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Tahira L. Perry Date

*"But what if..."* : The Influence of COVID-19 on Vaccination Acceptance during Pregnancy in the US Southeast

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# *"But what if..."* : The Influence of COVID-19 on Vaccination Acceptance during Pregnancy in the US Southeast

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2021

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An abstract of a thesis submitted to the faculty of the
Rollins School of Public Health of Emory University
in partial fulfillment of the requirement for the degree of
Master of Public Health
2023

## Abstract

*"But what if..."* : The Influence of COVID-19 on Vaccination Acceptance during Pregnancy in the US Southeast

By Tahira L. Perry

**Introduction:** Vaccination serves as an efficient primary means of control for infectious disease. However, in the case of the COVID-19 pandemic, literature suggests that pregnant women within the United States had the lowest rates of COVID-19 vaccination and intent to vaccinate during the initial onset of the global pandemic. The purpose of this study is to describe the social implications of COVID-19 and pregnancy on vaccine decision-making, contextualize this decision-making process for pregnant people during the pandemic and analyze the factors that informed COVID-19 vaccination uptake during pregnancy.

**Methods:** This study uses data from a mixed-methods study that examined the impact of COVID-19 on women's experiences of pre-natal care, birth support and delivery in the US South. The research team utilized Dedoose and created a dual inductive-deductive code book analysis of in-depth interviews (n=20) with women (18+ years old) who discovered their pregnancy by January 2020, and had their prenatal care and delivery during the pandemic beginning in March 2020. The transcriptions were de-identified and thematically analyzed to highlight prominent themes across participants associated with their birthing experience, COVID vaccination status and considerations. Participants completed a brief demographic online survey that included questions about their pregnancy history and COVID-19 vaccination status and a separate psychosocial survey, the results of which were used to analyze participant data based on vaccination status.

**Results:** Participants cite three major themes when discussing their considerations of COVID-19 vaccine decision-making during pregnancy. The themes included decisional conflict leading to COVID-19 vaccine hesitancy, the intersection between support and resources sharing as a tool for empowerment, and vaccination as an opportunity to regain connection. Additionally, participants reported the impact of prior adverse reproductive experiences on COVID-19 vaccine hesitancy during pregnancy.

**Conclusions:** This study begins to address the gap in knowledge about what factors that are important for pregnant women when vaccine decision making and how different contexts and personal identifies shape how those factors are weighed. The findings from our study provide insight into the lived experiences of pregnant women during the COVID-19 pandemic, the struggles to find substantial data for vaccine safety among birthing populations, how social and clinical support influences perinatal decisions, and the impact of prior adverse reproductive experiences on individual calculus. Notably, understanding this relationship will allow for enhancement of vaccine dissemination strategy and advocacy for vaccine trial inclusion for the population.

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Additionally, I must take time to express my appreciation for the amazing research team who conducted the primary data collection and analysis for the study including PIs Suba Narasimhan and Leslie Johnson, as well as RAs Joi Henry and India Stevenson. To my thesis chair, Suba Narasimhan, I am honored to have completed this study under your tutelage. Thank you for the continuous support and encourage throughout the process. I must also extend my gratitude to my committee member, Leslie Johnson, who provided extensive expertise and guidance throughout the data analysis process. Without the individuals previously mentioned, the study and thesis composition would not have been possible.

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# Introduction

## Problem Statement

COVID-19 is a viral disease, first discovered in Wuhan, China in late 2019 (Wang et al., 2020). Since the rapid spread globally, there has been a total of nearly 104 million cases of COVID-19 infection, with a total of approximately 230 million people receiving the primary series of COVID-19 vaccination within the United States. As of March 2023, there has been an overwhelming total of 1.1 million deaths since the start of the pandemic (CDC, 2023). To date, this data has not been disaggregated to highlight the COVID-19 deaths during pregnancy. Vaccination serves as an efficient primary means of control for infectious disease. Specifically, in the case of the COVID-19 pandemic, the accelerated production and approval of vaccination was essential to combat the rapid rates of infection and adverse health outcomes of the SARS-CoV-2 virus (Galanis et al., 2022). Yet, much work is left to create vaccination guidelines for pregnant women, who have not been adequately prioritized as a vulnerable population.

Researchers have identified that pregnant women with COVID-19 symptoms are more susceptible to face severe illness, preterm birth outcomes and mortality (DeBolt et al., 2021; Zambrano et al., 2020; Breslin et al., 2020). Based on existing literature, the increased state of vulnerability associated with pregnancy requires protection from COVID-19 acquisition for people who can become pregnant. However, literature reports that pregnant women within the United States had the lowest rates of COVID-19 vaccination and intent to vaccinate during the global pandemic, ranging from 37% to 52% (Goncu et al., 2021; Skjefte et al.,2021; Battarbee et al., 2022; Mohan et al., 2021). This may be related to the lack of empirical evidence targeted towards pregnant individuals regarding COVID-19 vaccine safety and the fact that clinical trial

populations which did not include pregnant people (Beigi et al., 2021; Adhikari & Spong, 2021; Garg et al., 2021; Whitehead & Walker, 2020). Several researchers have discussed the harmful realities of clinical trial exclusion for pregnant people including increased vaccine hesitancy and lack of opportunity for informed decision-making. (Beigi et al., 2021; Adhikari & Spong, 2021; Garg et al., 2021; Whitehead & Walker, 2020). Moreover, this lack of data hinders the ability for clinical professionals, such as OB/GYNs, to properly inform and support their patients regarding COVID-19 vaccine uptake, creating opportunity for heightened vaccine hesitancy (Brillo et al., 2022; Rasmussen et al., 2021).

Currently, literature about pregnancy and COVID-19 vaccination focus on perceptions of vaccine safety, reviews of vaccination guidelines for pregnant women and analysis of the external barriers which prevent vaccination during pregnancy, However, there is limited research provided about the experience of pregnant women, specifically the interplay between internal and external barriers and facilitators that may impact COVID-19 vaccination decision-making and uptake. This cross-sectional qualitative study will fill the gap by examining the vaccination decision-making of people who were pregnant and delivered during the COVID-19 pandemic.

**Purpose Statement**

The purpose of this study is to describe the social implications of COVID-19 and pregnancy on vaccine decision-making, contextualize the decision-making process for pregnant people during the pandemic and analyze the factors that informed COVID-19 vaccination uptake during pregnancy. Specifically, we seek to gain a better understanding of how intersectional identity influences vaccine decision-making and how perception of public health guidelines can mitigate or exacerbate vaccine hesitancy among birthing populations.

## Research Objectives & Aims

The objective of this study was to understand the considerations of COVID-19 vaccine decision-making for pregnant individuals from the perspective of women pregnant during the COVID-19 pandemic residing in Georgia in the Southern United States.

The Aim of this study were to:

> Aim 1: Examine the internal and external facilitators of COVID-19 vaccine uptake during women pregnant during COVID-19, and differences across demographic characteristics.
>
> Aim 2: Examine the internal and external barriers of COVID-19 vaccine uptake during women pregnant during COVID-19, and differences across demographic characteristics.

## Significance Statement

The realities of COVID-19 acquisition remain relevant, especially for a vulnerable population, including pregnant individuals. Although, preliminary studies provide information about vaccine hesitancy among pregnant women, there is a lack of qualitative research which examine the considerations among pregnant individuals around COVID-19 vaccination, and which elements push individuals to receive the COVID-19 vaccine (Goncu et al., 2021; Skjefte et al., 2021; Battarbee et al., 2022; Mohan et al., 2021). Further, current research literature fails to underscore the nuances of vaccine decision-making for pregnant individuals in the context of global emergencies. Moreover, the findings of this study set the precedent for more primary qualitative research focused on the decision-making pathways during pregnancy for vaccines. These results are useful to inform future pandemic preparedness and response when creating guidance for pregnant women and COVID-19 vaccination.

## Literature Review

To adequately examine primary considerations of pregnant individuals when deciding about COVID-19 vaccination, there must first be a detailed review of existing literature surrounding the COVID-19 pandemic and the resulting topics related to this humanitarian emergency. The literature review process was comprised of 25 existing scientific articles gathered via the Google Scholar and PubMed search engines. The keywords used explore literature included COVID-19 pandemic, COVID-19 risk during pregnancy, results of COVID-19 during pregnancy, COVID-19 vaccine trials, perceptions of COVID-19 vaccine safety, and COVID-19 vaccination during pregnancy. These terms allowed for a scoped analysis of existing literature.

### *Trends of the COVID-19 Pandemic*

The SARS-CoV-2 virus was originally identified in the Wuhan province of China, following the identification of pneumonia cluster cases of unknown cases to the Chinese National Health Commission. These cases were recognized during December of 2019 (Wang et al., 2020). The initiation of the novel coronavirus caught the attention of international agencies as a potential threat for pandemic. Wang et al. (2020) reports that the virus was isolated by Chinese scientists from identified cases within Wuhan. Through these developments, China served as a hub for early coronavirus findings around development of diagnostics. As global entities observed the virus unfold, in January 2023, the novel coronavirus spread from China to other areas of Asia and North America (Wang et al., 2020). Following the dissemination of coronavirus via air travel and migration, the World Health Organization addressed the increasing levels of spread and viral adaptation (Peirlinck et al., 2020).

Namely, from a clinical lens, the novel coronavirus was characterized by asymptomatic and symptomatic stages. As identified by Peirlinck et al. (2020), the majority of COVID-19 cases within the United States resulted in mild symptoms, while more severe cases may have been fatal. These symptoms included fever, cough, shortness of breath, and respiratory distress (Peirlinck et al., 2020). Upon the rise of the COVID-19 outbreak in the United States, there were region-specific trend which differed from the initial dynamics in Wuhan, China.

The initial spread of COVID-19 in the United States was identified in Washington state in January 2020. In the following April, the United States surpassed Italy with the most reported COVID-19 fatalities. The death burden of coronavirus served as a severe risk for older populations and the Black community (Bergquist et al., 2020). Within the United States context, the dynamics of data collection and reporting around COVID-19 were diverse across specific states. Though initial spread of coronavirus occurred on the West Coast, New York served as the core of the pandemic in the US. However, the state infection patterns seemed to fluctuate throughout various peaks of the COVID-19 timeline. Furthermore, the feature of decentralized government resulted in various levels of mitigation across the nation (Wang et al., 2020; Bergquist et al., 2020). However, politically, the federal administration spearheaded efforts for economic reinforcement following pandemic lockdown status. These efforts occurred in tandem with a rise in political and racial discourse within the United States.

The rapid outbreak had specifically harsh health outcomes for communities of color and other vulnerable populations. In these cases, during pandemic isolation, communities of color were more likely to sustain the ‘essential workforce’ and thus were more susceptible to occupational exposures. Additionally, these disadvantaged populations are more likely to have lowers

socioeconomic status and reduced access to adequate healthcare (McNeely et al., 2020). The intersectionality of these identities and roles for individuals exaggerates vulnerabilities to COVID-19.

Of all races represented, white individuals were suggested to be most at-risk for COVID-19 infection. However, Black individuals accounted for the highest rate of COVID-19 deaths, thought the population had lower risk of acquisition (Abedi et al., 2020). Specifically, the Black race faced 211 cases of death per million, while White people represented 76 deaths per million (Abedi et al., 2020). This displays how other socioeconomic factors interplay with potentially adverse health outcomes for vulnerable populations. Additionally, these concepts may have been exhibited when discussing the nuances of navigating potential COVID-19 infection during pregnancy in the United States.

### *COVID-19 Acquisition during Pregnancy*

The existing literature provides a continuum of information about COVID-19 infection among pregnant people. Pregnant individuals have consistently been identified as a vulnerable population within the United States. At the start of the pandemic, the cause and presentation of COVID-19 required further research to understand the potential risk of infection during pregnancy and the necessary precautions that should be taken to avoid exposure. Initial research conducted within New York City hospitals has suggested that pregnant people with COVID-19 infection may or may not present with symptoms. Of those with symptoms, pregnant women presented with mild symptoms excluding experiences with pneumonia and/or upper respiratory complications (Breslin et al., 2020). These finding also reflect the decision to complete universal COVID-19 testing for pregnant women upon admission for delivery. Specifically, pregnant

individuals were likely to encounter common COVID-19 symptoms including fever, cough, dyspnea, diarrhea, and malaise (Wang et al., 2021).

Early studies suggest that pregnant individuals have equal risk for COVID-19 acquisition as non-pregnant individuals, however, studies with larger sample sizes have demonstrated that pregnant women are at higher risk of medical effects (e.g., dyspnea, low respiration rate, postpartum fever, pneumonia, and potential death) (Breslin et al., 2020; DeBolt et al., 2021; Zambrano et al., 2020). Additionally, existing research documents that chances of vertical transmission (mother-to-child transmission) are extremely low (Huntley et al., 2020). As a result of the circumstances of COVID-19 pandemic, birthing populations have also been found to be more susceptible to adverse mental health issues which should be assessed via clinical screening (Kotlar et al., 2021; Wastnedge et al., 2021).

### *The Impact of COVID-19 clinical trial exclusion of pregnant people*

When considering the potential for severe coronavirus disease in pregnant individuals, there is extensive hesitation and delay incorporating pregnant people into SARS-CoV-2 vaccine trials. Globally, collaborations between federal governments and pharmaceutical companies led to the rapid development of the COVID-19 vaccine (Garg et al., 2021). However, the unprecedented vaccine formation was created while excluding pregnant and lactating women from trials, thus leading to a lack of empirical evidence for a vulnerable population (Garg et al., 2021; Whitehead & Walker, 2020). This experience differed from other high-risk populations who were included in COVID-19 vaccine trials, such as elderly populations. There are five primary COVID-19 vaccine brands which received emergency use authorization by the Federal Drug Administration, including Pfizer/BioNTech, Moderna, Janssen, Oxford/AstraZeneca and SinoVac, yet none were

tested among pregnant women. Historically, pregnant individuals have been excluded from vaccine research to prevent liability of maternal and fetal safety (Garg et al.,2021). However, in recent years, there have been regulatory adjustments made to clinical trial inclusion guidelines to increase vaccine data for this population. Specifically, the National Institute of Allergy and Infectious Disease and FDA have established guidelines for assessing the safety of clinical trials including pregnant people (Garg et al.,2021). Nonetheless, of the 5 major COVID-19 vaccine companies, only Pfizer and Moderna have made steps towards including pregnant women in their studies, due to unexpected pregnancies in their initial clinical trials.

The exclusion of pregnant women in clinical trials has created a perpetuating cycle where the lack of representation in research results in gaps in treatment and public health promotion campaigns. Beigi et al. (2021) advocates for the inclusion of pregnant people in COVID-19 vaccine trials while providing an approach for analysis of the dynamics. Namely, they express how exclusion of pregnant individuals from COVID-19 vaccine trials may be perpetuating a problematic cycle whereby, “pregnant women are neither expressly considered nor prioritized in early efforts to develop vaccines, they are in turn excluded from participating in research and the generation of evidence, which then results in exclusion from vaccine delivery programs” (Beigi et al., 2021). This description displays how the lack of evidence may lead to heightened susceptibility to and adverse outcomes from COVID-19 for pregnant persons. The existing literature also speaks to how the exclusion of pregnant people in COVID-19 trials leaves physicians ill-prepared when counseling birthing populations about COVID-19 vaccine safety and outcomes (Beigi et al., 2021; Adhikari & Spong, 2021). Despite these challenges, large societies such as the American College of Obstetricians and Gynecologists and the Society of Maternal Fetal Medicine, continued to advocate for COVID-19 vaccine availability for birthing

populations during the 2021 period of pandemic (Adhikari & Spong, 2021). Overall, researchers and professional medical societies advocate for the inclusion of pregnant persons in COVID-19 vaccine trials.

### *Perceptions of COVID-19 vaccine safety and acceptance among pregnant individuals*

Extensive research has been conducted to examine the perceptions of COVID-19 vaccine safety among perinatal women and highlights the psychological factors that play a role in deterring pregnant women from getting vaccinated against COVID-19 (Goncu et al., 2021; Skjefte et al., 2021; Battarbee et al., 2022; Mohan et al., 2021). According to the literature, intention to vaccinate during pregnancy ranged from 37% – 52% among this population (Goncu et al., 2021; Skjefte et al., 2021); while some articles suggested vaccine hesitancy rates of 25% and higher depending on the trimester of pregnancy (Mohan et al., 2021; Goncu et al., 2021). Specifically, existing research expressed that women held similar views of influenza and COVID-19 vaccination; thus, respondents who refused COVID-19 vaccines were also likely to deny influenza vaccines (Goncu et al., 2021; Battarbee et al., 2022). Pregnant women report low-trust in the safety of the COVID-19 vaccine due to the lack of data available (Goncu et al., 2021; Skjefte et al., 2021). Additionally, the details of individual pregnancy experiences played a major role in vaccine decision-making. Namely, pregnant women who were medically labeled as high-risk experienced more anxiety about receiving the COVID-19 vaccine (Goncu et al., 2021). These experiences were also salient for women who may have labeled themselves high-risk due to racial/ethnic identity (Skjefte et al., 2021). In some instances, pregnant women adopt the hesitancies expressed by their family members (Goncu et al., 2021), while some research suggests that pregnant women may be motivated to accept the COVID-19 vaccine in order to

protect their family members, particularly their children (Goncu et al., 2021; Skjefte et al., 2021).

Public health agencies and clinicians have a key role in advocating for vaccine uptake in this population. Brillo et al. (2021), however, suggests that public health agencies played an important role in creating vaccine hesitancy among pregnant women. The authors highlight that early guidance stated that COVID-19 vaccines were unsafe for pregnant women may have set the stage for continued vaccine hesitancy (Brillo et al., 2021). The lack of available data regarding the safety of the COVID-19 vaccine for pregnant persons also made it challenging for clinicians to provide education and guidance to pregnant people. Rasmussen et al. (2021) addressed the role that obstetric gynecologist plays in vaccine acceptance among pregnant women, noting that the lack of data available also hinders their ability to make informed decisions around COVID-19 vaccine safety (Rasmussen et al., 2021). Reports from obstetric-specific organizations, such as the American Congress of Obstetricians & Gynecologists (ACOG) and the Society of Maternal-Fetal Medicine (SMFM), aim to counter these barriers to vaccine uptake by increasing trust within the birthing population (Rasmussen et al., 2021).

### *Facilitators and Barriers of COVID-19 vaccine decision-making for pregnant people*

Currently, there is limited available literature on the facilitators and barriers of COVID-19 vaccine decision-making for pregnant people. Nichol et al. (2023) has proposed a research protocol for a review of the literature that would focus on identifying and synthesizing the currently available evidence on barriers and facilitators to perinatal vaccination for influenza, pertussis, and COVID-19. The authors suggest that their research will contextualize the relevant domains of vaccine hesitancy. Globally, a survey-based study conducted in Northern India

(Kumari et al., 2022) has characterized the knowledge, attitude, and concerns of pregnant and lactating women regarding COVID-19 vaccination. Similar to data form the U.S., this study found that the lack of data and inclusion of pregnant women in trials serve as a major deterrent to vaccination among the population. Additionally, the identified barriers to vaccination included socioeconomic status, willingness to pay for vaccination unforeseen effects on the fetus, the rapid vaccine development and approval process. However, this study was based on questionnaire data and North India socio-cultural contexts, which limits the generalizability of these findings. Other available literature focuses on country specific contexts including Ghana (Afrifa-Anane et al., 2022); vaccinations for other diseases of interest including human papillomavirus (HPV), rotavirus, pertussis, and influenza (Kilich et al., 2020), and other populations of interest including the general public, ethnic minorities and healthcare professionals.

**Significance**

As the climax of the pandemic fades, the realities of COVID-19 infection are still prominent, especially for vulnerable populations such as pregnant people. Although preliminary data support a limited understanding of COVID-19 vaccine decisions and hesitancy among pregnant women, there are gaps in understanding the specific domains and drivers which motivate or deter COVID-19 vaccine acceptance for this population. Furthermore, pregnant people continue to be excluded from vaccine trials which further impacts their negative perceptions of vaccine safety, especially in reference to COVID-19. The following study will address the present gap in understanding of barriers to COVID-19 vaccine uptake among pregnant persons, thus allowing for more tailored efforts to reduce COVID-19 vaccine hesitancy.

# Methods

## Study Team

The research team consisted of three individuals. The Principal Investigators (PIs) for the study were Drs. Leslie Johnson and Subasri Narasimhan. Additionally, the Research Assistant (RA) for the group was Joi Henry.

## Study Design

This is a secondary analysis of a subset of qualitative data from a cross-sectional concurrent mixed-methods study on the impact of COVID-19 on birth care and support among women who received prenatal and postpartum care during the COVID-19 pandemic prior to 2022 in Georgia. Data collected included in-depth interviews (IDIs) from 20 participants.

## Participant Sampling Criteria and Recruitment

Participants (n=20) were included in the study if they were pregnant by January 2020 and delivered in Georgia after March 2020. Women who gave birth to multiples and who were non-English speakers were excluded from the sample. Participants were also purposively sampled to reach a target of at least 50% of first-time parents. Further, to ensure that the study participants were representative of the racial/ethnic diversity of Metropolitan Atlanta, researchers purposively sampled to include 40% non-White respondents. The primary research team created digital flyers for advertising and participants were recruited via multiple strategies, including advertising to local birth centers and medical facilities serving pregnant people in Metro Atlanta. Informational emails were sent through organizational listservs and networks of different parent

groups. The response rate for the primary study was 91%, 22 participants were enrolled but 20 were ultimately interviewed. Two participants were lost to follow up after multiple contact attempts via email and phone.

### *Data Collection*

#### Instrument

The in-depth interview guide was generated through a collaborative and iterative process and the guide explored three key areas, (1) the perceptions of women on the impact of COVID-19 on their pregnancy and birthing, (2) the differences between first-time parents and parents with previous birthing history, and (3) the impact of the pandemic on women's postpartum psychosocial health outcomes. Interview probes, or sub-questions, examined vaccine decision-making and consideration for vaccine uptake at points in pregnancy or postpartum. Following in-depth interview guide development, PI Narasimhan conducted initial interviews and RA Henry was observed completing two interviews. RA Henry completed most interviews after being trained by PIs Narasimhan and Johnson. Additionally, all participants were given a socio-demographic survey to complete after consenting into the primary study. This survey included vital record of participant vaccination status and timing, leading itself well to the secondary analysis.

#### Procedure

Study recruitment flyers instructed interested individuals to call or email study staff to schedule an eligibility screening. Individuals who met the eligibility criteria and who provided e-consent were then asked to complete a brief pre-interview demographic survey. The 18-question

demographic survey collected participant characteristics including age, gender, race/ethnicity, education, marital status, employment status, members of the household, job loss during COVID-19, insurance type, insurance status during COVID-19, COVID-19 testing, COVID-19 infection, vaccination status, vaccination timing, and pregnancy and childbirth history. Upon completion of the consent document and demographic survey, they were scheduled for a time to conduct the interview and set of psychosocial questionnaires. Interviews were conducted through Zoom and had a meantime of 66 minutes (R: 57-87 minutes). Administration of the psychosocial questionnaires took around 30 minutes to complete. Interviews were recorded and transcribed verbatim using HappyScribe[3], an automatic transcription software. Once transcribed, transcriptions were checked for fidelity by a research team member. Quality checks were performed to ensure that transcriptions accurately depicted the nuances of the interview including participant verbiage, colloquial slang, and signs of verbal or bodily expression. Transcripts were then de-identified to ensure participant confidentiality and stored with a participant identification code (Study ID). Voice recordings and transcription files were separated and securely stored in OneDrive.

### *Data Analysis*

This secondary analysis focused on analyzing interview data that related to COVID-19 vaccine decision-making. A phenomenological approach was used to code and analyze the data. For data management and analysis, the primary research team used the Dedoose qualitative analysis software. Dedoose is a cross-platform web-based application designed to analyze qualitative and mixed-methods research with text, photos, and audio files.[1] Once the final codebook was established, coders individually coded each transcript.

## Secondary Analysis

With the research objective of understand the factors that influence COVID-19 vaccination uptake among pregnant women, the existing coded transcripts were reviewed to increase familiarity with the data and identify relevant codes. Beginning in November 2022, coded transcripts were reviewed in the Dedoose software. After comprehensive review, codes pertaining to the impact of COVID-19 and vaccination were identified for further evaluation. The identified parent codes of interest included were COVID, Decision-making, and Types of social support, while the secondary codes were vaccination, family risk perception, emotional drivers, partner, family, peers, medical team, and internet. For this secondary analysis, a thematic analytic approach was used, a process that includes identifying, examining, and recording trends within the data (Clarke et al., 2015). Throughout the analysis, thick descriptions were developed for the identified themes. Survey data on participants' vaccination history and socio-demographic characteristics were used to conduct comparisons within and across themes.

Additionally, the data reported through the standardized survey instruments were collected using REDCap.[2] The quantitative data were analyzed using descriptive statistics to summarize the key sociodemographic and psychosocial characteristics. These descriptive statistics include frequency, proportion, mean and range.

## Ethical Considerations

The research protocol was submitted to the Emory University Institutional Review Board (IRB) and deemed exempt due to the non-sensitive nature of the data collection. However, researchers adhered to appropriate informed consent and confidentiality procedures during study activities to

ensure participants were protected. Participants were recorded verbally consenting to the interviewer prior to the start of the interview., identifying characteristics were separated from interview data and interviews were redacted to ensure confidentiality. All interviewees were assigned a Study ID, which served to protect respondent identity and distinguish participant responses in an organized manner.

## Results

Participants interviewed included 20 self-identified cis-gendered women who received prenatal care and delivered prior to December  2021of the COVID-19 pandemic period. The majority of participants identified as White or Caucasian America (60%, n=14). The remainder of the participants identified as Black/African American (30%, n=6) and Mixed Race (5%, n=1). Whereas 5% (n=1) of participants reported ethnically as Hispanic/Latinx. The diverse population of participants mimicked the racial make-up of the Atlanta population. 60% of participants were first-time parents (n=12) while 40% had other children (n=8) in the household.  The mean age of the women interviewed was 35 years (R: 24 -43 years). The majority of women (85%, n=17) reported being vaccinated, all indicated receiving the booster dosage, while three women (15%) reported being unvaccinated during time of interview process. 35% (n=7) of individuals received the COVID-19 vaccine while pregnant, whereas 50% (n=10) of respondents were vaccinated after delivery.  Participants were highly educated with 85% with advanced degrees (n=17),10% with undergraduate education (n=2), and 5% with high school diploma (n=1).

**Table 1** : *Participant Demographics* (n=20)

| Characteristic | Frequency | Proportion (%) |
|---|---|---|
| **Age** | | |
| 20-29 years | 1 | 5 |
| 30-39 years | 16 | 80 |
| 40-49 years | 3 | 15 |
| **Educational Attainment** | | |
| Advanced Degree | 17 | 85 |
| Undergraduate Education | 2 | 10 |
| High School Diploma | 1 | 5 |
| **Self-Reported Race*** | | |
| Asian/Pacific Islander | 1 | 5 |
| Black/African American | 6 | 30 |
| White/Caucasian | 13 | 65 |
| **Ethnicity** | | |
| Hispanic/Latinx | 1 | 5 |
| Non-Hispanic/Latinx | 19 | 95 |
| **Parental Status** | | |
| First-Time Parent | 12 | 60 |
| Not First-Time Parent | 8 | 40 |
| **Vaccination Status** | | |
| During Pregnancy | 7 | 35 |
| Postpartum | 10 | 50 |
| Unvaccinated | 3 | 15 |

**Note: Participants were allowed to check all that apply for race/ethnicity, leading to a total over 100 percent.*

The results of the secondary analysis are presented within three thematic categories describing the major considerations which influenced COVID-19 decision-making among pregnant women, including*: decisional conflict leading to COVID-19 vaccine hesitancy, the intersection between support and resources sharing as a tool for empowerment, and vaccination as an opportunity to regain connection.*

**Theme 1: Pregnant women experienced decisional conflict around COVID-19 vaccination, which led to hesitancy to vaccinate while pregnant.**

Study participants fell on a continuum when they described their experiences with decisional conflict and COVID-19 vaccine hesitancy during pregnancy. The continuum ranged from no internal conflict and/or vaccine hesitancy to high levels of conflict and COVID-19 vaccine aversion. Throughout the interviews, the majority of individuals expressed facing 'internal conflict' when they decided whether to receive the COVID-19 vaccine during pregnancy or postpartum, while the minority of participants indicated little hesitation when deciding whether to be vaccinated for COVID-19. The source of decisional conflict mentioned were commonly the overwhelming lack of research and trial representation available about COVID-19 vaccination within birthing populations. Many respondents expressed combatting decisional conflict by consulting advice from medical professionals, public health practitioners and medical journals. In some cases of internal conflict, people who were hesitant also did additional independent research about the COVID-19 vaccination processes and get insight from medical professionals in maternal healthcare to reconcile their feelings. This included mentions of repetitive research about clinical COVID-19 vaccine trials which included pregnant people. Mentions of additional research varied from minimal to extensive research, depending on available career and

community resources. A first-time parent expressed how the lack of trials imparted challenged for COVID-19 vaccination during pregnancy.

> *Well, I did research on my own, but at the time, there wasn't any real research on COVID and pregnancy because they weren't doing any trials for the vaccines on pregnant women that we knew us. They didn't know how COVID really affected pregnant women. They just knew that it made them more susceptible to being sick and dying. But that's just because pregnancy is a comorbidity. (Non-Hispanic, African American, P_23)*

Furthermore, the decisional conflict around COVID-19 vaccination during pregnancy was attribute to differing priorities in areas of their lives. There were three major relationships identified when discussing the challenge of opposing ideologies about COVID-19 vaccination, including (1) career versus personal values, (2) perception of individual safety versus fetal safety and (3) perception of individual safety versus familial safety. One clear conflict for the majority was their careers/jobs, which were often in health or healthcare-related fields, espoused vaccination, and they often supported vaccination to their peers and family, but the personal calculus during pregnancy was challenging. For example, many participants expressed working within the public health field and support for the general concept of vaccination; however, they faced internal conflict when deciding to be vaccinated for COVID-19 while pregnant, due to lack of information and studies about the intersection of the virus and pregnancy. Specifically, a public health practitioner explained the discord between her professional and personal priorities.

> *I have this internal conflict given that I work for CDC, and I am pro- vaccine. I'm that kind of person. They're like, you need to take this vaccine. I'm like, okay, yes, no problem, no questions asked. I trust the science; I trust the medicine. And working with CDC, I try to promote vaccinations because I know they're important. Yeah, but I'm torn about this*

> *one because looking at the data I read, first I need to do more research and actually look at the scientific articles and what has been written about it. (Non-Hispanic, African American, P_13)*

Many interviewees also linked decisional conflicts to their household risk perception, especially prominent in households with children under five who were unable to receive COVID-19 vaccination. Additionally, some participants within the study described difficulties feeling that they would publicly supported vaccination, either through encouraging friend or family members, but had private reservations or issues when COVID-19 vaccine decision-making during their pregnancy period. Specifically, a mother of two discussed the battle of COVID-19 vaccine considerations for herself, her fetus, and her three-year old child.

> *I think it was hard to always know what was best for my other child during the pandemic. And I found myself asking my provider during my pregnancy visits what recommendations they had for my other child. So I found myself, even though I was there for a check on my unborn child, I was asking questions about the other one. (Non-Hispanic White, P_07)*

Similar conflicts existed among participants who ultimately became vaccinated and those who remained unvaccinated. Furthermore, for unvaccinated participants, some participants mentioned the decision to rely on herbal medicines as a means of protection for families with respiratory issues. For example, a participant shared that she and her partner chose not to get their family vaccinated because of their fear that vaccine side effects exacerbated their existing conditions of asthma and chronic bronchitis. A parent of three other children discussed that she relied heavily on herbal medicine and at the time of the interview, she believed that her family had never been exposed to COVID-19 because no one had become sick.

> *And like I said and I - most of it is based on just in all honesty, like I said, knowing that we do have, like between my husband and my little ones with the asthma and myself with chronic bronchitis, just kind of not knowing we just we did not. However, I am like, of this herb/nature mommy, we just stuck with it but none of us have ever, from the start of this thing up until now, ever tested positive or got sick. (Non-Hispanic, African American, P_18)*

Conflicts arose across the majority of participants' irrespective of their vaccination decision, suggesting how pregnancy or postpartum experiences altered priorities for vaccine decision-making. These findings seemed to be amplified by the lack of COVID-19 vaccine trial evidence including pregnant persons. Furthermore, decisional conflict was also linked family risk perception, in both participants that were vaccinated and unvaccinated during perinatal and postpartum stages. For many participants, the presence of young children, ineligible for COVID-19 vaccination, in the household resulted in parental desire to be vaccinated as a means of barrier protection for their other children. On the contrary, few participants mentioned fear that the COVID-19 vaccine side effects would exacerbate existing respiratory conditions in their household, leading to denial of the COVID-19 vaccine.

***Subtheme 1.1: Concern for Fetal Abnormality or Pregnancy Loss because of COVID-19 vaccination***

The issue of decisional conflict also arose when participants discussed potential adverse health outcomes for their fetus, because of COVID-19 vaccination. Participants who expressed concern for fetal abnormality or pregnancy loss were also the group that delayed or avoided vaccination. Specifically, participants mentioned the fear that elements of the vaccine might potentially impact fetal development or cause fetal abnormalities. A 38-year-old participant described how

her internal conflict was related to her concerns which stemmed from feeling unsure about side effects on the fetus.

> *So, in the middle of the end of June, and it was as a person in public health, I was having an internal conflict with myself. Do I get this vaccine that they don't know much about and how it would affect me in pregnancy? Will my baby have side effects from its kind of thing? (Non-Hispanic, African American, P_23)*

For some, these concerns were related to previous negative pregnancy experiences, such as miscarriage. A participant described her fears from a pregnancy before the pandemic, which impacted her concerns for the fetus she was carrying.

> *So I had a miscarriage early 2020, like, pre-pandemic. So I was already nervous that like we weren't going to hear heartbeat, I wasn't going to hear a heartbeat… (Hispanic White, P_10)*

Moreover, concerns of fetal abnormalities and pregnancy loss related to vaccination were common in first-time parents or those who had experienced previous loss. This connection was rooted in the 'fear of the unknown'. First-time parents were navigating the process of pregnancy, reproductive health decisions, the circumstances of the coronavirus pandemic and COVID-19 vaccination. A first-time parent of color expressed the levels of uncertainty she faced during her pregnancy.

> *For me, I was excited and surprised at the same time because I had gotten off birth control probably in November, and I thought that I was pregnant in April, and so I thought it would take way longer than that. Somehow, I thought it would take a year. And we had been trying, and I had just gotten the pandemic had started in March. So we were*

*at that point where we're like, should we even continue to try? Because it's a pandemic. The future is uncertain. What would it look like to be pregnant during this time? What would it be safe to go to the hospital? Just all of these unknowns just made it sound scary. (African American 33 years old, P_13)*

However, existing parents mentioned a sense of control over their pregnancy because they have engaged in the process, thus eliminating certain concerns when decision-making.

Some participants also mentioned how their professional experiences, which put them in contact with the adverse effects of COVID-19, led to concerns in their own pregnancies. For example, one interviewee reported that her and her partner were working for the Center for Disease Control (CDC) in COVID-19 case evaluations. In this role, they were exposed to an array of positive COVID-19 cases among pregnant women which unfortunately resulted in maternal death. These experiences forced participants to realize their potential for fatal outcomes following COVID-19 infection.

*…we both worked for CDC, but he had been working on the pandemic response and so he was very much aware of the ins and outs and of the data, the deaths and the risks of pregnant women. So he was very nervous. (African American, 33 years old, P_13)*

Participants' views on vaccine safety differed by racial background. Based on interviews, non-Hispanic White participants expressed more trust in vaccine safety and less hesitancy for COVID-19 vaccination. However, respondents of color discussed more complex considerations for vaccine safety. Of the six non-Hispanic Black participants, three individuals were unvaccinated for COVID-19 at the time of delivery; two decided to delay COVID-19 vaccination until after delivery, while one decided to be vaccinated while pregnant. However, the remaining

three Black women in the study account for all the participants that reported being unvaccinated at the time of interview. Further, Black women also described greater concern for negative outcomes in pregnancy linked to the high rates of maternal mortality among Black women in the United States healthcare system. Specifically, they mentioned feeling more comfortable with black providers and/or doulas to truly care for their birthing experiences and outcomes.

> *I mean, you know this. But of course, I wanted to have a home birth, especially with somebody that looks like me, a black person, to feel safe. I know it's a very sacred process. I wanted someone that I could trust. I wanted to be in my home where I felt comfortable. (African American, 30 years old, P_09)*

Majority of the black women in the study would mention how the experience of pregnancy as a black woman is nuanced. One 38-year-old Black participant who was vaccinated during pregnancy described the interplay between her racial identity, decision-making during pregnancy, and feelings of dismissal in clinical environments.

> *Like I said, pregnant women, they did know that there was a more likelihood of pregnant women dying. Couple that with being a black woman and the complicating factors of that in the healthcare system while being pregnant, I was like, oh, God, here's another thing for them to ignore. If I go to the hospital, that's basically what I felt like. And luckily, my OB GYN is a black guy, so I felt pretty safe with him. And being able to tell him, don't kill me, don't let me die. I think that was the biggest thing in making sure to be an advocate for myself, especially in the face of not having anybody there that could advocate for me if I was not able to do so myself. (African American, 38 years old, P_23)*

**Theme 2: Support and resource sharing around COVID-19 and reproductive health within social networks as a tool for empowerment.**

Participants who worked in the health fields and/or had members of their support network (i.e., spouse/partner, family members, friends, neighbors, etc.) that were public health practitioners or clinicians, they were more likely to trust the safety of the COVID-19 vaccination protocol. Participants' closer proximity to scientifically vetted health information made some feel like they had the self-efficacy to make informed decisions. The majority of respondents expressed how the ability to commune and discuss options with trusted members of their social networks eased the decision-making process. Specifically, a participant with one prior child mentioned her experiences with support and resource sharing within her own social networks. These experiences of sharing improved her comfort with vaccination without concerns.

> *"I'm very comfortable getting the COVID vaccination. And it was with that thought process that I had no reservations for myself, and I had no reservations for my spouse or parents, anyone in my friend group to receive it. And my spouse received his as soon as his group was available. Another layer of our family history is that I grew up in the [Atlanta] community where my neighbors are scientists and my friend group that graduated from [university] are scientists. A lot of them shared on social media research and excitement [for vaccinations]. A lot of my friends are healthcare providers. So, in my social media network, it was overwhelmingly excitement for vaccinations and sharing of precautions that we were taking to prevent the spread of COVID-19. That is my community that I'm surrounded by." (Non-Hispanic White, P_07)*

Within these conversations, most participants reported that there was no, or minimal stigma associated with COVID-19 vaccination discussions within their support network, in comparison

to conversations with individuals outside their trusted social networks (I.e., coworkers, healthcare providers, etc.). This observation encouraged their ability to explore options for COVID-19 vaccination, while also investigating perceptions of coronavirus vaccine safety from their trusted surroundings. Participants described how they received trusted information on vaccination through social media platforms and other online networks. For instance, one participant informed the interviewer that she believed it was absurd to encounter stigmatization within social networks, especially with consideration of pregnancy. She expressed that she felt supported in her decision to be vaccinated through pregnancy, which may have been reinforced by her social media networks as well.

> *On social media, I saw people sharing things, providers, especially who said, I'm a provider and I'm a pregnant person. And I chose to get that vaccine for these reasons. And if you want to send me a private message and discuss your situation, I'm happy to talk with you. (Non-Hispanic White, P_07)*

Specifically, she spoke about how she would follow [on social media], a health provider who was also pregnant during COVID-19. This provider created content about the reason she received the COVID-19 vaccine and encouraged her followers to privately message her for advice and to discuss personal circumstances. It is important to also propose that all participants did not have high proximity to public health and clinical networks or knowledge, thus they would not have had the same experiences or feeling of support when COVID-19 vaccine decision making while pregnant. Moreover, there seemed to be differences in generational exposure and trust in scientific processes, such as vaccination. Participants with diverse backgrounds seemed to have differing action thresholds for COVID-19 research. For instance, participants with generational exposure to scientific knowledge and trust in their lives seemed to

have lower thresholds for research-based evidence for vaccine safety. Whereas participants without generational exposure to the scientific knowledge and trust expressed more vaccine hesitancy and need to extensive empirical proof of vaccine safety

### *Subtheme 2.1: Comparison between COVID-19 Vaccination and other required perinatal vaccinations*

For some pregnant women, the rationale for COVID-19 vaccination was centered around the comparison between the COVID-19 vaccine and any other vaccines administered and encouraged during pregnancy. These approaches were seemingly rooted in communication with health professionals, including primary obstetric physicians and nurses. Of the participants that expressed receiving COVID-19 vaccine communication with their OB/GYN team, a minority described clear and informative advice regarding risks of pregnancy and COVID-19 vaccination. Within interviews, a mother of one expressed how the COVID-19 vaccine was comparable to other required vaccination during pregnancy.

> *To me, it was just like any other intervention you do during your pregnancy when you get your TDAP, or you do if you come back with Group B Strep and they're going to give you penicillin immediately. At that point, it was like, it needs to be a normal part of pregnancy. I was going to get my flu vaccine anyways. It was like, let's just do it right. (Non-Hispanic White, P_04)*

On the contrary, some study participants solicited COVID-19 advice from their health providers and did not receive adequate help or guidance in their vaccine decision-making process. Many participants felt overwhelmed by the overall information related to pregnancy and vaccination. These sentiments made these individuals develop concerns about receiving the COVID-19

vaccine. One participant discussed how the COVID-19 messaging produced overwhelming pressure for vaccination which led to aversion.

> *"I just personally feel like there's a lot of different diseases, there's a lot of things out here that some vaccines are not mandatory. You have your baby at the hospital. They ask you; do you want the hepatitis B vaccine. They don't just take your baby and just start vaccinating your baby. They ask you, and that's deadly for a baby. There's a lot of things. So, I feel like if you're not forcing me to get those, I shouldn't be forced to get anything else. I feel like it should just be my choice. When people force things, that's when I get a little skeptical, like, why are you forcing it? If it was just a choice, I probably would have done it, but the way it got forced, it kind of pushed me away from it." (Non-Hispanic, African American, P_17)*

**Theme 3: Vaccination allowed participants to regain social connection and perinatal support.**

Many participants cited the potential for interaction and community connection as motivating them to get vaccinated, however the experience seemed especially salient for first-time parents within the study. In some interviews, participants expressed how their motivations to receive the COVID-19 vaccination may have been linked to their ability to interact with their loved ones with a sense of safety.

> *And also, another positive, of course, is that we were feeling like our families were doing this as well, we had hopes that we would be able to finally see our families again. So, we live in Atlanta, but both of our families are in other states, and so we don't have them nearby. And so, we've literally spent a couple of years having no visits until vaccination*

*was a possibility. And we feel very grateful. All of them also got vaccinated, all of our close family and everything and friends as well. But it felt like a ticket to being able to see our families again. So even if all these other pieces weren't true, it felt like a really important piece of being able to have our dreams come true with our families being able to see our daughter when she was born and on and on.(Non-Hispanic White, P_12)*

Furthermore, participants mentioned that isolation and lack of physical interaction with family support, friends, and healthcare providers were factors impacting their vaccine considerations.

*I think that there was nothing that anyone could do, but I just felt very lonely because I was just at home and I was - it was lonely because of COVID at first, before I got vaccinated.(Hispanic White, P_10)*

With this in mind, the theme was tied to the desire to share the experience of pregnancy with their diverse social networks including parents, siblings, and grandparents. This pattern was especially relevant among first-time pregnancies within the participant group. A first-time parent expressed how the lack of social connection impacted her during her first pregnancy during COVID-19.

*But also it was sad because I just would have loved to have been with all of the family and to have that community and pass the baby around or just kind of have that kind of connection. So, yeah, I feel like that was kind of really striking to me in terms of just the isolation.(Non-Hispanic White, P_03)*

Interaction and support served as a repetitive theme, allowing participants to consider coronavirus vaccination to ensure their safety, as well as the safety of their family members, especially those populations more susceptible to health complications.

## Discussion

The purpose of this study was to describe the implications of COVID-19 and pregnancy on vaccine decision-making, to contextualize the birthing experiences of pregnant people during the pandemic and highlight the factors that informed COVID-19 vaccination uptake or hesitancy. We also sought to gain a better understanding of how intersectional identity, including identifying as a woman of color or a first-time parent, may influence vaccine decision-making and how perception of public health guidelines can mitigate or exacerbate vaccine hesitancy among birthing populations.

Our sample was highly vaccinated and educated, yet almost all expressed nuanced and complicated decision-making and some vaccine hesitancy. Many of the respondents expressed some decisional conflict due to competing ideologies leading to a range of vaccine hesitancy. Results suggest pregnant people use a wide range of calculus in their vaccine decision-making. A study by Kumari et al. (2022) also highlighted this result. The research study was a cross-sectional survey design including 313 pregnant and lactating women in a tertiary care center in North India. Kumari et al. (2022) found that pregnant women agreed that vaccination is essential however, they also considered economic status, the lack of data about vaccine safety for pregnant women, rapid vaccine development and approval. Notably, participants faced opposition between their professional and personal values, perception of individual and fetal safety, and perception of individual versus familial safety. These factors were drivers of vaccine hesitancy and some of the primary considerations for vaccine acceptance among our sample. As individual-level ideologies were not commonly identified in previous research, these results were not originally expected. It could be suggested that, though participants were highly educated and vaccinated, there presence of pregnancy creates a polarizing shift of considerations for the

birthing population. The study continues to reinforce concept of decision-making for self, while considerations are more carefully critiqued when women are responsible for the health outcomes of their offspring, especially when considering the trauma of past negative birthing outcomes such as miscarriage. This is immensely important to understand how best to inform birthing population in the case of pandemic health guidance and vaccine safety. With this information, research can expand clinical trials to include pregnant individuals with attention on the impact of vaccination on birthing outcomes.

The majority of our sample was vaccinated, however many delayed vaccinations until after delivery. These findings mirror results found in current literature on COVID-19 vaccination and pregnancy. Goncu et al. (2021) reported that only 37% of pregnant women in their study conducted with pregnant patients in Ankara City Hospital in Turkey, intended to receive the COVID-19 vaccine during pregnancy. Whereas our study had 35% of participants receive the COVID-19 vaccine while pregnant. Currently, pregnant women in the United States have the lowest rates of vaccination compared to other resource-rich countries, with vaccine hesitancy as a primary factor (Skjefte et al., 2021).

One of the most highlighted reasons for vaccine delay were lack of representation for pregnant women in clinical literature and concerns of fetal impacts. These results echo the findings of a study consisting of cross-sectional survey data from pregnant women in three US cities (Salt Lake City, UT; Birmingham, AL; New York, NY). Researchers found that pregnant suggested fetal protection was a primary reason for COVID-19 vaccine refusal in their study (Battarbee et al, 2022).

Battarbee et al. (2022) details that participants of diverse race and ethnicity were less likely to accept COVID-19 vaccination. Within our study, there were similar discrepancies in which

pregnant women of color discussed vaccine hesitancy and/or aversion. Women of color also accounted for all unvaccinated participant within the study, at the time of interviews.

Many participants highlighted COVID-19 vaccination data excluding pregnant individuals in their interviews, which resulted in a lack of clinical research around vaccine safety for the birthing population. This reflects the findings of existent data which speaks to how these exclusionary practices leave pregnant people more vulnerable to adverse outcomes (Garg et al., 2021; Whitehead & Walker, 2020; Adhikari & Spong,2021). Garg et al. (2021) supports these findings with a review of existing guidance supporting COVID-19 vaccination among pregnant and lactating women while highlighting how public agencies are altering current clinical trial frameworks to be more inclusive. Additionally, Whitehead & Walker (2020) developed correspondence to discuss the consideration of pregnant individuals in COVID-19 vaccine trials. The authors expressed that the revision of the exclusion of pregnant in COVID clinical trials by a major trialist, WHO-sponsored SOLIDARITY trial, could set a necessary standard for other COVID vaccine trails. Existing literature provides insight into how clinical providers, particularly OB/GYNs, may a major role in empowering pregnant to make informed decisions around COVID-19 vaccination. Adhikari & Spong (2021) produced an opinion piece with emphasizes the need for inclusion of pregnant women in COVID-19 clinical trials to allow for more informed clinicians. The authors underline how availability of data will encourage OBGYNs to empower their pregnant patients.

Findings related to delayed COVID-19 vaccination among participants met initial expectations, based on previous studies to understand vaccine safety among pregnant people. Beigi et al. (2021) supports that this observation is concerning because as a population that is highly vulnerable to disease, pregnant people are marginalized from research which leads to difficulties

for informed vaccine decision-making and heightened hesitancy. Also, the authors identify that birthing populations are seemingly excluded from the early planning and ultimate delivery of COVID-19 vaccinations.

Furthermore, our sample suggests that proximity to support and resource sharing improved uptake of COVID-19 vaccination among pregnant people. This finding expands upon the nuances of existing literature which does not mention this relationship. Due to the features of our study cohort, participants were in careers, households and neighborhoods saturated with healthcare professionals with knowledge about the COVID-19 pandemic and vaccine. However, the ability to have informative and resourceful communication within their trusted networks seems to heighten the opportunity for vaccine acceptance for pregnant individuals. This concept seems to arise due to an extension of trust within social networks.

Lastly, the advantage of seeing family and friends improved motivations to accept vaccination among pregnant individuals. Among the data, these motivators were especially salient for first-time parents. Though these findings do not appear in previous research, the findings seem apparent. Throughout the COVID pandemic within the United States, pregnant individuals were often isolated, whether by federal mandate or personal choice (Talbot et al., 2021). Talbot et al. (2021) performed a thematic analysis of tweets by pregnant individuals, companies, non-profit organizations, and health professionals. The analysis identified that pregnant women expressed anxiety, depressive symptoms, sleeping problems, and distress due to COVID-19 isolation. The experiences were persistent across their social and clinical support within our study. This relationship more than likely led to a developed yearning for social support throughout pregnancy, as well as the ability to engage with their loved ones for mental relief.

All in all, this study supports findings available in existing literature and expands upon said findings to further explore the internal considerations which impact COVID-19 vaccine decision-making among pregnant individuals. The major factors reported throughout the study were feelings of internal conflict due to the lack of available data and inclusion of pregnant people in COVID vaccine trials, decreased vaccine hesitancy with more support and resource sharing within personal networks, and the desire to be vaccinated for family and friends support during pregnancy.

**Strengths & Limitations**

Though there are many benefits to this study, there are some limitations to the findings. The study consists of a homogenous sample group with high educational attainment, similar professional training, and race/ethnicity. However, this niche sample allows for a deeper understanding of how more affluent women approach the internal factors of vaccine decision-making. Additionally, during primary data collection, our research team did not disaggregate information by brand of vaccine. Initial collection acquired information about vaccination status and time of vaccination during pregnancy. This study is embedded in the context of the Southern United States, as thus will not provide insight into this relationship in other geographic contexts. Furthermore, most of the participants had private insurance, thus the team cannot extrapolate to individuals with public insurance coverage. As a secondary analysis, vaccination was not the primary impetus for the study and was not a part of the recruitment timeline. Therefore, a subset of women within the study did not have COVID-19 vaccines available until their post-partum period. Another potential limitation would be that the quantitative survey metrics were self-reported, thus leaving room for inaccurate reports. As a safety precaution, each participant was interviewed via Zoom. Seemingly, this factor would limit the study, however, participants

expressed that the virtual format allowed an opportunity to freely discuss their experiences during pregnancy.

Though there were some limitations to our study, there were many strengths. Though existing literature provides information about external barriers to COVID-19 vaccination during pregnancy, this study explores the internal barriers to vaccination. Furthermore, all participants were mandated to include specific vaccine information to prevent bias. Additionally, the participant sample provided variability in birthing experiences and their support systems. Likewise, participants exhibited variability in their prior adverse reproductive experiences, extending the opportunity for inductive sub-characteristics for richer analysis.

## Conclusion

Since the beginning of the COVID-19 pandemic, there has been substantial evidence which suggest low intention rates for COVID-19 vaccination among pregnant individuals (Goncu et al., 2021; Skjefte et al., 2021). Thus far, a broad range of research has been dedicated to examining the impact of COVID-19 acquisition during pregnancy, the impact of COVID-19 vaccine trial exclusion on pregnant women, and perceptions of COVID-19 vaccine safety among the population (Kotlar et al., 2021; Breslin et al., 2020; Wang et al., 2021; Andrikopoulou et al., 2020; Debolt et al., 2021; Zambrano et al., 2020; Adhikari & Spong, 2021; Beigi et al., 2021; Whitehead & Walker, 2020; Garg et al., 2021; Wastnedge et al., 2021; Goncu et al., 2021; Skjefte et al., 2021; Battarbee et al., 2022; Brillo et al., 2022; Rasmussen et al., 2021; Mohan et al., 2021). However, existing literature has not efficiently explored the range of facilitators and barriers of COVID-19 vaccination for pregnant women. This study begins to address the gap in knowledge about the internal compass of considerations for pregnant women when vaccine decision making. The findings from our study provide insight into the lived experiences of

pregnant women during the COVID-19 pandemic, the struggles to find substantial data for vaccine safety among birthing populations, how social and clinical support influences perinatal decisions, and the impact of prior adverse reproductive experiences on individual calculus. The contextualization of pregnant women's experiences about vaccine hesitancy and considerations provides opportunities to further explore the interplay between pandemic emergencies and vaccine uptake among pregnant individuals. Notably, understanding this relationship will allow for enhancement of vaccine dissemination strategy and advocacy for vaccine trial inclusion for the population.

## Public Health Implications & Recommendations

The purpose of this study was to describe the implications of COVID-19 and pregnancy on vaccine decision-making, to contextualize the birthing experiences of pregnant people during the pandemic and analyze the factors that informed COVID-19 vaccination uptake during pregnancy such as perceived susceptibility and severity. There are several recommendations that emerge from these results. Initially, obstetric, and gynecologic providers should have access to comprehensive COVID-19 vaccine updates and information about the clinical trial outcome including pregnant individuals, if any. This adjustment will allow for more empowerment and informed decision-making opportunities, regardless of demographic differences. As some participants mentioned that lack of clinical trial representation as a sources of vaccine hesitancy, research institutions should consider the inclusion of pregnant women in vaccine trials within situational judgement. As previously expressed by Beigi et al. (2021), the current exclusion approach for pregnant people, though evading liability, creates opportunities of injustice as the benefits of vaccination in pandemics outweigh the potential risk. Furthermore, during these circumstances, pregnancy and postpartum individuals should have access to educational vaccine

resources, including hotlines which will allow for personalized communication of concerns. These resources could be offered virtually for safety purposes but will allow for dispersion of access. This improvement could be especially helpful for communities of color which often face heightened levels of distrust and vaccine hesitancy, rooted in various historical injustices.

All in all, the reality of the COVID-19 pandemic and pregnancy altered the ways in which individuals approach vaccine decision-making, perinatally and postpartum. The findings of this study spotlight the nuances that should be considered for birthing populations when faced with vaccine decisions. These include the possibility of decisional conflict, emotional drivers influenced by previous reproductive experiences and identity, social support and access to resource sharing, and communication with healthcare providers.

Furthermore, there should be improved plans to disseminate and provide guidance for pregnant people in public health emergencies. Pregnant individuals are particularly sensitive to disease and adverse health outcomes; however, they must be prioritized as the general public when providing vaccine recommendations. Additionally, public health agencies should work on creating better pathways for offering highly useful data to the public. The findings in this study can be utilized to prepare and mold future public health emergency responses for pregnant individuals. Specifically, these suggestions can be used to inform strategies for the birthing population in Atlanta and other regions of Georgia. Furthermore, the results reiterate the needs for more multi-sectoral and targeted approaches to aid pregnant people make informed vaccine decisions for infectious disease.

Efforts to promote COVID-19 vaccine uptake among pregnant and postpartum individuals must be multi-sectoral to ensure that messaging best fits diverse attitudes, beliefs, and identified needs of people of color and first-time parents. Though the COVID-19 pandemic has reached a period

of plateau, these considerations of public health and safety should be leveraged to inform pandemic responses for birthing populations.

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