participant)</p>
Concerns that COVID vaccines would be mandated	<p>"Don't agree that they are trying to make it a mandatory thing, like if you don't have it, you can't travel or whatnot, you have to be tested it for COVID" (20-year-old Black or African American English-speaking participant)</p> <p>"Right now, the school sent me a note that I could already vaccinate them, and I saw one the news that in September, if the children that could get vaccinated don't get vaccinated that they couldn't go back to school, that brought me a bit of fear and sadness because at the end I'm not going to vaccinate them because I want to and I feel secure, but instead because I feel obligated to vaccinate because of the school otherwise they wouldn't be allowed to go to school." (33-year-old Hispanic/Latinx Spanish-speaking participant)</p>
Misinformation related to COVID vaccines	
Vaccine causes death/heart attack	<p>"...that's about the vaccine that it kills you... or you can have a heart attack, a lot of things, but I don't believe in those things" (32-year Cape Verdean English speaking participant)</p> <p>"There was also an article stating that um a guy in perfect health condition had got the corona vaccine and he ended up dying." (20-year-old Black/African-American English-speaking participant)</p>
Vaccine causes miscarriage	<p>"Because women have lost their babies when they got it and I'm scared of that." (25-year-old Hispanic/Latinx Spanish-speaking participant)</p>
Microchip Insertion	<p>"Oh yes I've heard that they say that the vaccine they give you a chip when they give you the vaccine." (31-year-old Hispanic/Latinx Spanish speaking participant)</p>

(continued on next page)

Table 3 (continued)

Themes	Example Quotes
Vaccine sterilizes girls and boys	<p>"I heard a person saying don't get it. Because that is a metal that they are going to inject you and after the Government is going to control you through that metal..." (40-year-old Hispanic/Latinx Spanish-speaking participant)</p> <p>"And then someone else said, don't get it because this, it's the virus and that brings more, it has long-term consequences, I even heard that it is bad for the like, it sterilizes girls, this is something that you still hear out there." (40-year-old Hispanic/Latinx Spanish-speaking participant)</p>

me a paper, so I'm left with doubts." (37-year-old Hispanic/Latino and white Spanish-speaking participant).

To ascertain what information was most important for patients, we asked participants what they would like to know regarding the influenza, Tdap vaccine, and COVID-19 vaccines. Participants shared their desires to learn more about the side effects and safety of receiving these vaccines during pregnancy and the effects of vaccination on their fetuses. Regarding the influenza vaccine, more Spanish-speaking participants wished they knew more about the vaccine's purpose and benefits, while English speakers wanted to learn more about its effectiveness. When interviewed about the COVID-19 vaccine, both English and Spanish-speaking participants desired to learn more about the vaccine's safety profile during pregnancy and its effectiveness. English speakers particularly stressed their desire to hear more about the vaccine composition and its mechanism of action.

Influence of the COVID-19 pandemic on vaccine attitudes

Participants also reported the influence of the COVID-19 pandemic on their attitude regarding vaccines in general. At the time of the interview, 64% (n=27) reported feeling that the pandemic did not affect their perceptions of vaccines. Another 19% (n=8) stated the pandemic positively impacted their perceptions of general vaccines: "Yes it has changed for me, the idea of having a medication that can help is very important, is supremely important, to be able to have and vaccine and the ability to use it. And being able to have the opportunity to have it, to obtain it, because many countries do not have that possibility and people continue to die." (40-year-old Hispanic/Latinx-Spanish-speaking participant). A minority of participants commented that the pandemic made them view all vaccines more negatively (14%; n=6).

DISCUSSION

This qualitative study of English- and Spanish-speaking pregnant individuals in a safety net setting provides insight into attitudes, motivators, and barriers toward receipt of maternal vaccinations, including COVID-19 vaccines. Nearly 4 out of 5 participants in our study reported high intention to receive the influenza and Tdap vaccines if recommended by their healthcare provider. These reported numbers exceeded the current national vaccine coverage of approximately 50% reported by the CDC.³ Approximately 30% of participants had received the COVID-19 vaccine at the time of the interview, consistent with national data CDC.⁶ An additional 20% intended to receive the COVID-19 vaccine in the future.

Participants of all cultural, racial/ethnic, and language backgrounds shared similar positive beliefs about the influenza, Tdap, and COVID-19 vaccines, and these were common to all vaccines: (1) vaccines promote health, (2) vaccination as a social norm, (3) trust in healthcare providers, and (4) protection of the individual and the community. Prior research also supports these findings. In Peru, pregnant people viewed receiving the influenza and Tdap vaccines as protection for themselves and their babies and were likely to receive said vaccinations due to physician recommendations.²² Similarly, pregnant women in Houston, Texas were willing to obtain the influenza and Tdap vaccines if recommended by their healthcare providers and if they received information regarding safety for themselves and their babies.²³

One key motivator is the importance of strong patient-physician relationships in shaping vaccine attitudes amongst patient populations. For both the influenza and Tdap vaccines, several participants reported receiving these vaccines as recommended by their physician without feeling a need to seek additional information. Furthermore, healthcare providers served as the most trusted source for vaccine information for many participants. Participants noted that the combination of their provider's

best intentions along with their medical expertise made them trusted resources for their and their children's health. These findings mirror research in other populations. In Mexico, over 80% surveyed would accept the Tdap vaccine if recommended by their obstetrician-gynecologist.²⁴ In El Salvador, researchers found that a high degree of trust between the community and healthcare providers positively influenced maternal influenza vaccine uptake.²⁵ In the United States, while the national influenza and Tdap vaccine coverage is only 50%, physician recommendation of these vaccines in pregnant populations boosted their acceptance to 68.1% and 69.9% for the influenza and Tdap vaccines respectively.³ Our findings and previous research demonstrate the importance of healthcare providers in maintaining and improving solid relationships with their patients and communities to optimize vaccine acceptance.

Overall, we found that while vaccine motivators were consistent across different vaccines (influenza, Tdap, and COVID-19), concerns and hesitancy were more specific to individual vaccines. Participants had few worries about the Tdap vaccine, which they viewed as a routine vaccine, and they were most worried about newer vaccines like the COVID-19 vaccine. Personal experience with flu-like illness after receiving influenza vaccines often drove a lack of enthusiasm for influenza vaccines, as they were perceived to be ineffective or cause the influenza. A previous U.S. study also found similar results.¹⁷ In addition, among women born in El Salvador and Guatemala, and Hispanics born in the U.S., confidence regarding vaccine safety predicted regular influenza vaccination.²⁶

Participants also shared concerns unique to the COVID-19 vaccine. These concerns generally fell under two categories: (1) politics and (2) personal safety. Relating to politics, participants noted their worries about the vaccine's rushed development, forced mandates, and the existence of microchips. Regarding personal safety, individuals remarked on their fears that the vaccine might cause miscarriage, infertility, or long-term effects on their health or their baby's health. These concerns largely mirrored previously reported hesitancies regarding COVID-19 vaccines.^{27,28} These specific concerns shared by our participants indicate the multifaceted nature of individuals' barriers to receiving a vaccine and serve as a reminder to healthcare providers to consider multiple perspectives from their patients when seeking to improve vaccine uptake.

Higher levels of hesitancy were specific to the COVID-19 vaccine—participants across racial/ethnic and language backgrounds largely reported that their views on routine vaccinations had remained unchanged. Healthcare providers can capitalize on positive feelings toward routine vaccines to educate around vaccine-specific concerns.

Public health messaging around vaccine safety and side effects may be more effective if vaccine specific, and likely should avoid stating that all vaccines have similar side effect profiles. International research noted that higher knowledge levels in pregnant individuals was associated with higher rates of influenza vaccination in Italy.²⁹ Vaccine-specific education could assist with the implementation of future interventions for new vaccines.

This study has several limitations. This single-institution study only included patients receiving care at an urban safety net hospital, limiting the generalizability of these results to patients who access care in private healthcare settings, those who do not access healthcare, and those in other geographic regions. Moreover, the study did not actively recruit vaccine-hesitant individuals, and those who participated may be more trusting of healthcare or research, influencing their view on vaccines. This research occurred at different time points during the COVID-19 pandemic as interim guidelines and recommendations changed frequently, which may have provided variability in responses depending on the time of the interview. Future research can explore preferred vaccine messaging among vaccine-hesitant individuals and messages with culturally competent language in communities of color.

CONCLUSION

We found that most pregnant individuals supported routine prenatal vaccines. Positive attitudes toward vaccinations were similar across Tdap, influenza, and COVID-19 vaccines and among patients of different racial/ethnic and language backgrounds. In contrast, concerns were vaccine specific. Participants expressed few worries related to Tdap vaccines due to longstanding familiarity with the tetanus vaccine. However, their personal experiences of flu-like illnesses after influenza vaccination caused some participants to reject future boosters. Concerns about COVID-19 vaccines due to misinformation were most prevalent. Regardless of these concerns, the COVID-19 pandemic did not negatively impact most of our participants' views on vaccines in general. Based on these findings, future interventions to improve vaccine uptake may focus on benefits common to all vaccines, while addressing concerns in a vaccine-specific manner.

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DECLARATION OF COMPETING INTEREST

The authors have no conflicts of interest to disclose.

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